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SECTOR HANDBOOK
DISTRICT HEATING

Prepared by the CrossBorder Bioenergy Working Group on District Heating

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SECTOR HANDBOOK

DISTRICT HEATING

Prepared by the CrossBorder Bioenergy Working Group on District Heating
1. INTRODUCTION TO MARKET SECTOR
Almost 50% of the total energy consumed in Europe is used for the generation of heat. Renewable energy for heating covered 11.9% of total final energy consumption for heating in 2008 and 5.5% of the total gross final energy consumption of the EU-27. Of the 564.7 Mtoe total final energy consumption for heating, 67.8 Mtoe was covered by renewable energy (Eurostat).

District Heating (DH) covers currently supplying 10% of total heat demands in Europe. There are more than 5,000 medium and large scale district heating systems, with an annual turnover of €19.5 billion and 2 EJ (556 TWh) heat sales. However, market penetration of district heating is unevenly distributed. While DH having an average market share of 10 percent in Europe, it is particularly widespread in North, Central and Eastern Europe, where market shares often reach 50 percent and more, even 70% (EuroHeat & Power).

District Heating and Cooling (DHC) is cost-effectiveness and ecofriendliness. The share of renewable energy sources used in the generation of district heat is constantly increasing. At the same time the share of coal and coal products, as well as oil and petroleum products decreased. This development together with the large scale utilisation of cogeneration technologies make DH to one of the most popular sources for heating. The obligation to reduce CO2 emissions and increase the share of renewable energy, in order to meet European requirements, is regarded now and in the near future as one of the main drivers for the development of DH. An increasing number of national governments have identified District Heating and Cooling as an efficient technology to achieve the main objectives of the European legislation regarding sustainable energy.

IEA: "District Heating and Cooling consist of pipe networks that enable other technologies such as combined heat and power (CHP) to realise its potential by recycling or reusing waste heat. Energy efficiency results not only in a saving of fuels, but also in a consequent reduction of environmental pollution".

An international study co-financed by the European Commission confirms the possibility of saving an extra 400 million tons of CO2 yearly with more District Heating and Cooling across 32 European countries (thus more than the whole Kyoto target). Creating conditions for the expansion of district heating and cooling schemes will thus secure a more sustainable energy system and a brighter energy future (EuroHeat & Power).
DHC using renewables is strongly increasing in Europe. According to European Technology Platform on Renewable Heating and Cooling (RHT-Platform): In 2020 over 25% of heat consumed in the European Union could be generated with renewable energy technologies and by 2030 renewable heating and cooling could supply over half of the heat used in Europe. The majority of energy use takes place in urban areas, characterised by higher population density, where district heating and cooling networks represent a critical infrastructure to ensure large scale integration of renewable energy sources. The large majority of renewable heating and cooling will still be produced from biomass sources. RHC-Platform expects biomass use to more than double by 2020, mostly to meet heat demand.

For the market scope of the sector, today there are quite updated but overall District Heating and Cooling statistical data from most of European countries. For instance via the following links:

- Eurostat: http://ec.europa.eu/eurostat
- IEA DHC/CHP: www.iea-dhc.org
- RHC-Platform: www.rhc-platform.org
- DHC+ Technology Platform: www.dhcplus.eu
- AEBIOM: www.aebiom.org with its national bioenergy associations
- National energy associations like in Finland, Finnish Energy Industries: www.energia.fi

The CrossBorder Bioenergy -project collects and produces detailed DHC data from the point of view of bioenergy. The RHC-Platform expects biomass use to more than double by 2020, mostly to meet heat demand. The CrossBorder Bioenergy -project collects and produces detailed DHC data from the point of view of bioenergy. There will be a new GIS system on the project website, making it easy to identify promising bioenergy markets in Europe. Actual data and links into relevant data are needed for a sound market evaluation will enable companies to adapt market attractiveness to their own needs.

