

Existing legislative support assessments for DHC



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Summary

This report is a country by country assessment of the supports and barriers for district heating and the subsequent effects they have on the sector nationally. This is an analysis of information gathered by the national partners of this project from 10 or more experts and combined with the extensive knowledge and experience of the 14 national partners. These reports can be found on the web in Country by Country database and should be consulted when further information on a specific country is desired (ecoheat4.eu/en/Country-by-Country-DB).

This report aims to address the following for each of the 14 countries covered by Ecoheat4EU:

1. The effectiveness of the existing legislative support framework per country.
2. The intention of the support schemes are compared to the actual impact seen on the DHC market sectors.
3. Potential inconsistencies in the legal framework are identified.

Each country report can be broken down into:

- a) A summary of the existing national support legislation
- b) An analysis of the identified needs, barriers and opportunities
- c) A review of the national implementation of the three EC Directives
- d)

The information summarised in this report is also further developed as the basis of the national recommendations and roadmaps which can also be found on website www.Ecoheat4.eu.

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Consolidation Countries

**Denmark
Finland
Sweden**

Denmark

Support legislation

The eight support measures for Denmark comprise:

- 1) General heat planning regulation,
- 2) Taxation,
- 3) Subsidies,
- 4) Heat price regulation,
- 5) CHP-requirement,
- 6) Waste planning,
- 7) Ban on electrical heating and
- 8) Law on district cooling.

The purpose of the **first** is to avoid competition between collective heat supply systems as natural gas and DH and individual systems in order to ensure efficient use of surplus heat and fuels. It is said to ensure the most socio-economic and environmentally friendly utilization of energy by ensuring a market for collective heat supply and is claimed to have positive effect on all impact measures.

The **second** concerns general taxation on energy both fuel and its eventual emissions. The overall purpose is to ensure energy efficiency, divert energy demand away from oil and coal towards natural gas and renewable fuels. This taxation is claimed to impact DH positively making these investments economically more feasible. Also it is claimed that this taxation has made collective systems more competitive thus working in favour for DH systems. A positive impact in all respects except organization is listed.

The **third** point concerns *direct* specific subsidies that generally disappeared around 2000. The collected information shows some subsidies that still might have a very small impact on district heating *indirectly* through subsidies to electricity production. However, it is apparent that subsidies was of significant importance especially during the 1990s. These included: subsidies for converting older houses to DH, completion of planned networks (speed up process) and conversion from coal to gas.

The **fourth** issue is specific heat price regulation. The price of district heating is regulated by the principle that it shall "pay for itself", so called non-profit regulation. The regulation is motivated by the fact that DH companies are local natural monopolies. Our information suggests it impacts all measures except organization. The existence of an energy complaints board enhances consumer confidence in district heating as a fair heating option.

The **fifth** issue concerns CHP-requirement. Although the legislation doesn't explicitly ban condensing electricity production, the electricity act makes it practically impossible to receive an approval for an electricity only thermal installation. Also here the data suggests positive impact on all measures except organization.

The **sixth** issue concerns waste planning. Waste is considered to be a partly renewable fuel and the priority order for waste is first general prevention, second recycling, third incineration with energy capture and fourth waste deposition. The purpose is foremost to solve environmental waste issues at the lowest possible socio-economic cost. It is listed having positive impact on planning, generation and distribution.

The **seventh** issue is the ban on electrical heating. There is a general ban on using electrical heating in Denmark if the building is or will be supplied by any collective heat supply as DH. A positive impact on demand only is listed.

The **eight**, and final issue of concern here is the law on district cooling. In Denmark, municipalities are allowed to operate DC schemes on commercial terms only if this activity is handled by a separate limited liability company. The purpose is to give the municipalities the possibility to operate commercial DC schemes as they already own the DH utilities suitable for DC.

All but one of the above measures to support DHC in Denmark is in existence today; the exemption is the third point, subsidies, which is said to be neither existing nor planned. The ban on electrical heating is said to positively influence demand only while the other measures are listed as having a broader impact, except for impact on organization which is only effected by general heat plan regulation (the first point).

Needs, barriers and opportunities

One consequence of the Danish regulation (mainly 1, 4 and 7 above) is that costumers are locked in to the use of DH no matter what price of fuel being used. Even if prices are on average low in Denmark some costumers pay above average prices especially when buying DH from small plants using natural gas. Consequently it is said that one of the major needs is the adjustment of heat planning both in order to increase the flexibility for small district heating schemes to discontinue their compulsory use of natural gas and for customers presently locked into the use of individual gas to be allowed to switch especially if cheaper district heating is available nearby. Fossil transition is another challenge since over 50% of the electricity production uses fossil fuels (80% of DH comes from CHP-plants). The economics of DH is the main driver in these challenges.

Some barriers are mentioned. Many local markets are almost saturated (Copenhagen 98%); growth must consequently come from geographical extensions into new areas suitable for collective heat supply. New technological development is needed to meet the heat demand from new, low energy, buildings. Other issues cited are the "lost" competencies in municipalities regarding heat planning, the high initial investment, lack of information and knowledge on DH, exaggeration of the benefits of individual renewable solutions and the DH over-dependence on fossil fuels combined with a possible future shortage of biomass.

The main opportunity is said to be the climate change because district heating can offer greater sustainability at a lower cost compared to individual solutions. The collected information suggests that the general opinion regarding district heating is positive among the stakeholders (or at least neutral). The technical skills are basically sufficient but require some revitalizing.

National implementation of EC directives

First, the EU buildings directive was implemented in 2005 and comprises three executive orders: 1) Inspections on ventilations and cooling installations, 2) Energy labelling of buildings and 3) Inspection of boiler and heating installations in buildings. The main purpose is said to be to increase energy end use savings in buildings and is said to have been effective given that there has been a constant energy end use since 1980 despite a 30% increase in heated area.

Second is the implementation of the CHP-directive that promotes cogeneration. The purpose is to fulfil the requirements of the CHP-directive. The effectiveness is hard to measure as the share of cogeneration in Denmark is already high (around 80% of district heating or 50-60% of thermal electricity) and all CHP-plants are in principle fulfilling the effectiveness requirements.

Third is the planned implementation of the RES-directive that for Denmark set the share of renewable sources for energy production to 30% by 2020. The share in 2007 was 17%. A domestic new target for 2011 is set to 20% share of renewable resources; this is possible thanks to the expansion of wind and the use of biomass in large scale CHP-plants. In the longer run it is claimed that Denmark will not be able to cover a huge use of biomass without imports, wind is said to be the only abundant resource though future contributions from geothermal, solar and wave energy can be expected. DH is already a market share of more than 50% and it is expected to grow to 60% in the future when expanding into areas now supplied with natural gas. This is viewed as a major infrastructural change that will increase Denmark's use of renewable sources.

Finland

Support legislation

Our information on Finland shows two main issues regarding support measures for DHC. First a general subsidy of 10% to residential buildings joining the DH network for covering some connection costs and some equipment cost. This subsidy was introduced in 2006 and is not seen as having a significant impact on promoting DH (whose position is considered to be strong) but rather helping renovators to make an "impartial choice as to whether DH is a possibility".

The second issue put forward as a supporting measure for DH is the "domestic work tax deduction for households", which makes it possible for households to make a maximum deduction of 3000 Euros per person when switching from oil boiler to DH, solar panels or heat pumps.

Additionally, there are two new pieces of legislation under preparation that are aimed at increasing energy efficiency as well as the share of especially renewable heat. They are very likely to come into effect in 2012. The first – new building code will set primary energy efficiency standards for new buildings and different sources of heat will have different coefficients. The higher the coefficient the more difficult it is to achieve the standards. The "ranking" of the coefficients is as follows: electricity 2.0; fossil fuels 1.0; district heat 0.7; renewables 0.5. In addition, there is a requirement that a certain percentage (25 %) of the used heat ought to be from renewable sources. DH is automatically considered to fulfil this criterion. Finally, the new set of legislation will virtually ban electric heating in DH-areas.

The second piece of legislation is a support system for the use of renewable energy in heat and power generation (a feed in tariff). Moreover, there will also be a support system for the supply of renewable fuels (i.e. wood based products). Some of the tariffs are designed for smaller scale plants but nevertheless as a whole it will very likely increase the use of renewable fuels in CHP plants.

Needs, barriers and opportunities

There are no major needs or challenge identified for the immediate future. In the longer run one need is to find relevant heat load in systems demanding less heat due to increased number of low energy buildings. Another key issue is to have the DHC development in close harmony with the surroundings as the investment costs are relatively high. An additional long term need is to increase efforts regarding innovations, research and development concerning the DH sector including issues

like, for example, improving technology and developing new or additional business models. No new legislation or support measures were seen to be needed.

No institutional barrier is identified, but technology development for lowering the investment cost in less densely populated areas is needed and can constitute a barrier for the development of DH networks in those areas. Any policy measure should be directed towards the early stages of planning including integrated energy plans.

The key issue was found to be to tackle the global warming and the policy measures that limit the need for heating and cooling in general. The building code amendment from January 1st, 2010, requires new buildings 30% more effective through insulation, energy efficiency and ventilation. In 2012 new requirements will demand additional energy efficiency by 20%. In the future energy efficiency measure will include CO₂ emissions and this is claimed to favour DH especially if connected to CHP. The EU directives are expected to have a negative impact on Finnish DC and CHP since it doesn't include early actions (prior to 2005) taken by the energy sector in Finland. No major changes are expected by 2020. Strong market position will remain and increased use of renewables such as biomass will support DH.