### Potential objectives for bioenergy, including a break-down according to the final form of the energy (in Mtoe):

<table>
<thead>
<tr>
<th>Year</th>
<th>2007</th>
<th>2020</th>
<th>2030</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total primary energy consumption</td>
<td>98</td>
<td>220</td>
<td>300</td>
<td>370</td>
</tr>
<tr>
<td>Total final energy consumption</td>
<td>78</td>
<td>175</td>
<td>261</td>
<td>357</td>
</tr>
<tr>
<td>Made up of:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heat (biomass for heat and derived heat)</td>
<td>61</td>
<td>124</td>
<td>182</td>
<td>231</td>
</tr>
<tr>
<td>Electricity</td>
<td>9</td>
<td>20</td>
<td>35</td>
<td>56</td>
</tr>
<tr>
<td>Biofuels</td>
<td>8</td>
<td>32</td>
<td>45</td>
<td>70</td>
</tr>
</tbody>
</table>
Strongly increasing use of biomass will serve large variety business and growing technology market and export possibilities to the stakeholders. Markets are open for different type and size DHC plants and networks/grids for bioheat, biocooling and CHP (Combined Heat and Power Production).

1.1 Key technologies in the DH-sector

The sector’s business and technology area is really large, by scale and size. DH-bioplants with boilersystems need also heat network with pipelines, pumps, heat exchangers, radiators, control and safety equipment, valves, other equipment and temperature meters. Also biomass production and fuel receiving into the plants will offer large amount of variable technology and logistical possibilities for stakeholders. The need of boiler capacities for DH-purposes starts from few hundred kW (thermal) boilers up to many hundred MW boilers (heat-only or CHP).

Today competitive technology for providing bioheat to households, commerce and industry is available, reliable and efficient but has to compete against well established systems based on fossil fuels. Bioenergy can provide both low-temperature heat and steam, and high temperature heat suitable for industrial processes. Small-scale heating systems fired with wood logs, chips or pellets offer good ease of use, low operating costs and are replacing oil heating in many European regions (Ecoheat4EU).

The key technologies of the sector are combustion or gasification of solid biomass and generation of heat-only or CHP. For combustion there are several technologies available (grate firing systems, fluidized bed combustion systems, jet blower firing, gasification systems etc). Same kind of basic boilers are suitable for both Heat-only and CHP plants in medium and large scale plants (min. capacity of 500 KW). More information and about main boiler technology and working principles for biomass plants is shown in the WG 4 (CHP) part of the
handbook.

Also biomass production and handling technologies and logistic system markets will serve huge possibilities to the stakeholder’s business over the borders. The rapid development of technologies will enable the production of high quality fuels, energy security, sustainable supplies, clean and effective combustion processes and optimally-integrated solutions for the inhabitants of the communities (households, offices, shops, service buildings and industry).

For small size district heating systems are based on few hundred kW boilers, normally using grate firing technology. The DH capacity suits only for heating few buildings. In larger municipalities heating network is connected normally in a 2-6 MWth boiler, and if it is CHP boiler it can produce also electricity (1-3 MWe). Boiler type can be grate firing or fluidised bed combustion boiler. In large cities and industry areas boiler capacities reach up many hundred MWth and more often they are CHP boilers with remarkable power capacity.

- **Indirect connection** of the customer heating circuit to the district heating network: a heat exchanger provides the hydraulic separation.

- **Direct connection** of the customer heating circuit to the district heating network. This principle does not include any heat exchanger, so the same district heating water is inside the secondary network (radiators, floor heating etc).

The heat network, especially if it includes efficient and inexpensive hot and cold stores, can operate as storage opportunity for the various renewable energy sources dependent on fluctuations in natural circumstances. This presupposes the effective accommodation of different energy sources at different temperatures. Solutions to be explored include the adaptation of operational temperature levels throughout the entire network and applying innovative types of pipeline configurations (EuroHeat & Power).

CHP will improve the energy efficiency rate in the plant corresponding with Heat-only solution. Same amount fuel and more energy. Also have to take into account climatic factors and local heating conditions when planning and investing DH-plants. Heating periods vary very much by countries and regions (from south to north and from sea-level to mountains). Normally in summertime a heatload is weak, and energy plant’s cost effectiveness decreases. Possibility to produce also electricity in a same plant will compensate that, and energy producer can run a plant with better energy efficiency.
Heat-only boiler 3-50 MW, max. pressure 10-20 bar (g), max. temp. 120-200°C, fuels: wood, bark, forest residues, peat (Renewa Oy).

 Fluidised bed boilers from 3.0 – 50 MW, max. pressure 100 bar (g), max. temp. 520°C, fuels: wood chips, wood waste, peat (Renewa Oy).

1.2 Target group in DH sector of the CrossBorder Bioenergy project

The CrossBorder Bioenergy project addresses mainly companies in the DH-sector business looking for a long-term commitment abroad, e.g. by investments into foreign branches or developing local market sectors to gain a high market share. Also technology producers who are looking after promising export possibilities in European bioenergy mar-
ket. Where is a market with an attractive market volume for investments, there is of course also potential for smaller single projects and subcontracting. Especially providers of turn-key bioplant projects covering all steps of a successful project implementation – from planning and consulting to implementation, operation and maintenance – and project developers are addressed first. These companies will most probably pave the way for many up- and downstream technology providers, component suppliers and service companies, following the pioneering company.

The main target groups are listed as follows:

- Bioheat and power project developers
- Energy companies / DH installers
- Investors and financing organisations
- Planning and consulting companies
- Technology manufacturers and providers
- Biomass trading and transportation organisations
- R&D specialists in the area
- National bioenergy promoters
Large amounts of bioheat/CHP technology and know-how are needed in the growing and also totally new market. To increase energy and cost efficiencies and to reduce greenhouse gas emissions are the remarkable strong driving forces why European energy market is developing and changing so fast almost in every member country. Main targets in bioheat sector are especially to invest modern bioheat and CHP plants with district heating networks, to replace small and large scale fossil heating systems and to renovate old-fashioned systems by adopting modern biomass heating solutions. In the bioelectricity sector main targets are to push the development of small scale CHP systems based on solid biomass and biogas. Also there are growing need to adapt power generation possibility into existing heat-only plants. Local and international power markets are developing more and more profitable when using renewables. So, the key words of energy producers and customers are to increase energy and cost efficiencies and use as much renewables as possible. Markets are full open for modern bioheat and power solutions and technology, and also for practical know-how. Only problem is to find and contact the right customers who are waiting good proposals for fullfilling their investment plans, reliable good quality technology and systems by reasonable price.

Also the demand for cooling, especially in new buildings with high standards, is growing. Therefore the market for District Cooling is enlarging. In many cases District Cooling represents the most competitive technology to supply cooling energy, in particular when cooling demands are close to the existing network and cheap surplus heat or free and natural cooling is available. A District Cooling system typically reaches 5 or even 10 times higher efficiencies than traditional electricity-driven chillers.

So, new DHC plants fuelled with local biomass are needed. Modernisations of old plants and heat networks are also needed. Large market possibilities exist also for modern technology solutions in biomass harvesting and transporting areas. Operational logistical solutions are needed. Know-how and high professional planning are needed. For small scale district heating systems up to huge CHP investments.

2.1 Marketing Scopes for exporting / investing bioenergy technology to the target countries

- **Little CHP/DH experience** – Such countries may not have undertaken any steps and will need to start by gaining a full understanding of how bioCHP/DH can align with broader policy objectives.

- **Some CHP/DH experience** – Such countries may already have an unders-
tanding of how CHP/DH can help meet objectives but have until now only adopted piecemeal approaches to CHP/DH. There might still be significant barriers, lack of experience and/or an incomplete understanding for investing to bioCHP/DH-solutions.

- **CHP/DH success stories** – Such countries will typically have a share of CHP/DH in electricity generation exceeding 25% and more, and are already enjoying the benefits of this growth. However, there may be minor barriers remaining, but also new opportunities, for example, for expanding bioCHP/DH development in “DH-fee” urban areas and remote villages.

- **Rebuilding and modernising** – In all countries older, less efficient energy systems and networks must be upgraded with the know-how and technology found in the modern systems. Promising business possibilities in old historical downtowns and city centres, and in new suburb areas to adapt CO2-free modern “renewable CHP/DH systems”.

The choice of technology for supplying district heat or cool depends on:
- Area and building infrastructure (urban, rural, industry)
- Local climate and weather patterns
- Customer’s needs and energy market situation
- Good quality biomass resource availability and fuel procurement security
- Proximity to sources of waste heat such as industries etc.
- Incentives etc. available enough
- Prices of technology and after-sale services

*Biomass-fired District heating plant in Lienz (Austria)*
*Photo: ariclean*
2.1 Feedstock used for DH fuelled with biomass