During the course of 2010 the Finnish government decided to reform the energy taxation system. This will have severe negative effects to the DHC sector as the rises in tax levels are quite drastic. While the rationale of the reform is quite clever – divide energy tax into two components: energy and CO₂ and thus have different levels for each fuel based on its environmental impact. However, rises are quite significant and will endanger the competitiveness of DH compared to ground to air heat pumps in scarcely populated areas and the fringes of DH-networks.

Taxes will increase the price of district heating on average by 13 %, however the expenses will be divided very unevenly (as some areas mainly rely solely on fossil fuels)

National implementation of EC directives

Our data collection found six implementations of EC directives, five existing and one planned. These are;

- 1) Building Efficiency Act,
- 2) The RES-directive,
- 3) The energy efficiency agreement,
- 4) The environment protection act and
- 5) The waste legislation.
- 6) The verification and notification of origin of electricity (planned).

The *first* involves energy certificates for buildings. These are compulsory for all new as well as many existing buildings and rank the energy efficiency of a building on a scale from A to G with A being the most efficient. The certificate is valid for 10 years. It is listed as having impact on demand only.

Concerning the *second* issue, RES-directive, Finland's target according to an EC decision is to have a share of renewable energy sources at 38% by 2020. The share was in 2005 almost 29% with bio energy being dominant over other forms such as wind, solar and geothermal. According to the presented baseline Finland is expected to reach only 31% by 2020 not reaching the EC target. It is also said that this achievement depends heavily on energy consumption entering a downward trend. It is said in the report that in order to realize additional use of renewable sources the current subsidy and steering system, including feed-in-tariffs, must be improved and changed. With the industrial CHP already using 80% renewable fuels the potential is within DH and DH related CHP in which the share today is 13%. The share could increase substantially if not for the inadequate supply of wood and wood residues in sufficient scale. These kinds of mandatory requirements are seen as issues making DH operations more difficult. Therefore we conclude that this will have negative impact on planning, generation and organization.

The *third* point is the Energy Efficiency Agreement with the purpose to fulfil the requirements of the Energy Service Directive. It covers many industry branches which join the system on a voluntary basis with an energy improvement target of at least 5% compared to 2005. It is thought to impact negatively on planning and demand.

The *fourth* point concerns the Environmental Protection Act on prevention of pollution regarding all activities that may cause environmental damage through fulfilling of the IPCC directive. It is claimed

that this directive leads to some problems for the Finnish energy industry; tight emission limits creates peak-load problems, the "common stack" is suggested to not be applied to plants already built, long environmentally harmful transportation of some fuels means that incineration of waste some areas is more efficient. The impact of this directive is said to negatively affect planning and generation.

The *fifth* and last of the listed *existing* EC directives implemented is the Waste Legislation to fulfil the waste directive. The aim of the national waste plan is to stabilize the amount of waste by 2016 and to ensure a downward trend from that year. The aim is also to ensure that 50% of all municipal waste is recycled and that 30% is used as fuel by 2016. The impact of this measure is said to be positive on generation.

The last point is the planned implementation of verification and notification of origin of electricity which is expected to only marginally influence the Finnish DH/CHP sector with as yet no discernable effect.

Sweden

Support legislation

Sweden has three main issues;

- 1) System conversion subsidies,
- 2) Climate investments programs and
- 3) Carbon dioxide tax.

The *first* measure, system conversion subsidies, aims at promoting efficient and environmentally friendly use of energy and a reduction in electricity use for heating in residential buildings. It is stated that subsidies can be given to single or double households as well as to residential buildings for conversion from electricity panels to heat pumps, bio fuel or District Heating. Up to 30% of the investment cost can be subsidized with a maximum value of SEK 30 000. This system has not yet been evaluated but there has been a tendency for oil heated houses to convert to heat pumps and electric heated houses to convert to DH.

The *second* point is a climate change program which gives support to greenhouse gas reducing projects. These programs are not specifically targeting DH but they do include things like the expansion of DH and transition to bio fuels for example.

The *third* measure is the carbon dioxide tax which is a fuel taxation based on the carbon content in the fossil fuel. The overall purpose is to phase out fossil fuel for heating and DH is claimed to be the most successful sector in this field because of the increasing cost for oil heating. Seen over a 30 year period this tax can be regarded as very successful as it has resulted in an extensive use of surplus heat from the industry as well as the use of biomass and energy from waste.

According to our research these three measures taken in Sweden have relatively narrow impacts. The first is said to positively impact demand only. The second point, climate investment programs, is said to have a positive impact on planning and generation while the last measure, carbon dioxide tax is expected to have positive impacts on generation (large) and on demand (fair).

Needs, barriers and opportunities

No change in legislation is asked for but a "system perspective" in the building codes is called for. The rules for CO2 taxation seem a bit "unfair" since it is lower for industry than for DH. A price review is called for in order to increase customer confidence and give the costumers a forum for impartial price assessments. Increased freedom for municipality owned companies are also called for which include the removal of the localization principle so that local companies can be allowed to do business outside the municipality. One of the most challenging issues for the future is expected future lower demand for heat from new, energy efficient, buildings. Another important issue is "convincing new consumers and in the long run ensuring customer loyalty. Expansion of district heating for the existing costumers may feel that they subsidize new costumers".

The lack of system perspective in building codes again and unclear signals from regulating bodies and the possible introduction of TPA and price regulation constitute considerable risk fact. This significantly disturbs the expansion of District Heating because "DH is a long term commitment". Other problems are that property owners are sometimes prevented to use other energy sources together with DH, though this behaviour has no legal support, and potentially unfair tax systems create competitive distortions between DH and other technologies. "District heating is long term and collective, while competition is short term and individual. District heating requires a system approach, while competitors benefit from a narrow local view". The latter is seen to be favoured in the building codes.

DH is claimed to have a strong position in Sweden and is seen to be an important part of the sustainable urban infrastructure with its nearly fossil fuel free energy supply. Future opportunities include collaboration between DH companies and construction companies to develop solutions for increased efficiency suitable for DH as, for example, combinations with solar panels where surplus energy can be utilized by other costumers in the network. Developing contractual arrangements and price schemes for these solutions would be a necessary first step in realizing this.

National implementation of EC directives

Sweden mentions the EC directive on energy performance of building in which has been implemented through two measures; the Energy Declaration of Buildings and the Energy Declaration methods, designs, data and expertise with the clear purpose of increasing energy efficiency in the building stock in the long run. In principle the energy efficiency of all buildings being built, sold or

rented/leased as well as those buildings that are used for public activities and are larger than 1000 square meters should be declared.

An energy declaration is valid for 10 years and shall contain at least the following; energy performance, reference or benchmark values, recommendations for cost effective improvements and shall be established in an independent manner. The energy declaration of buildings begun in 2008 and the most recent declaration must be available and clearly visible in the building. In the report it is claimed that this measure can create a risk for sub-optimization as "the rules favour house installations compared to installations in a District Heating system", this because the baseline for the declaration is "delivered energy".

Refurbishment Countries

**Croatia
Czech Republic
Lithuania
Romania**

Croatia

Support legislation

Eight support systems are listed by Croatia.

1) Legislation aiming to protect DH costumers by stating relevant authorities and by establishing procedures for consumer complaints. This measure covers the protection of DH customers by DH companies and Consumer Protection Associations.

2) A piece of national legislation regarding the strategy of energy development in Croatia. The purpose is to define a development strategy for 2020 in which the goal is to build a sustainable energy system including security of supply, competitiveness and environmental issues. District heating is said to be one of the priorities of energy policy in Croatia.

3) A piece of national legislation regarding general conditions for the supply of district heat including, for example, procedures for approval/permission for connection to network, conditions for connections, reliability of supply and quality etc.

4)-6) These three initiatives cover issues concerning metering in different ways. The first one is the law on district heat which, inter alia, (4) deals with the installation of meters in order to improve the regulation of DH systems and fulfil the obligation to charge consumers according to actual consumption on at least building level. The second one (5) sets up methodological issues concerning calculation of tariffs and the third initiative here (6) deals with the allocation issues for calculating costs for supplied heat on common meters.

7) A financial initiative for support for renewable energy sources and energy efficiency. The purpose is to provide a financial initiative in order to encourage environmental protection, energy efficiency and use of RES by, for example replacing and reconstructing worn out inefficient plants, introducing more efficient technologies, changing to alternative fuels, optimising plants, and encouraging CHP, etc. The financial instruments include for example "soft" loans, interest subsidies, financial aid and donations.

8) Another financial support scheme for financing projects of environmental protection, energy efficiency and renewable energy sources. The purpose is to encourage investments that, for

example, encourage cleaner production and reduce waste and emissions from production, renovate landfills, protect and conserve biological and landscape diversity, encourage the use of renewable energy sources (sun, biomass etc.), encourage cleaner transport, etc.

Needs, barriers and opportunities

The major challenges found in Croatia include: to affirm the district heating activity by using current legislation with an emphasis on amendments to the heat tariff system. This would, it is claimed, create the conditions for district heating activity to become profitable by letting the price level enable development etc. The implementation of the energy development strategy through an energy strategy action plan is also put forward as a challenge as it would determine a number of parameters for the next four years. The image of district heating also needs to be improved, especially among those not currently using district heating. It is claimed that this can be achieved through information and education campaigns.

As the main barriers the following are considered to be of highest importance: 1) simplifying the heat tariff system that is currently too complicated and involves a long administrative processes, 2) natural gas is the main competitor and is seen, among the DH companies, as favoured from political, local community and price perspectives, 3) the existing DH systems require substantial investments for revitalization and modernization in order to increase reliability and security of supply. And last 4) the absence of energy planning.

The main opportunity is said to be "improved energy efficiency and increased reliability and security of supply of district heating systems by application of new technologies" including cogeneration, biomass and incineration plants, replacement of old networks with pre-insulated pipes, improved regulation of DH systems at all levels including demand side management, etc. Given the planned accession to the EU it is also said that by 2020 the Republic of Croatia is expected to create the basic preconditions for the development of district heating such as improving the technical and technological conditions of existing systems, the completion of the related legislative framework and the commencement of energy planning as well as general energy management.

National implementation of EC directives

Croatia has three key EC directives being implemented.

- 1) 2002/91/EC, also known as the Energy Performance of Buildings,
- 2) 2004/8/EC Cogeneration Directive
- 3) 2006/32/EC, the Energy End Use Efficiency Directive.

Regarding the first directive (EPB-D), Croatia lists seven legislative, existing, implementations. 1) The Physical Planning and Building Act that introduces an obligation to prepare further regulation for a complete implementation of EPB-D into national legislation regarding energy efficiency, heat savings, energy consumption, energy characteristics, satisfactory indoor climate and obligatory certification. This is said to impact positively on the planning, demand and organization of district heating. 2) Pre-feasibility studies on the application of alternative energy sources in new and existing buildings. This existing legislation is mandatory for all buildings (new or existing under major renovation) larger than 1000 square meters. It includes the analysis of technical, ecological and economic feasibility of RES, cogeneration, DHC, heat pumps or fuel cells. The documentation of achievements and data regarding, for example, indoor micro climate, is mandatory. The impact of this legislation is claimed to be positive on planning and demand. 3)-7) are all further steps in the EPB-D. 3) Technical regulation concerning energy economy and thermal protection in buildings. This decree provides a basic framework for the content of design documentation regarding foremost technical requirements. 4) Ordinance on the Energy Certification of Buildings has the purpose of providing framework, content and procedure in energy certification to be made by authorized energy certifiers and obligations on actors in the process. 5) Ordinance on the Requirements and Criteria to be met by Energy Auditors and Energy Certifiers of Buildings. This ordinance shall provide criteria for institutions and experts to conduct education, general framework for education program and eligibility criteria for future energy certifiers. 6) Ordinance on Heating and Cooling Systems in Buildings. This decree contains descriptions of essential building requirements, technical characteristics of heating and cooling systems in buildings and requirements for designing, construction, use, maintenance and other special requirements. It is primarily intended for designers of heating and cooling systems. 7) Methodology of Energy Audits for the purpose of Energy Certification of Buildings. This legislation shall give a determination of the energy characteristics of new or existing buildings, calculations of energy needs, recommendations for energy efficiency improvements, etc. This decree is obligatory for experts conducting energy certification of buildings. The impact on DH is said to be indirect but nonetheless positive on planning and demand.

Regarding the Cogeneration Directive, Croatia lists three legislative, planned or existing, implementations through, 1) Law on District Heat (planned), 2) Energy Law (existing) and 3) Law on electricity Market (existing). These laws introduce obligations to prepare further regulation for complete implementation of the Cogeneration Directive into national legislation. The impact of these legislations is said to be positive on planning, demand and organisation.

The third piece of legislation has existed since 2008. The purpose is said to be an "Exercise of sustainable development, reduction of energy sectors negative impact on the environment, security of energy supply, meeting energy demand in final consumption, meeting of national obligations in GHG reduction, enhancing implementation of energy efficiency measures in final consumption". It is stated that the impact is positive on planning and organization but no further descriptions of used methods are given.

Czech Republic

Support legislation

1) **The Energy Act no. 458/2000 Coll. Support for CHP: a preferential connection of electricity to the transmission system, contributions.** The Energy law provides the electricity generators with a preferential electricity connection to the transmission system and then to distribution systems provided that the electricity was generated from renewable sources or using CHP technology. Similarly to the other countries, contributions over the market price of electricity are paid by operators of the distribution systems or by the transmission system operator.

2) **The Act on Energy Management no. 406/2000 Coll. Subsidies for CHP investment technology.** The Act on Energy Management states basic principles for receiving subventions on CHP technology investments or on electricity generation by combustion of secondary energy sources from the State Program on energy savings 'support and use of renewable sources of energy'. The measure is claimed to be effective as modernisation and renovation of DH subsequently takes place in CR. Moreover the Act deals with energy audit procedures with an unclear impact on district heating.

3) **The Energy Regulatory Office: Additional subventions to producers with CHP technology.** The Energy Regulatory Office (the ERO) determines an additional payment to the market price for the electric energy produced by renewables and secondary energy sources in its published Price Decisions every year. The instrument is especially significant when regarding small and middle-sized plants.

4) **Legislative measures on regulation.** Some measures concentrate on a basic regulatory energy framework such as regular inspections of boilers, energy performance certificates of buildings, inspections of air conditioning systems' efficiency with the purpose of achieving network efficiency, reducing fossil fuel consumption and utilizing efficiency in heat energy distribution and limiting CO2 emissions.

5) **Metering and its impact on supplier-buyer relations.** In addition to all the foregoing, the Energy Act stipulates metering as a means for charging customers for heat energy supply. The heat energy generation license holder and the heat energy distribution license holder shall provide measurement

and charge customers for heat energy supply in accordance with the actual parameters of the heat transfer medium and the readings obtained from its own metering devices. The legislative measure has proven to prevent some commercial supplier-buyer disputes. However, district heating systems deal with extra costs while installing heat meters installations.

A few measures described above deal exclusively with CHP in different ways aiming at supporting it, prioritising the use of renewables, increasing efficiency etc. The positive impacts on DHC are mainly on the planning/generation and distribution side.

Needs, barriers and opportunities

The needs are summarized:

- 1) Ensure fuels for DH
- 2) Enable the gains from energy savings (funds from emission credits) for further investment in DH sector
- 3) Remove distortions in heat market among installations included in the EU ETS and those not included in the emission system
- 4) Put into practice Territorial Development Plans and City conceptions including DH planning/zoning
- 5) Solve land ownership rights for permitting networks construction.
- 6) Inform Apartment Owners Associations of DH options.

Among the main barriers, the following facts are listed:

- a) The price paid by customers is regulated, whereas the input price (mainly the fuel price) is not,
- b) That natural gas for individual boilers is excluded from the ECO tax.

Renewable Energy Systems are said to be the minor opportunity in the Czech Republic. Among them, the role of biomass is of greatest significance. The increased use of dendromass (biomass from trees) used to be seen as a domestic potential, especially since the DH-systems have been gradually upgraded and renovated. However, the dendromass is already close to reaching its maximum potential for exploitation. Waste-to- Energy, heat pumps, and solar thermal energy could be seen as additional opportunities for the Czech Republic.

National implementation of EC directives

The first measure found in the Czech Republic is the promotion of electricity generation from renewable resources. The instrument aims at increasing of the electricity share produced by renewables to the indicative target of 8% by 2010 thus contributing to the reduction of GHG and other pollutants. Secondly, further diversification of energy resources improves the security of the

energy supply in the Czech Republic. This act is said to have led to a substantial increase of the use of RES for electricity generation. Nevertheless, as a vast majority of the electricity generation is produced in condensing plants, it has had almost no impact on heat supply. Moreover, there is a risk of a domestic depletion unless an increased amount is guaranteed.

The second and third measures also deal with RES, stating e.g. technological criteria for the fuel, supporting fossil fuel transition and reducing CO₂. The impact on DH is marginal and concerns planning and generation.

Lithuania

Support legislation

Lithuania brings up seven support measures.

1) Heat supply plans for cities (article 7 in Law on Heat Sector). The objective with this special plan is to *meet the consumer heating needs at lowest cost* while not exceeding set limits of negative environmental impacts. From the introduction of this Law special heating plans in all municipalities were prepared in 2004 - 2006. This has led to the closure of some ineffective parts of networks thus lowering supply losses and thereby improving efficiency of the remaining part. Also an increasing use of renewables is mentioned as another consequence.

2) Order for *heat procurement from independent producers* into DH systems adopted in 2003. This order set obligations to purchase heat from independent heat producers for; Heat supply systems exceeding heat delivery 10 GWh/a, independent heat producers with capacity at least 1 MW, conformity of independent producer installations with technical regulations and environmental requirements and a minimum 1 year supply contract. The purpose is efficient and environmentally friendly heat supply, rational use of waste heat from industry and the promotion of the wider use of domestic resources thus opening possibilities for independent producers to sell heat into DH-systems. Since 2003 it is claimed that the share of independent producers increased to 20% of the total heat delivered to networks. Now there are *18 independent producers supplying waste heat, CHP, geothermal and renewable heat*.