The DHC networks are essential to delivering biomass based energy to urban centres. DHC/CHP systems in several countries are already supplying bioheat and electricity into the use of urban centres with good energy and cost efficiencies. A wide range of biomass fuels or feedstock are available for use in modern DHC systems: different kind of energy wood straight from forest, wood process residues, short rotation forest wood, energy crops, straws and crop residues, industrial and municipal solid biowastes, animal wastes, olive pits, corncobs, pruning etc. Biomass fuels will play a major role in any renewable energy future. Medium and large scale bioplants (over 5 MW) can use large variety of biomass sources, either alone or mixed fuel. Fuel receiving and boiler technology order mainly the suitability and minimum quality demands for the acceptable fuels. Small DH-plants need more so called...
high quality fuels (pellet, wood chips, billet etc). In normal bioDH-plants there can be use different kind of forest fuels (wood chips, wood residues, and even crushed stumps), industrial by-products (sawdust, bark) and pellets. Also recycling woody materials are suitable depending on the chemical contents and the limitation orders. However, for large-scale DH/CHP plants a secured fuel supply is crucial. Because of the low energy density in comparison to fossil fuels, the lengths of the transport ways are economically limited and it has to be sure that enough biomass will come in every case to the plant as expecting when making the final investing decision. In the project’s criteria and indicators-list there are many questions regarding feedstock and biomass potentials in the target country/region.
4. LIST OF CONSIDERED CRITERIA AND INDICATORS
The evaluation of market attractiveness for bioheat and CHP is a complex issue, various aspects have to be considered and information collected. For SME which have decided to expand on international markets but haven’t identified a suited country yet, this selection process can be very time and cost intensive and moreover, if these companies haven’t gained any experienced in market assessments so far, important key factors can easily be ignored.

From there, within the CrossBorder Bio-energy project relevant categories and criteria have been elaborated with support of market established company stakeholders which will give guidance on what to consider and to look for in the market evaluation process. Following key factor categories were selected:

1. Country profile / risk
2. Institutional environment
3. Energy market
4. Feedstock market
5. Market saturation level
6. Financial market and local support

**Country profile / risk**

There are many aspects to be regarded on a macro-level, out of which the profile of the country itself in terms of Gross Domestic Product, economic development and education level of the sector. Higher costs linked with RES in general are usually only accepted by the public in a period of welfare and positive development expectations, while in times of economic slowdown or depression short-term cost savings and social safeguard are put in the foreground. Linked to that is the question of credibility and reliability of a country, respectively its company stakeholders as partners for international business cooperation. How secure are investments into a foreign country, how likely is a payment failure? What risks can be waited ahead? Crime or corruption risks? With view on the financial risk of investments into foreign markets, the currency exchange risk has to be highlighted as well. Another financial risk arises with steadily growing inflation rates, which not only reduces the purchase power of potential customers, but also abate the value of the company’s assets, once acquired with the market entry process. A stable or even declining inflation rate over a period of time is accordingly another valuable indicator to avoid negative financial impacts on the
investment.

**Institutional environment**

Political regulations play an important role for the accelerated development of RES. Clear and binding targets for the RES sector or even single technologies are a strong driver for investments. But of course these targets have neither to be undemanding, nor exaggerated or unrealistic. National Renewable Action Plan is an important indicator for the whole-heartedness of the political will. Though many policy makers wish to develop the bioenergy sector, the production costs of bioenergy are still in many cases higher compared to fossil competitors, investments into the biomarket therewith linked with a significant higher risk. These risks wouldn’t be accepted without a minimum security for the investment, e.g. in form of a support scheme which covers these extra costs or provides a long-term calculable cash flow within the pay-back period of the investment. Another important fact is whether or not the targets and action plans were transposed into adopted support schemes or regulations, that is to say: Is there a sufficient support scheme implemented, or not? Last but not least existing support schemes or their conditions must not change too often along a minimum period of time, as this again wouldn’t contribute to the investors’ confidence and hampers the investment security. Steady and reliable support schemes are of utmost importance to evaluate and accept the risks, otherwise the potential would remain untapped. And due to the variety of different regulations and requirements, but also because of the various state of knowledge at the authorities, the duration and efforts of the approval procedure can be very different from country to country. For planning a bioplant it is naturally important to get the allowance as soon as possible to avoid running costs and the risk of changing framework conditions during the time between application and approval.