3) *VAT reduction for residential heating adopted 2005 in order to make it cheaper to buy DH*. This is said to have led to lower indebtedness thereby reducing short term borrowing for companies.

4) *Social support for low income families* aiming at helping those on lower incomes to keep their homes at an acceptable level of comfort and hygiene with the same effectiveness as the VAT exemption.

5) *Structural funds* for infrastructure development. The following investments are said to be able to receive funding from EU structural fund: *Modernization* and development of systems and networks, *Fossil fuel switching* to biomass, *Biomass based CHP development*, *Refurbishment of existing CHP plants* and of new ones, *Modernization of boiler houses*, *Energy recovery of municipal waste* and

Renovation of residential and public buildings. The present plans include renovation of 1 800 km DH routes and modernization of 100MW of energy generation capacity.

6) Order for procurement promotion of electricity production using renewables and waste adopted in 2004. This order sets criteria, conditions and requirements for promoting electricity generation from renewable sources including biomass making these investments more attractive. The largest effect so far is said to be expected in the development of wind power and biomass/biogas CHP plants, the later with modest results due to a high initial investment compared to the market electricity price.

7) Public sector obligations in the electricity sector, adopted in 2001. Under this legislation power utilities *are obliged to buy and sell electricity from renewables and waste sources and to buy and sell electricity from CHP* when these are connected to the network, *according to public service obligations.*

Needs, barriers and opportunities

The Lithuanian energy sector was changed in 1997 when the heat sector was separated as shares were transferred to municipal ownership; large debts of the state energy company were left to the new municipality owned DH companies. Due to a lack of possibilities to even buy fuels, many companies were forced to lease both networks and heat generation possibilities to private investors. Today, in 2010, around 50% of all heat is provided by and delivered by private companies. One problem that has arisen is the large number of block houses and privatised residential buildings with no single owner making it very difficult to achieve a common decision concerning both: renovation of the building envelope and heating systems. This housing management problem is said to partly explain the slow speed of renovation and has further negatively affected the image of DH due to high expenses for heating poorly insulated buildings. Aging networks are another challenge for the future as is further detailed metering in order for single households to influence their own heat consumption.

There are still not enough revenues in order to finance new investment without further increasing the price. Investment plans are to be approved by municipalities who usually don't approve plans that increase heat prices. The low value of existing assets makes it also economically impossible to modernize existing infrastructure at the same price so eventual benefits do not cover expenses, at least not in the immediate and short term.

DH in Lithuania supplies heat to around 75% of the total residential building area. Assuming a reduction in heat demand of 40% by renovating all buildings, the existing networks are thought to have enough capacity even for new costumers. Dependence on imported fuel can be reduced significantly by switching to local fuel resources like biomass and municipal waste together with heat demand reduction by building renovation.

National implementation of EC directives

In this heading Lithuania first mentions the draft of a National Renewable Energy Plan with a number of different general tasks in the area of RES and its promotion. Some of the foreseen activities described comprise a program for the heating sector increasing the share of bio fuel to 50% and reducing the gas share to 40% (from today's 80%), to have a DH market share of 75% in residential buildings in towns and cities and increase solid biomass electricity from CHP from 22MW in 2010 to 162MW in 2020, and biogas CHP from 12MW to 62MW respectively¹. Lithuania also implemented the act on Energy Performance of Buildings setting certification requirements for new and old buildings. The last implementation of EC directives mentioned by Lithuania is the CHP-directive with requirements to grid operators to buy electricity from CHP plants at prices set by National Control Commission for Prices and Energy. The report states some doubt concerning the effectiveness of this act. After the closure of the Ignalina Nuclear Power Plant the domestic CHP plants cannot compete in price with electricity imports from Russia or Ukraine. The competitive position of fossil fuel CHP versus wind farms being prioritized as renewable source is another challenge.

¹ According to the officially announced National Renewable Energy Plan

Romania

Support legislation

Romania was found to have *four* different *Government Decisions* of which two include important *support* measures for *DHC*. First is the Government decision 291/2007 that establishes the legal framework for promotion and development of efficient CHP. Some purposes of the legislation comprise: *increase the share of electricity produced in CHP-operations*, modernising and constructing new CHP-plants as well as expanding existing plants and networks. *Grid operators are obliged to connect CHP plants* to the grid and to buy electricity from cogeneration with priority over conventional electricity. The act also has a positive effect on cogeneration due to the bonus paid for this kind of electricity, a bonus meant to offset the higher investment cost for CHP plants.

The second Government decision is 1215/2009 contains a legislation which supports and clarifies the un-regulated aspects of the previous legislation mostly with respect to the support scheme with the bonus system for cogeneration.

The third Government decision is 462/2006, "District Heating 2006-2015 warmth and comfort program". The purpose is two folded; a) to *rehabilitate* the centralized heat supply by different primarily *technical investments* and b) *thermal rehabilitation of buildings* including for example *individual metering and renovation of building's thermal "envelope"*. The effectiveness is said to be less than expected so far due to a lack of financing.

The fourth and final Government decision mentioned is 1661/2008 which is a national program for energy efficiency and renewable energy use in the public sector for the years 2009-2010. The purpose is mainly to *increase Romania's energy independence and to reduce pollution by implementing new technologies*. This program is supposed to finance programs having the local government authorities as the direct beneficiaries. Eligible projects comprise: rehabilitation and modernization of DH including changing the type of fuel e.g. switching to biomass and the thermal rehabilitation of public buildings and use of local renewable energy potential for power/heat supply. The effectiveness is so far below expected due to lack of co-financing requested from the beneficiaries.

Needs, barriers and opportunities

The delay in receiving payments of delivered heat and lack of funds for rehabilitation and adaptation of heat sources is a key problem. The regulated tariff is said to be insufficient to generate enough profit to facilitate investments in new technology and for modernization of old. Finding the relevant heat load for tomorrow's more energy efficient buildings is another need. Too strong public ownership reduces efforts regarding innovation and R&D. The possibility to mix individual boilers with collective solutions like DH is claimed to be the only "legislative" need.

The general consensus from the survey is that there are no institutional barriers holding back the DH-development. Instead it is the *low-income population, the age of the DH-systems and the tax system*, not tailored to meet the specific features of the DH-sector that are the main barriers.

As future energy efficiency will be measured by primary energy use and include a CO₂ emission component it is expected that DHC will come out strong in any comparison. Also, both DH and CHP provide good opportunities to increase the use of biomass. It is also here underlined that the DH-sector requires long term commitment in order to be functional.

National implementation of EC directives

Romania lists three implementations of EC-directives, two existing and one under planning. The existing act on the energy performance of buildings is aimed at reducing the overall energy consumption with the specific target of reducing energy demand for heating and warm water by 30% in the building sector. As for other countries this law establishes for example methodology for calculations, minimum requirements in new and existing buildings, the certifications and technical verifications. It is claimed to impact negatively on planning since the heat load is harder to foresee and for the same reason it has a negative impact on demand expected. However, a net positive impact on generation is expected. The other existing implemented act is the CHP-act for promoting and developing high efficiency cogeneration heat and power. The purpose is to contribute to an increasing share of electricity from CHP in Romania, modernizing old plants and building new ones. The basic instrument used in Romania is an obligation for grid operators to connect CHP plants to the grid and give priority to buying electricity from cogeneration plants. It is felt that this will have a broadly positive impact on planning, generation, distribution and demand. The last issue is the under planned implementation of the RES-directive on renewable energy sources. It is planned to be implemented December 5, 2010 and it will probably consist of a system of mandatory quotas and

green certificates. The national targets for the power produced using renewable sources are 33%, 35% and 38% for the years 2010, 2011 and 2020 respectively.

Expansion Countries

France
Germany
Italy
Norway

France

Support legislation

According to our research, the three main support measures, that are recent, are reduced VAT, the Renewable Heat Fund and the feasibility studies.

VAT is collected with a rate reduced to 5.5% regarding thermal heat delivered through district heating systems: for all DH networks for the “subscription” part of the bill (the same as for gas or electricity in France); for the part of the bill regarding heat deliveries from DH when the heat is produced from at least 50% of biomass, geothermal energy, waste or recovered energies (R&R). The purpose is to give an incentive to DH-systems to increase share of R&R energy sources into fuel mix.

Another support measure is a heat fund for “renewable heat” (biomass, geothermal, biogas, PV, etc.). DH-systems can benefit from the fund if their share of R&R energies is over 50% (or if they formally commit to get to that objective in a given period of time). The purpose is also to further increase R&R in the fuel mix. The effectiveness is not yet evaluated since it is a new subsidy, created in April 2009, and considering the time needed to set up DH projects (investments, building, etc.). Up to the beginning of 2011 it is said that over 400 km of network have benefited from this heat fund.

Another support measure mentioned is a feasibility study that requires local authorities/project owners to make the effort of analysing various heating possibilities before choosing the relevant one. This is not yet evaluated.

Needs, barriers and opportunities

The list here is relatively long ~~(and just a list)~~ and includes city planning, energy policy, thermal regulation, tax regulation and costs and tariffs as urgent needs and challenges.

For city planning there is a need to simplify different rules and soften contract regulations as well as giving priority to DHC in new urban areas and giving competitive advantages to existing systems. Regarding energy policy there is a need to create a support fund for biomass supply and to promote DH and simplify procedures. Thermal regulation needs to grant better consideration for shared heating. There is a need to make tax rules on emissions equitable and restore equity between private initiatives and DHC regarding emission quotas. Furthermore, tax regulation needs to give incentives

to connected users, avoid carbon tax on DHC and extend reduced VAT to more DHC-systems and to suppress tax on biomass DHC. For costs & tariffs France has a need to grant better consideration to DHC and to adjust retail gas prices to real costs. There is also a need to promote CHP energy by increasing purchase price. A fairer sharing of the investment costs between tenants and landlords is also an important issue.

The main driving forces to be found in France are: reduced VAT on heat supplies, renewable heat fund, support measures for renewables, market opening on gas and electricity (electricity purchase obligation), obligation to assess the possibility of connecting to DH, involvement of local authorities and development of new urban areas, white certificates and pro-DHC associations work.

The barriers listed by France are divided into legal and non-legal barriers.

The legal barriers are mainly covering issues like the distortion of competition for individual heating systems by support systems (emissions and gas price regulations) also the contract conditions and the public accounting rules are mentioned. Other legal barriers are said to be the high investment cost and lack of favourable conditions to help finance the projects, thermal/energy legislation regarding CO2 quotas, limited heat demand, increasing regulatory constraints, complex tax rules, the risk of a carbon tax on DH, complex billing and the lack of social tariffs on DH.

Among the non-legal barriers in France are; price/pay-off levels of investments, lack of political will, lack of collective constructions, urban spreading, lack of global cost thinking, decreasing heat demand, individualisation of heat production even in collective buildings, no individual metering, loss of know-how on collective solutions etc.

The Grenelle works is put forward as the major opportunity for French DHC.

National implementation of EC directives

France lists six directives:

- Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings (**28 implementation texts**)

In the presentation of the EPB-D, there are 28 actions/decisions for its implementation. All the points in the list deal with issues connected to technical/thermal properties of buildings and definition of criteria hereof for existing buildings as well as for new ones; energy efficiency diagnosis (method, qualification required, dissemination of the results, etc.); feasibility studies (energy supplies, thermal characteristics and energy efficiency); mandatory controls and checkouts on thermal plants.

- Directive 2004/8/EC of the European Parliament and of the Council of 11 February 2004 on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC (**3 implementation texts**)

France has three actions/decisions concerning the CHP-directive; one about general policy as such and two concerning the labelling of the origin of electricity from renewable sources or from CHP. There are no comments on national purposes or the impacts of these implementations in the French report.

- Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (**1 implementation text**)

Only one very general text (“on various legislative measures implementing European Union Regulation”) seems to have been taken for the purpose of implementing this Directive.

- Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC (**1 implementation text**)

One text is referenced as serving the purpose of directly implementing this Directive; it addresses the question of energy savings. Many decrees have been taken since then, regarding the White certificate system in France. They set the rules for the 1st, then the 2nd period: objectives, procedures ...

- Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control (**No direct implementation reference found**)

Several regulatory works are in progress in France regarding this matter.

- Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (**1 implementation text**)

An Ordinance n°2010-1579 of 17 December 2010 on various legislative measures implementing European Union regulation in the Waste field was taken.

Germany

Support legislation

Ten support measures for DHC are listed for Germany.

1) Combine Heat and Power Act with the purpose of increasing the share of electricity in CHP plants to 25% by modernising and constructing new CHP-plants. The basic instrument is to oblige the grid operators to connect CHP plants to their grid and to give priority to buy electricity from cogeneration (the same obligation exists for electricity from renewable energy sources). Unlike the system for electricity from renewable energy sources there is no feed-in tariff system in place but a bonus payment for electricity from cogeneration which is paid on top of the market price. The new Act also includes support measures for DH pipelines as heat sinks for CHP based on this system. The target is to reach 25% electricity from cogeneration by 2020 (from existing 13%).

2) Act on Promotion of Renewable Energies in the Heat Sector with the aim to "facilitate sustainable development of energy supply and promote further development of technologies for the generation of heat from renewable energies...". The aim is to increase the share of renewables in final energy consumption for heat to 14% by 2020. The instrument is an obligation to use energy from renewable sources to a certain extent in newly built buildings, DH from high efficient CHP and/or renewable energy sources may act as an alternative measure to fulfil this obligation.

3) Ordinance on General Conditions for the Supply of DH set up a general framework for standard business conditions for the supply of DH to consumers, it addresses the specific technical and economical features of DH on the one hand and customer protection on the other.

4) Act on Granting Priority to Renewable Energy Sources aiming at facilitating a sustainable development of energy supply for protecting climate/environment and reducing the overall nationwide cost of energy supply. The expected result is a share of electricity from renewable sources of 30% by 2020 based on a feed-in tariff system. There is a bonus payment for the use of CHP.

5) Energy Saving Ordinance aiming at reducing primary energy demand of buildings by 30% in the building sector. The ordinance targets the building envelope, the systems engineering and the

primary energy sources which are being utilised. Electrical heating is phased out, this applies especially to storage heaters, but electrical heat pumps are not affected.

6) The Future Investment Programs I and II were initially introduced in 1973 and 1978 in order to fight the negative effects of oil prices. They stimulated investments in heat supply and distribution in urban areas in order to reduce energy consumption, protect environment, secure supply and increase fuel diversification. Support of a maximum of 35% of investment costs could be given under the programs.

7) The Program for Rational Energy Use, Renewable Energy Sources and Energy Savings was introduced in order "to achieve a significant contribution towards climate protection and the reduction of CO2 emissions". Support can, for example, be given to the construction of biomass, biogas installations and for connection of costumers to DH grid supplied with heat from CHP or DH from renewables.

8) The Loan Program for Energy Efficiency aiming for energy efficient buildings providing financial incentives for energy efficient construction and refurbishment.

9) Mandatory heat planning acting locally on issues such as environmental protection.

10) The Market Stimulus Package for Renewable Energy Sources is an incentive schema for investments in technology incorporating renewable energy sources in the heating market leading to lower costs. The aim is to increase the share of renewable sources to 14% by 2020. Especially large scale biomass installations, deep geothermal installations and local heating grids are of interest with a special focus on small and medium enterprises.

Needs, barriers and opportunities

The needs and challenges for Germany are presented as a 10-point list ranked from 1, most important to 10, least important.

- 1) Future legal framework (like for example emission trading system),
- 2) Convincing new costumers,
- 3) Convincing Policy makers
- 4) Future demands,
- 5) Contribution to EU-policies,
- 6) Fossil transition,

- 7) Customer loyalty,
- 8) Knowledge transfer,
- 9) Technology transition,
- 10) Handicraft industry.

The European Emissions Trading System that currently excludes installations below 20MW distorting competition and preventing "fair" competition. High initial investment cost is also put forward as a barrier as is the high cost of fuel relative to the heat value for renewables with accompanying logistical problem.

DH is considered to be among the fundamental future solutions regarding climate change, security of supply, competitive pricing and energy efficiency and it is said that the favourable legislation from 2009 leads to significant development. Also, renewable sources such as biomass and geothermal energy are said to be best suited for DH. Due to some of the barriers it is expected that the development of DH will increase gradually over the coming years and not exponentially as is claimed to be possible with changed legislation.

National implementation of EC directives

Germany lists two issues here; the Energy Savings Ordinance and the Combined Heat and Power Act. Although the first is said to implement a number of directives the basic directive being implemented here is the Energy Performance of Buildings. The ordinance applies to buildings (if heated or cooled) and to heating, cooling, ventilation, lightning and warm water installations and appliances of buildings. It includes thus the "where" (buildings) and "what" (the technical installations). The target is said to be to reduce primary energy demand for heating and warm water consumption by 30% in buildings. It is said in the report that the ordinance has a holistic approach on the building envelope, the systems engineering and the primary energy sources being utilized. One example given is that obligations can be fulfilled by either using more insulation or more efficient systems engineering or primary sources. It is then claimed that the system therefore generally reflects the efficiency benefits of DH based on CHP. The impact of this measure is said to be positive on generation and negative on planning and demand.

The second and final implementation is of the CHP-directive called here the CHP Power Act. The purpose is to increase the share of CHP produced electricity to 25% (from 13%) by protecting, modernising and constructing new CHP plants. The purpose is also to support the launch of fuel cells and to promote the construction of new networks, and the expansion of existing networks, which

supply heat from CHP-plants. There are some introduced instruments for the fulfilling of the goal of 25% electricity from CHP, for example, an obligation for grid operators to connect to CHP and to give priority to buy electricity from cogeneration. Also, for electricity bought from CHP there is a price premium on top of the market price. This premium is granted for a limited time in order to offset higher investment costs for CHP viz. condensing plants. There is also a premium of one EURO per millimetre nominal diameter and meter of network route being built. This premium may not exceed 20% of investment cost or 5 million EUROS in total. The purpose for this last network premium is to incentivise the creation of additional heat sinks (DH customers) in order to produce more electricity from CHP. The impact of this measure is said to be broadly positive on planning, generation, distribution and demand.