**Energy market**

Beneath the feedstock supply, the structure of the energy market is a decisive criterion for an investment decision, too. Due to the high flexibility in the energy markets by countries, there are many issues which can be considered, but there are generally spoken three aspects which are important to analyse: the available energy infrastructure and its rules, the development of the fossil competitor and competition with other biomass users already active in the market. The heat market can generally be an attractive market for bioplants as well, as energy producers are more and more keen on to operate the plants as CHP to increase income and to lower the economical risks. If the target is also electricity production, it is first of all important to know how the electricity market has developed in recent years and how it is expected to develop. Are there
already new power plants announced, or are existing plants already out-dated and due for replacement? Electricity has to be sold to the common market. It is optimum if an electricity grid is available close to the plant to avoid costly grid connection costs. And as experience has shown, if there aren’t clear rules defined for plant owners and grid operators on the costs, rights and duties of grid injection and transportation, the denial of the grid access has often proven to be the bottleneck for a successful development of the RES electricity market. Nevertheless competition in the sector already indicates favourable framework conditions and a running market. Therewith, the interpretation of the market analysis depends very much on the existing market volume and the investor’s strategy.

**Feedstock market**

The availability of biomass in a sufficient amount and qualities is crucial. So the different kind of feedstock potentials should be calculated separately and required biomass capacities into the energy plant should be confirmed. In addition, to be attractive for foreign investments, the biomass potential has to allow a critical market volume for the investor. To justify the costs, efforts and risks of investing into a foreign market, there has to be potential to sell enough outputs to the local market. The feedstock potential of a region has to correspond with this requirement accordingly which demands that the biomass already used for existing plants or other applications has to
be deducted from the theoretical potential as well. Biomass has to be transported to the plant, a dense infrastructure suited for related means of sufficient transportation like truck roads, railway lines or waterways is needed.

Market saturation level

When looking export possibilities over borders, it is important to know and should investigate what kind of DH-markets are in the target country. Important issues when detecting the market saturation level are, what is an average DH rate in the country and a region company is looking after. Are there consumption sales break enough for my technology or investment? Are there free heatload for district heating in the possible area? Are there already wellknown national technology producers and companies in the sector? What kind of strong competitors are already in the market? Are there cooperative or subcontracting possibilities? Luckily almost in every case and from country to country there will be at least promising opportunities and sub-markets for high quality modern bioenergy technology and solutions.
Financial market and local support

Financing possibilities and possible supporting tools in the country are one of most important key issues, when planning investments or sales over borders. National and local financing availabilities for new bioenergy business and investment, also possible EU fundings, are often essential for the whole project. Furthermore without financial or regulatory support the operation of a bioplant wouldn’t be profitable in most cases. However, bioenergy competes already successful against fossil energy in many European countries. Continuously increasing fossil fuel prices, extra taxes, emission penalties etc have changed and will change the competitiveness of bioenergy more and more better way. With the help of RES directive and national renewable energy action plans, strong driving forces in member countries. But still today in some countries, due to the higher energy production costs, the economic risk for investments into bioenergy projects is fairly higher compared to already market introduced, fossil energy carriers. With view on the long-term payback-period for the investments, potential investors will feel a delicacy about spending their money without having a minimum of planning security. Same is true for the financing of projects by banks which won’t dare to grant credits to risky projects or will demand unfeasible charges to cover the risk. Consequently, a country which has successfully implemented a support scheme addressing this fundamental disadvantage is very attractive for investors resp. technology providers. In addition, to manage the risk of volatile prices, for many investors the price transparency of markets is an important factor, too. What are financing availabilities for new business development? Investment subsidies? Inflation and bank sector risks? Is there a market place where prices both for feedstock and energy are published?

Final list of criteria and indicators

To evaluate and compare the attractiveness of markets in different countries common assessment criteria translated into measurable and therewith comparable indicators have to be defined. This was done during the Cross Border Bioenergy project with support of company stakeholders of the target groups, who identified the key information needed by them and consulted with the implementation of the data into a practicable tool. Certain the most important key factors categories were selected with criteria and indicators.
1. Country profile (geography, demographics, logistics, etc.)

1.1 Geography and Climate
- Total land area
- What is the average winter temperature across regions in target country over the last 10 years?
- What is the average summer temperature across regions in target country over the last 10 years?
- Total number of inhabitants
- Total number of households in the country
- Population density
- Household density

1.2 Wealth/economic status of population
- What was the average GDP real growth rate between 2008 - 2010?
- GDP per capita for 2010

1.3 Logistics - road and rail network
- What is the density of rail-network?
- What is the density of road-network?
- What is the density of water ways-network?
- What is the density of the electricity transmission and distribution networks?
- What is the density of the gas transmission and distribution networks?