Implementation of EC Directive 2009/28/EC is currently in the legislative process but the “omnibus act” (“Artikelgesetz” in German) will not be published before the beginning of 2011 at the earliest. AGFW is involved in the process.

Italy

Support legislation

There is in Italy no specific legislative Act on DHC. The Italian support measures for DHC are presently embedded in many different national and regional acts, mostly national and regional laws, guidelines and regulations.

The relevant national measures are mainly be related to: 1) Green certificates if thermal energy is generated from renewables, 2) White certificates for energy generated in high efficiency CHP plants, 3) Participation to the CO₂ voluntary emission trading system and 4) Tax credits for DCH systems using renewables for energy generation.

The regional measures, issued by local governments, mainly cover three broad areas, 1) Planning of energy and energy service developments related to three main objectives: increasing the share of renewable sources in the energy mix, promoting energy savings and efficiency, reducing carbon emissions, 2) Defining legal framework including DHC and 3) Providing economic support and funding through public procurement, capital investments for DHC systems, particularly based on the use of renewable energy sources and on industrial heat utilization.

Needs, barriers and opportunities

It is remarked that further developments would require: 1) A dedicated legislative framework integrating all the measures related to DHC, 2) A simplification of the authorization pattern for the localisation and the realisation of DHC systems (generation plant, transport network, distribution subsections), 3) An effective economic support scheme related to the heat effectively distributed with particular attention to renewable energy sources and high efficiency CHP-plants. The application of incentives should be clear and simple. Also another major challenge is to convince new costumers and policy makers. The main drivers are energy savings, increased utilization of renewable energy, higher security of supply and cost reduction perspective for the end user.

Five barriers are listed: 1) The climate conditions which traditionally only include the northern regions of Italy as suitable for DH systems, 2) The extended diffusion of high efficiency decentralized heating systems connected to the gas grid, 3) The particularly ancient urban structure of Italian cities and their historical buildings, 4) Electrical power plants generally far from heat costumers, 5) The lack

of consolidated procedures to obtain incentives related to distributed heat and, 5) The high cost of the heat distribution grid, also penalized by noticeable energy losses (7,5 to 10%).

Three opportunities were identified, 1) development of small CHP plants using local biomass or wastes, 2) a stronger support from municipalities for the realization of DH systems within the implementation of local public utility concepts and infrastructures, 3) a better integration between industries generating and/or processing heat and heat distribution companies.

National implementation of EC directives

Italy has six distinct implementations of EC directives.

1) The Energy Performance of the Buildings Directive (EPB-D) consists of two existing national laws and covers methodological issues for the evaluation of buildings, application of minimal requirements of buildings, general criteria for certification of buildings, periodic inspection criteria for plants and information to final users and training of operators. The overall purpose is to improve the energy performance of buildings nationally, to promote the application of RES, rational use of energy, diversification of primary energy sources and to limit GHG emissions. It is also expected that these measures will increase competitiveness and technological developments. Presently, the implementation of EPBD doesn't evidence a specific effect on DH development.

2) The implementation of the CHP Directive is carried out at a national level with the purpose of improving overall energy efficiency, security of supply and a reduction of emissions. The focus of the related acts is dedicated to the support of the "high efficiency concept" of the combined heat and power plants in order to encourage the effective use of the generated heat. It is noted that a major impact is expected on the development of small, medium and large scale plants with a higher/advanced technology standard. The impact of the CHP Directive is therefore expected to be positive on the generation, distribution and organization of DH systems, and it is closely linked to the full application of the support scheme for energy efficiency titles (White certificates) in DH.

3) The implementation of Waste Directive will provide a clear definition of wastes, including issues like sub products, secondary feedstock, recycling and the waste life cycle. The Directive is not expected to have a noticeable impact on the development of DHC systems. However, for DHC systems fuelled with the biodegradable fraction of wastes, considered as a biomass and thus eligible for the public subsidies (Green certificates) accorded to the renewable sources, a negative impact may be seen on planning, generation and organization, since the combined plant will be subjected to

a more complex authorization pattern of the generation system and to more stringent emission control regulation.

4) The implementation of the Energy Service Directive with the purpose of promoting market instruments in the liberalized market will contribute to the achievement of higher energy efficiency. DHC can be seen as a possible sector to subsidize using white certificates. Furthermore, heat generation using renewables is eligible for green certificates. The impact of the implementation of the Energy Service Directive is expected to be positive on planning, distribution and demand.

5) The implementation of Renewable Energy Sources Directive (RES-D) is aimed at increasing the share of renewable energy in Italy's energy mix by supporting electricity generated from solar, biomass, wind, small hydro, geothermal etc. This measure is expected to have positive impact on planning and generation of DHC-systems using biomass or geothermal energy because of regional incentives, green certificates and tax credits.

6) Implementation of the Integrated Pollution Prevention Control directive (IPPC-D). This measure aims to prevent or reduce pollution generated from industrial activities by regulating in particular the emissions from the energy generation plants of DH systems. Although it is linked to environmental authorisations allowing the operation of a specific plant, there are no explicit impacts on DHC-systems or on their development as it has to be considered in the design and operation. Therefore a negative impact on planning and generation can be expected.

Norway

Support legislation

The first support measure is a Financial Support Scheme for DH infrastructure for investing in new DH infrastructure or to extend existing infrastructures through the use of Public Service Obligations (PSOs) in competition with other companies not regulated by state aid regulations, 30 million EURO's in 2008 and 59 million in 2009. The objective is to change the energy system by increasing the use of renewables in the heating sector and to make the heating system more flexible. Another objective is to build DH-systems in the 20 largest cities where the lack of infrastructure is the main barrier and for substantial investments in waste incineration plants in reaction to the prohibition of waste in landfills from July 1 in 2009. Support is given to DH systems to receive waste heat and in order to build DH infrastructure in large cities with no previous DH, based on renewables. The support has given investment in infrastructure that otherwise wouldn't have started due to the financial crisis and DH extensions or new grids in 12 larger cities.

The second support measure is Financial Support for Renewable Heat Production for DH companies for new production from renewable energy and for small scale renewable heat production. The support is regulated by the state aid regulations, max 30% support per company (in average 15-20%). 18 million EURO's in 2008 and 41 million in 2009. The main purpose is to improve efficiency and use renewable heat and to improve security of supply and to reduce the use of electrical heating. The political goal is 25 new TWh of renewable energy by 2020. Support has been given to all new DH plants and some small scale heat plants that wouldn't have been started due to financial crisis.

The third support measure is regulations in the guidelines for the Planning and Building Act of 01/07/2010. Electrical and fossil heating is forbidden in all buildings over 500 m². There is a claim of a minimum of 60% of energy from renewable heat in all buildings over 500 m², and a minimum of 40% for buildings below 500 m². There is an obligation of connection for DH. Exemptions for zero-energy houses can be claimed. DH is regarded as renewable, even with 12% fossil fuel. The goal is for DH to be completely renewable by 2020. Installation of oil-only boilers is forbidden in all new and refurbished buildings (exceptions for the industry and DH sectors). Waste planning and the landfill ban are also important measures.

The fourth support measure is burden taxes. The carbon tax on fuel oil will increase from 1.1.2011 to 0.8 cent/kWh, and with the basic tax on fuel the total is 2 cent/kWh.

The tax on electricity has not increased, being 1.4 cent/ kWh, but is important for raising the price of electricity, as well as the ETS, giving better profitability for renewable heat.

The fifth support measure is tax deduction on electricity used in DH production and on the NOx tax. Most of the industrial, energy and transport sector have exemption from the NOx tax and have joined an agreement with the ministry of environment of reducing the NOx emissions.

The sixth support measure is national energy policy, and goals about a more flexible energy system, increasing the production of renewable heat. This leads to the measures below.

The seventh support measure: renewable planning for electricity and heat: a goal of 28 TWh bioenergy in total in 2020, including bioenergy in DH and waste heat.

The eighth support measure is carbon taxes on fuel oil and gas.

The ninth support measure is energy tax 1.4 eurocent/kWh.

The tenth support measure is heat planning in the Planning and Building Act, § 11.8 and 12.7: municipalities shall plan for DH if there are possibilities in the community (heat resources, density of population), this leads to:

The eleventh support measure, local heat planning: where municipalities, using the PBA, have offensive plans for DH, supporting DH in competition with building related energy resources.

The twelfth support measure is participation in the ETS.

The thirteenth support measure is waste and landfill bans, increasing the amount of waste for waste incineration. Waste heat is the most important energy resource in DH.

The fourteenth support measure is customer complaint board at the energy authorities and in the Energy Industry Organisation, dealing with complaints for both electricity and DH.

Needs, barriers and opportunities

The needs/challenges and barriers are put together. The main issue is the need of improved systems for energy labels, since the present system rewards low-energy buildings using internal heat systems

such as heat pumps, solar or electricity. The result is claimed to be that building companies do not want DH and tend thus to invest in their own energy supply even if connected. There is no obligation to use DH. The consequence is a loss of costumers that might reduce the expansion of DH.

There have been changes in the financial market, resulting in difficulties for DH companies to get credit, and a stronger claim of profitability from the owners. That urges the need for increased intensity in investment support. The heat sector have argued for 325 million euros in 2011 to a heat package consisting of investment support for renewable DH, DH infrastructure enlargement, local bioenergy plants, converting from electricity heating to waterborne systems in all buildings over 500 m2 and for energy flexible systems for all households.

More offensive environmental taxes on Co2 emissions and use of electricity are needed, in order to make renewable heat more profitable and to make a change in the use of energy.

Opportunities include positive discussions with the government and other authorities regarding issues described earlier.

National implementation of EC directives

I Norway the Energy Act is a concession for DH companies and price regulation for customers in the residential and service sector due to the Planning & Building Act which includes connection duty to all customers. The purpose is to give companies a possibility to expand DH in cities to become increasingly profitable with more connected customers and to promote DH for the security of supply and the increased flexibility of systems. It is claimed that these laws have a positive impact on planning and a "mixed" or uncertain impact on generation, distribution and demand while the impact on organization is said to be negative. As Norway is still in the construction phase of DH the effectiveness of these measures aren't evaluated. It is claimed however that the connection duty is important for new buildings only and there is still a need for regulation, regarding price and connection duty, in order for the sector to expand.

The RES-D is not yet adopted in Norway, though the negotiations regarding Norway's obligation on the increase of renewable energy is finished. No matter the outcome on specific obligation, Norway mentions that renewable heat will be an important factor to promote.

Norway has adopted the EPBD, with national adaptations of the energy labelling system, described earlier. There is a need to work out primary energy factors for the energy labelling system.

Finally, Norway is proposed to join the Swedish system with green certificates in order to get a larger and broader market. Renewable heat will not be a part of that system.

New Development Countries

**Ireland
Spain
United Kingdom**

Ireland

Support legislation

Ireland has six measures for supporting DHC;

1) Building regulations: These regulations focus in principle on energy consumption and emissions connected to new and existing dwellings and other buildings. The general purpose with the regulation is to provide health, safety and welfare for people in and around buildings. The more specific purpose is concerned with the conservation of fuel and energy in dwellings. It is claimed that one effect of this regulation is "an increased take up of small scale DH in residential and mixed used developments".

2) CHP Deployment program aimed at providing support for the deployment of CHP by means of grant aid assistance in accordance with EU directive on CHP. The objective is to increase the deployment of small scale CHP (between 50kWe and 1MWe) systems in industrial, commercial, service and public sectors. Decrease fossil fuel usage and increase electricity security via more diversity, increase consumer awareness and the capability of Irish CHP equipment supply chain.

3) The third measure is called "Biomass CHP/Anaerobic Digestion (AD) CHP Deployment Program Call for Proposals". The objective is to increase deployment of biomass and AD CHP schemes, reduce fossil fuel usage, increase electricity security, customer awareness and improve the equipment supply chain regarding biomass CHP and AD CHP.

4) The ReHeat deployment program is short for the Renewable Heat deployment program and is aiming towards stimulating installation of new renewable energy plants supplying space, water and process heating in commercial, industrial, services, public sectors as well as Energy Supply Company installations by means of grant assistance. The program is focused on biomass boilers, solar thermal collectors and heat pumps. The objectives are to increase use of renewable energy heating systems, increase the deployment of biomass boilers, ensure efficient design and installation and to achieve carbon emissions savings.

5) Renewable Energy Feed in Tariff. This measure aims at increasing the share of electricity produced by renewable sources of total electricity from around 15% in 2010 to 40% by 2020 by increasing the

compensation to suppliers of electricity by means of anaerobic digestion CHP, high efficiency CHP, ocean energy or offshore wind to the grid. During the first year (2006) 98% of all support from this program was allocated to wind farms.

6) The sixth and last mentioned support program is Building Energy Rating (BER). The major motive behind this program is to stimulate property owners and developers to invest in upgrading the energy performance of their buildings. This cover usually a combination of insulation, glazing, ventilation control, boilers and heating systems and in some cases lightning systems. By 2008 it is claimed that 82% of new homes have published a BER with the rate B, of these 40% received a B2, 8% an A rating and 10% a C rating.

Needs, barriers and opportunities

It is said that DHC is not well developed in Ireland due to a lack of knowledge and understanding among the general public and a lack of commitment from policy makers. One urgent need put forward is the removal of trade barriers for surplus electricity from CHP plants. Also a need for a regulator is called for in order to set the conditions for entering the market, monitor the prices and protect the costumers. Removal of regulatory barriers for opening and developing a CHP plant is also called for, the license process is considered to be too cumbersome.

One of the main barriers is the legislation that prevents the trade of surplus electrical power from CHP plants. The Electricity Act 1999 is said to effectively prevent the sale of electricity from CHP to multiple end users using a private wire network. Also the lack of legislation and regulation of DHC is put forward as a major barrier. Also there is a lack of general understanding of the concept, a lack of year around heat demand, a lack of "joined up thinking between stakeholders", a high proportion of one-off houses and low density development, access to cheap heat sources – solved partly by new Waste to Energy facilities.

The opportunities put forward comprise: Using heat from WtE facilities as there are a number of these plants "in the pipeline", using heat from the combustion of biomass, wood chip, wood pellets and bio crops, using bio methane produced during AD of organic waste, using thermal heat and last the requirement of diversity of energy sources for security of supply reasons in reducing the dependence on imported fossil fuels.

National implementation of EC directives

Ireland lists five implementations of EC directives;

- 1) Energy performance of buildings,
- 2) Cogeneration directive,
- 3) Energy service directive,
- 4) The Renewable Energy Sources (RES-directive) and
- 5) Integrated Pollution Prevention Control (IPPC-directive).

The first point has resulted in both the building regulations and the building rating system described in the supporting measures above. Also described above is the second and third point which has resulted in the CHP deployment program, biomass CHP/Anaerobic digestion "call for proposals" and the National Energy Efficiency Action Plan 2009-2020.

The fourth point, RES-directive has resulted in the Renewable Energy Feed-In-Tariff further described in the support section above as is the other implementation program, Renewable Heat Deployment program. The last point, the IPPC-directive has resulted in an IPPC licensing of industrial sites. The purpose is to ensure that the production of waste will be prevented and will be recovered as far as possible, that energy will be used efficiently, that measures will be taken to prevent accidents and that pollution risks will be avoided in the case of cessation of activity. The impact of this last measure is expected to be positive on generation and distribution.

Spain

Support legislation

One existing initiative includes a subsidy regarding "Improvement of the energy efficiency of thermal installation existing in buildings" The subsidy will in general be 22% of eligible cost. "The maximum amounts are 10 000 Euros for single-family house, block of flats for 200 000 Euros and 200 000 Euros for district networks". The purpose is said to be aimed at improving existing energy installations within a broad definition from electrical installations to thermal installations. The impact is expected to be the improved energy efficiency of all types of installation. It tries to stimulate connection of buildings to existing networks. The effectiveness is so far said to be poor.

Another, also existing, initiative comprises seven geographically different subsidies. These are almost all in the area of subsidising new installations of DH/DHC systems for several buildings The principal of these subsidies are to improve energy savings and energy efficiency promoting better use of energy, renewable energy and quality of energy and all things integrated with environment protection. Most of the projects are claimed to be a success.

The last initiative mentioned is an Improvement of Energy Plan of Barcelona. This plan is expected to provide knowledge and analysis of energy consumption, energy demand and local as well as global emissions. The purpose is also to do an analysis of the energy state of the city, to plan patterns of actions due to the above, increase quality of service and to develop tools for environmental decision making. It is claimed that this initiative has been very successful with the construction of four networks in the city of Barcelona.

Needs, barriers and opportunities

The most urgent need is said to be a change in current legislation in order to include DH/DHC which is excluded in today's legislation due to the limited amount of district heating networks in Spain.

The main change called for is a proposed obligation of the installation of DH/DHC for a minimum housing or service in urban plans. A tax reduction for these systems and easy financing options are also called for. There is also a need to convince policy makers of the advantages of DHC and a need for increased knowledge on how to build and construct these systems, a knowledge now primarily

belonging to foreign companies working in Spain. An increased knowledge on how to incorporate new DH-systems in existing urban areas is further called for.

The main barriers put forward belong to the planning phase of a system, both in existing urban areas ("social" or "cultural" and financial) and in new areas. The social and cultural barriers originate from a high sense of property with doubt on having a collective system outside own building.

The opportunities for investment companies are said to be the selling of electricity in cogeneration plants with additional revenue and profit from the waste heat.

The "social" opportunity is claimed to be that the current users of collective DH-systems are satisfied having both economic and energy savings.

Spain also mentions some environmental and legislative opportunities following new energy plans that require energy consumption as well as energy generation to decrease in Spain. New developments try to increase the use of DH/DHC networks. Increased use of renewables has made it easier to diffuse DH/DHC systems.

National implementation of EC directives

Three EC directives are listed by Spain;

- 1) Energy Performance of Buildings
- 2) The CHP-directive
- 3) The Renewable Energy Source (RES-directive)

With respect to the first point, Spain introduced a Royal Decree requiring qualification of buildings in terms of demand for heating and cooling. It aims at promoting high efficiency buildings and it is claimed that results point to the fact that energy consumption in terms of fuels and electricity has decreased. However, since the use of DHC in Spain is very limited, there are no visible effects or influence of this decree on DHC-systems and no DHC system has been built as a result of this legislation.