2. Energy Policy (political will, nREAP, etc.)

2.1 The nREAP is ambitious and proposes appropriate measures
- There are high-volume targets for RES?
- There are high-volume targets for solid biomass for heat?
- There are high-volume targets for heat from DH?
- Proposed measures for DH in nREAP are appropriate and convincing

2.2 A political will to develop the RES-sector is clearly recognisable and stable
- Does the government provide an appropriate budget for the targeted market growth for DH and CHP?
• What is the period of time before the next general (national) elections.

3. Feedstocks

3.1 The solid biomass potential is sufficient to realise small scale heat/CHP/DH projects?
• To what extent will the domestic availability of wooden biomass of forestry change by 2020?
• How large is the wood for energy potential from forests today?
• How large is the wood for energy potential from industrial residues today?
• How large is the wood for energy potential based on waste wood today?
• What is the total forest wood potential (irrespective of use)?
• What is the % of forest area owned by public bodies?
• What is the difference between fellings and increment (net growth)?
• What is the % of fellings dedicated to energy purposes?
• How much of the wood for energy potential from forests is already utilised?
• How much of the wood for energy potential from industrial residues is already utilised?
• How much of the wood for energy potential based on waste wood is already utilised?
• What is the amount of solid biomass feedstock used in competing sectors (e.g. fiber board industry) currently?
• Share of the total yearly wood demand fulfilled by imports on latest available year

3.2 Feedstocks are available for biofuel production
• Area of fallow/abandoned land available for agricultural expansion

4. Economic instruments (prices, support schemes/guarantee, subsidies, etc.)

4.1 Financial support schemes can be claimed for investments
• What proportion of the investment in DH can be claimed in subsidies (cumulative, including tax advantages)?
• When does the scheme end granting funding for DH?
4.2 Financial support schemes can be claimed for operation
- How high is the legally guaranteed price for DH heat based on biomass?
- How long is the guaranteed duration for the DH support scheme?
- Is the DH operation support scheme threatened by a maximum public spending budget?

4.3 Prices of biomass fuels/raw material are reasonable and stable
- What is the price for a kWh(th) for a tonne of wood chips?
- What was the price volatility of wood chips over 1 year period (2010, calculated as difference between highest and lowest, divided by lowest price)

4.4 Prices of fossil fuels are high and heavily taxed
- What was the average price of coal for large scale consumers over the last year (2010)?
- What is the commodity price development of coal over the last 4 years?
- What is the tax on coal?
- Is the use of coal supported e.g. by tax incentives, obligations, free delivery of CO2-allowances etc.?
- What is the price per kWh of gas for households (average over the last year)?
- What is the price per kWh of gas for large scale consumers (average over the last year)?
- What is the commodity price development of natural gas over the last 4 years?
- What is the tax on gas (CO2, energy, excluding VAT or ‘normal’ taxes)?
- Is the use of fossil gas supported e.g. by tax incentives, obligations, free delivery of CO2-allowances etc.?

5. Market aspects (volume, access to grid, etc.)

5.1 The energy sector is large and expected to grow
- Amount of coal used by medium and large-scale consumers (2010)?
- Expected growth in large-scale use of coal from 2009 to 2020
- Amount of gas used in medium and large scale consumers (2010)?
- Expected growth in large and medium-scale use of gas from 2009
to 2020
• Is the grid operator obliged to connect all renewable energy installations?

5.2 Is access to the heating grid ensured?
• Are there priority rules for renewable energy in the DH sector?

5.3 The heat market offers good opportunities
• What is the share of natural gas in the district heating sector?
• What is the total amount of energy consumed by the district heating network?
• What is the proportion of customers connected to a district heating grid?
• What is the amount of coal in the district heating sector?
• What is the average age of the stock of domestic heating appliances?

5.4 Produced energy can freely be marketed
• Is the heat market liberalised and private firms are free to participate in any part of the supply chain?

5.5 The heat market in the target country provides promising growth perspectives
• What is the rate of the additional heat demand until 2020?
• What is the growth rate of DH in the last 4 years? CAGR
• What is the cumulative amount of renewable heat produced by DH in the last available year?

5.6 The Framework conditions for fossil fuels do not impair market development
• What is the contribution of imported coal to primary energy supply in real terms?
• What is the percentage contribution of imported coal to primary energy supply?

5.7 The potential for DH is important
• What is the proportion of the national heat consumption delivered through DH?
• What is the total energy amount of the national heat consumption delivered through DH?
• What proportion of DH is fuelled with biomass?
• What proportion of DH is fuelled with coal?
• What proportion of DH is fuelled with LPG?
• What proportion of DH is fuelled with natural gas?
• What proportion of DH is fuelled with natural oil?
• Number of cities with more than 50,000 inhabitants
• What is the amount of process heat consumed by industry?
• Number of existing DH networks fuelled with coal
• What is the share of biomass based DH compared to all DH
• What is the growth rate of biomass DH output over the last 4 years (CAGR)

5.8 An intense competition is not recognisable
• Number of competitors providing (manufacture or sale) large-scale biomass-fired facilities
• Total amount of DH capacity sold (by existing competitors) over the last 4 years

6. Regulations (laws/mandatory targets for bioenergy, permitting, emission thresholds, etc.)

6.1 Regulatory instruments to support bioenergy markets have successfully been introduced
• How large is the quota for RES heat in absolute terms?

6.2 The approval procedure by the authorities is adequate in terms of time
• How long does an average permitting procedure for CHP/DH projects (<500kW) take in the target country?
• How long does the approval process last in average for large scale (>2MW) CHP/DH plants

6.3 Existing emission thresholds can be fulfilled with the applied technology
• Extra information DH

7. Project financing context (economic situation, loan, banks, etc.)

7.1 The country has a solid financial position
• Standard and poors rating
7.2 Export friendliness
- Euler Hermes rating
- Corruption perception index
- Country risk as reflected by the rating country of COFACE
- Ranking of feasibility of “starting a business” in the IFC-World Bank Doing Business Index
- Ranking of Feasibility of “getting credit” in the IFC-World Bank Doing Business Index

7.3 The banks are familiar with bioenergy technology and support its development
- Is the support of bioenergy projects highlighted in official papers of the banks, like annual reports etc.?
- Are Governmental guarantees for loans for bioenergy investments in place?

7.4 Foreign investments are supported in the target country
- Are there any programmes implemented in the region to attract foreign investments?

7.5 The banks in the target country provide attractive conditions for bioenergy projects
- Can bioenergy plants benefit from interest rates for credits lower than usual in the market?
- Are the support conditions feasible in an adequate scope?

7.6 The market is liquid and transparent
- Biomass fuel prices (wood chips, pellets, etc.) are published on market places
- Financial market instruments (e.g. hedging, futures) are available to lower the biomass fuel price risk

7.7 The value of the investment is stable due to a low currency exchange risk
- Is the market part of the Euro Zone?
- Was the inflation rate of the country more or less stable within the last 4 years (CAGR)?
8. Readiness for uptake (public acceptance, stakeholder networks, etc.)

8.1 Efficient networks and information are accessible
   • National and regional agencies are providing effective help to foreign companies wishing to invest
   • Is there a DH association (with a minimum of 10 company members) assisting the market?
   • Public web sites/ information/market reports on bioenergy

8.2 Public acceptance/knowledge of technology
   • Is DH known to and well-regarded by general public?
   • Have any DH project permissions been declined due to public opposition in the last four years?
Participating companies of the district heating working group

Charmont Investments Ltd
Jean-Michel Sylvestre
88 Wood Street, London EC2V 7RS, United Kingdom
Phone: +44 (0) 20 / 7193 0697
www.charmont-investments.com

SEEGER ENGINEERING AG
Thomas Krause, Chairman
Industriestraße 25-27, 37235 Hessisch Lichtenau, Germany
Phone: +49 (0) 5602 / 9379-0
www.seeger.ag

CTS Engtec Oy
Kirsi Juura Manager, Marketing and Corporate Communications
Kaikukatu 7, FI-45101 Kouvola, Finland
Phone: +358 (0) 207 / 567 268
www.ctse.fi

Benet Ltd
Dan Asplund
Asko Ojaniemi
Piippukatu 11, 40100 Jyväskylä, Finland
Phone: +35 (0) 8400 / 640460
www.benet.fi