Two Royal Decrees have been introduced within the CHP-directive; one with the aim at creating a framework to encourage high efficiency cogeneration increasing energy efficiency and improving security of domestic electricity supply. The impact of this decree is thus far marginal on planning and

organization and as yet no network construction has been driven by this legislation. The second decree within the CHP-directive mainly aims to "encourage" the use of renewable fuels and waste and the sale of electricity from CHP through a price subsidy or bonus for electricity from cogeneration. With some current projects still on the planning stage no immediate impact can be observed.

The last issue in the Spanish report refers to the RES-directive and is a planned national action plan in renewable energies. The purpose is to increase the use of renewable energy to electricity generation. The target value of Spain is 20% by 2020 and the estimate presented in the report claims that the share of renewable energy to gross energy will go from 10.5% in 2008 to almost 23% by 2020.

United Kingdom

Support legislation

UK boasts several initiatives;

- 1) National Planning Statements
- 2) Local Planning Policies
- 3) Climate Change Levy Exemption for Good Quality CHP
- 4) Enhanced Capital Allowances for Good Quality CHP
- 5) Home Energy Management Strategy (HEMS)
- 6) Zero-carbon new build housing through building regulations
- 7) Grant support schemes, past and present
- 8) Carbon Reduction Commitment (CRC)

1) National planning statements establish the national case for various types of infrastructure development and set the policy framework for infrastructure decisions. In order to meet the requirements set within the documents, when developing proposals for new power stations, developers are required to consider the opportunities for CHP from the very earliest point and the ability to operate, as CHP should be adopted as a locational criterion.

2) The supplement to Planning Policy Statement 1 (PPS1) sets out the Government's overarching planning policy framework on the delivery of sustainable development through the planning system. It advises rather than instructs. According to PPS1 "Regional planning authorities and local authorities should promote resource and energy efficient buildings; community heating schemes, the use of combined heat and power, small scale renewable and low carbon energy schemes in the developments;..." PPS1 aims to create a more sustainable environment which includes the implementation of low carbon technologies. PPS1 has encouraged the development of local planning policies relating to energy based on local evidence including the undertaking of area based heat mapping exercises which identify the opportunity for district heating.

3) The Climate Change Levy (CCL) is a tax on supplies of energy within the non-domestic sector including industry, commerce and the public sector. Fuels inputs and energy outputs from CHP are exempt where the threshold criteria for Good Quality CHP (GQCHP) are met. The extent to which individual schemes meet the threshold criteria is assessed under the Combined Heat and

Power Quality Assurance (CHPQA) programme. The aim of the CCL exemption is to encourage the installation of CHP for which there is an existing target of 10GW by the end of 2010, although the capacity at the end of 2008 was just 5.5GW. While the exemption of CHP from the CCL is helpful in making the case for CHP in certain applications, as most district heating networks serve domestic customers who are not subject to the CCL, it means it has limited impact in this sector.

4) The Enhanced Capital Allowances (ECA) scheme provides businesses with enhanced tax relief for investments in equipment that meet published energy-saving criteria. Eligibility for an ECA is one of the fiscal benefits available to new CHP schemes certified under the CHPQA programme. The enhanced capital allowances for GQCHP are effective in helping make the economic case for new CHP. However, pipes (except for insulation) are usually not included so the DHC infrastructure is not assisted, meaning it has limited overall effect in this sector.

5) The HESS saw the government acknowledging the role of efficient heat production in a major way for the first time and acknowledging the role that district heating could play. The subsequent Household Energy Management strategy provides a framework for the development of district heating, without committing to further specific measures.

6) The building regulations are the main mechanism through which energy savings in new buildings is enforced. Following the requirements of the EPBD, the building regulations compliance model/software estimates the carbon dioxide emissions from a new building and compares this to a target emissions rate for compliance. The aim is to deliver zero-carbon houses (by 2016 in England), non-domestic buildings (by 2019) and public sector buildings (from 2018). All new homes and buildings have to comply with building regulations, although the actual regulations vary between the individual countries of the United Kingdom.

7) A number of funding programmes have been carried out in UK. These include both grant capital support and assistance with pre-investment activities. One example is the Community Energy programme that sought to deliver new and refurbish old community heating schemes, reducing carbon emissions, alleviating fuel poverty and reducing frontline energy costs. Another one was provided through the Homes and Communities Agency (HCA). The HCA funded schemes

aim to ensure energy efficient infrastructure in included schemes that had this aspiration but which, through lack of capital, were set to proceed with individual dwelling heating systems.

8) The Carbon Reduction Commitment (CRC) is a mandatory scheme that aims to improve energy efficiency and reduce the amount of carbon dioxide emitted in the UK. Organisations must report their actual emissions and surrender allowances to cover their reported emissions. Allowances are sold by the Government and organisations buy as many as they need to cover their CRC emissions. If an organisation needs to buy additional allowances it can do so through the secondary market.

Needs, barriers and opportunities

Under needs, the report states initially that "District heating is omitted from national legislation and needs to be rectified". High capital cost (which is claimed to be even higher compared to countries having a more mature DH-market) as well as poor awareness and poor performance of some older systems are also put forward as needs/challenges.

It is also claimed that financial support is needed since "[DH] technology is economically viable, just not financially viable to establish". It is pointed out that there should be an obligation on developers to join a DH network if one is nearby. There could also be an "obligation for local authorities to develop district energy infrastructure, once established, costs fall". It is also emphasized that since DH isn't a "statutory undertaking, unlike other energy supplies: this adds cost..."

Upfront capital cost is said to be a major barrier for DH; "Operating in a liberalized market, it comes down to cost and other benefits...". Capital cost is said to be a major barrier as this technology requires a long term view.

It is also argued that the privatisation of the electricity industry with its accompanying trading agreements has made it more difficult to sell electricity to the grid from local scale CHP. Lack of knowledge and awareness is also claimed to be one major barrier as well as the lack of experience in the contracting sector.

The Renewable Heat Incentive is put forward as an opportunity as the hope is that RHI can incentivise DH networks as well as renewables. Another driver for district energy is said to come from planning system for new-build developments.

The Community Energy Saving Programme is a regulator-mandated obligation on energy companies to invest in energy efficiency measures. A number of UK local authorities have accessed financial support for DH development under the programme.

The really significant opportunities is said to be in town and city centres across the UK. The public sector is suggested to be allowed to borrow capital when investing in revenue earning activities. Currently there is no distinction made between resources sunk and those which earn revenue. Further, plans for a number of ECO-towns provide an opportunity.

National implementation of EC directives

A wide range of measures have been used to implement energy related EC directives in the UK. The measures discussed below all relate to the following 4 directives:

- 1) Energy Performance of Buildings Directive
- 2) Cogeneration Directive
- 3) Energy Services Directive
- 4) Renewable Energy Sources Directive

1) The Energy Performance of Buildings Directive has been implemented in the UK through a number of measures including Energy Performance Certificates (EPC) and Building Regulations (BR).

The requirement for buildings to have an EPC generated at different stages means there is a continuing focus on their energy performance and large organisations, such as corporates and public sector bodies, are often looking to improve the overall asset ratings of their building stock. The different models used to generate an EPC incorporate procedures to take into account the benefits of district heating and, thus, connection of a building to a district heating network served by a low carbon source can be one way of improving a building's EPC rating.

When they are constructed, new buildings in the UK are required to comply with Approved Document Part L of the Building Regulations, which relates to the conservation of fuel and power. Compliance is demonstrated by achieving a reduction in carbon emissions compared to a 'notional building'. The model used to estimate carbon emissions incorporates procedures for

dealing with district heating. Therefore, connection to district heating can be one way of helping to demonstrate compliance.

2) The requirements of the Cogeneration Directive have primarily been implemented through amendments to the Combined Heat and Power Quality Assurance (CHPQA) programme. CHPQA provides a mechanism for giving fiscal benefits to CHP installations that achieve quantifiable primary energy savings when compared to the separate generation of heat and power. As a result of the directive, the threshold criteria for Good Quality CHP set by CHPQA were realigned to ensure the minimum primary energy savings requirements were met. However, one of the main results of the implementation of the Directive in the UK was that for natural gas-fired reciprocating engine CHP schemes less than 1 MWe, i.e. the type of plant most commonly used in UK district heating, it became easier to reach the threshold criteria for Good Quality CHP, meaning less heat had to be used to achieve compliance.

Also to demonstrate compliance with the Cogeneration Directive, a series of analyses examining the potential for CHP in the UK were undertaken. One of these examined the potential for CHP and district heating and highlighted the large opportunity under certain conditions.

3) Voluntary agreements between energy suppliers and the UK Government have been implemented to help demonstrate compliance with the Energy Services Directive. While the agreements signify a degree of intent amongst the signatories to promote energy efficiency and not impede the development of the energy services market, there appears to be little within them to actively encourage the development of district heating networks.

4) The measure of primary relevance to district heating in terms of the implementation of the Renewable Energy Directive in the UK is the proposed Renewable Heat Incentive (RHI). The proposed RHI would deliver clean energy cash back for renewable heat with the aim of providing financial support that encourages individuals, communities and businesses to switch from fossil fuel for heating, to renewable technologies and sources. Under the proposals there may be support for biomass installations supplying district heating networks, as well as the possibility of wider support to encourage new district heating networks or the extension of existing networks.