Ecofys Germany GmbH
Sebastian Meyer, Consultant
Landgrabenstraße 94, 90433 Nürnberg, Germany
Phone: +49 (0) 911 / 994 358 12
www.ecofys.de

PUSCH AG
Lars Dahlhoff, Product Manager
Auf der Weid 1-15, 56242 Marienrachdorf, Germany
Phone: +49 (0) 2626 / 925 69-15
www.pusch.ag
RENERGIE Raiffeisen Managementgesellschaft für erneuerbare Energie GmbH
Josef Plank, Managing Director
Friedrich-Wilhelm-Raiffeisen-Platz 1,
1020 Vienna, Austria
Phone: +43 (1) 211 / 36-5990
www.renergie.at

KWA EVIVA GMBH
Frank Schillig, Managing Director
Vogelsanger Straße 250, 50825 Köln, Germany
Phone: +49 (0) 221 / 789 469-11
www.eviva-energy.com

Pure Energy Professionals Limited
Bruce Woodman
58 Coinagehall Street,
Helston TR13 8EL, United Kingdom
Phone: +44 (0) 1326 / 572 720
www.peprenewables.com

Norton Rose LLP
Rachel Dawes, Global Energy and Projects Business Manager
3 More London Riverside, London SE1 2AQ, UK
Phone: +44 (0) 20 / 7444 3162
www.nortonrose.com

Polytechnik – Biomass Energy
Lukas Schirnhofer
Hainfelderstraße 69, 2564 Weissenbach, Austria
Phone: +43 (0) 2672 / 890-26
www.polytechnik.com

Laborelec GDF-SUEZ Group
Yves Ryckmans
Rodestraat 125, 1630 Linkebeek, Belgium
Phone: +32 (0) 2 / 382 02 11
www.laborelec.com
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www.CrossBorderBioenergy.eu
Project Coordinator

European Biomass Association (AEBIOM), Mr. Jean-Marc Jossart,
Email: jossart@aebiom.org, Phone: +32 (0)478 77 36 09,
Website: www.aebiom.org

Project Partners

Austrian Biomass Association (ABA), Mr. Christoph Pfeiffer,
Email: pfefmeter@biomasseverband.at, Phone: +43 (0)1)533 079 732,
Website: www.biomasseverband.at

Danish Bioenergy Association (DI Bioenergi), Mrs. Kristine van het Erve Grunnet,
Email: kristine.van.het.erve@grunnet.dk, Phone: +44 (0)1)357 77 33 69,
Website: www.energie.dk

The Bioenergy Association of Finland (FINBIO), Mr. Pekka-Juhani Kuitto,
Email: pekka-juhani.kuitto@finbio.fi, Phone: +358 (0)207 639 661,
Website: www.finbio.fi

German BioEnergy Association (BBE), Mr. Thomas Siegmund,
Email: siegmund@bioenergie.de, Phone: +49 (0)228 81 00 223,
Website: www.bioenergie.de

Hungarian Biomass Competence Center (HBCC), Mr. Zsolt Gemesi,
Email: zsolt.gemesi@infm.gov.hu, Phone: +36 (0)1)795 3501,
Website: www.obbekk.szie.hu

Italian Agriforestry Energy Association (AIEL), Mrs. Annalisa Paniz,
Email: panzi@ael.it, Phone: +39 (0)49 88 96 722,
Website: www.aiel.it

Latvian Bioenergy Association (LATBIONRG), Didzis Palejš,
Email: didzis.palejs@latbionrg.lv, Phone: +371 (0)675 22 399,
Website: www.latbionrg.lv

Slovak Bioenergy Association (SKBIOM), Mr. Josef Vglasky,
Email: vglasky@vlst.tuzvo.sk, Phone: +421 (0)45 5206 875,
Website: www.skbiom.sk

Swedish Bioenergy Association (SVEBIO), Mrs. Lena Dahlman,
Email: lena.dahlman@svebio.se, Phone: +46 8 441 70 83,
Website: www.svebio.se

Consulting Partner

eclaren Consultants, Mr. Christoph Urbschat,
Email: cs@eclaren.com, Phone: +49 (0)30 246 286 90,
Website: www.eclaren.com

Imperial College for Science, Medicine and Technology, Mr. Arturo Castillo Castillo,
Email: a.castillo@imperial.ac.uk, Phone: +44 (0)20 7594 7312,
Website: www3.imperial.ac.uk

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