



Bio-energy CHP Potential Analysis

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Introduction

Policy Background

The European Union is well on the way to achieve the 2020 target of 20% energy from renewable sources in gross final consumption of energy¹. In the Energy Roadmap of 2011, the European Commission expects a rise of the renewables share to 30% in 2030 and up to 55% in 2050².

However, the EU is not on track to achieve the target to enhance the Union's energy efficiency by 20% until 2020. The combined production of heat and power (CHP) is a crucial technology to achieve the target. The relevance of CHP is underlined by the EU policies on cogeneration³.

Why bio-energy CHP?

The preamble of the CHP directive (2004/8/EC) summarizes well the main advantages of combined heat and power (CHP) and why it is a priority issue for the European Union's energy policies:

Promotion of high-efficiency cogeneration based on a useful heat demand is a Community priority given the potential benefits of cogeneration with regard to saving primary energy, avoiding network losses and reducing emissions, in particular of greenhouse gases. In addition, efficient use of energy by cogeneration can also contribute positively to the security of energy supply and to the competitive situation of the European Union and its Member States. It is therefore necessary to take measures to ensure that the potential is better exploited within the framework of the internal energy market.

As CHP systems can be run with a variety of fuels, biomass – be it liquid, gaseous or solid – is the ideal choice to maximise the CO₂ reduction potential in CHP systems.

Current fuel input to CHP systems

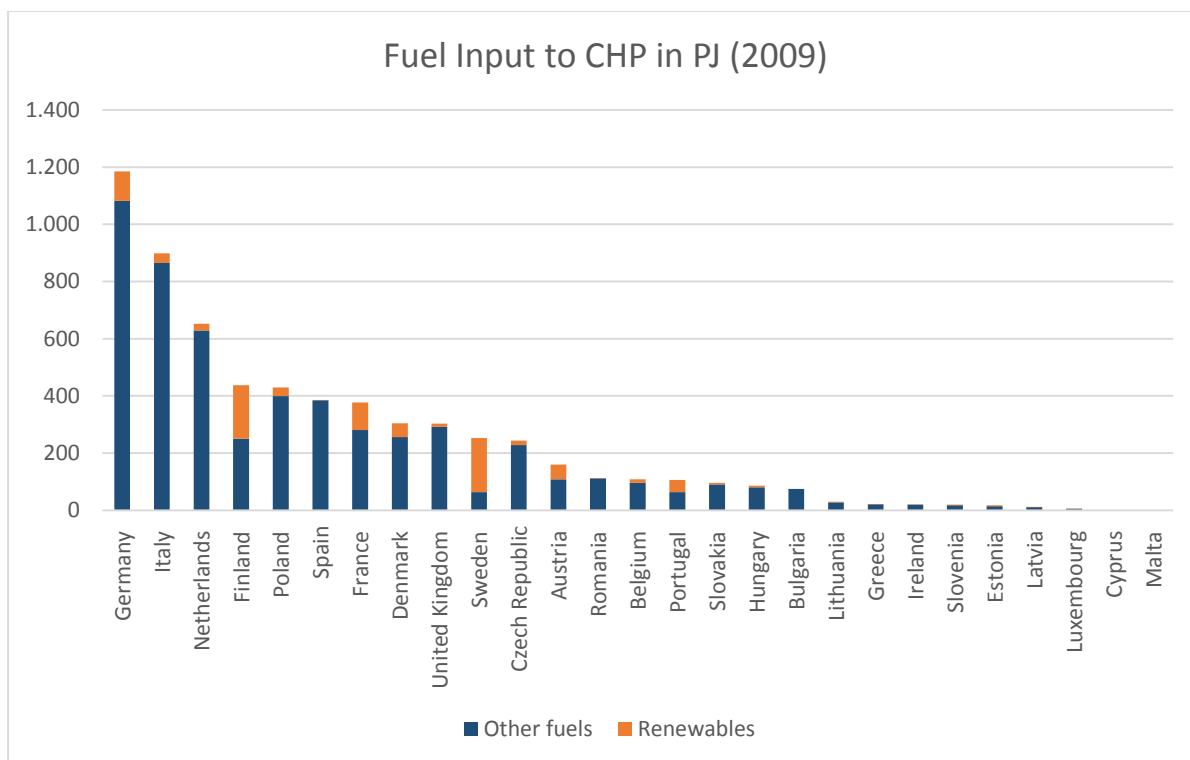
Currently, the penetration rates of bio-energy CHP in the CHP markets vary greatly in Europe. In Scandinavian countries with large forestry biomass resources and a traditionally strong CHP sector, the penetration rate is already very high (Finland: 42,6%, Sweden: 74,9%)⁴.

¹ Directive 2009/28/EC.

² Communication 2011/885/2, p.7, p.10.

³ Directive 2004/8/EC, Directive 2012/27/EU

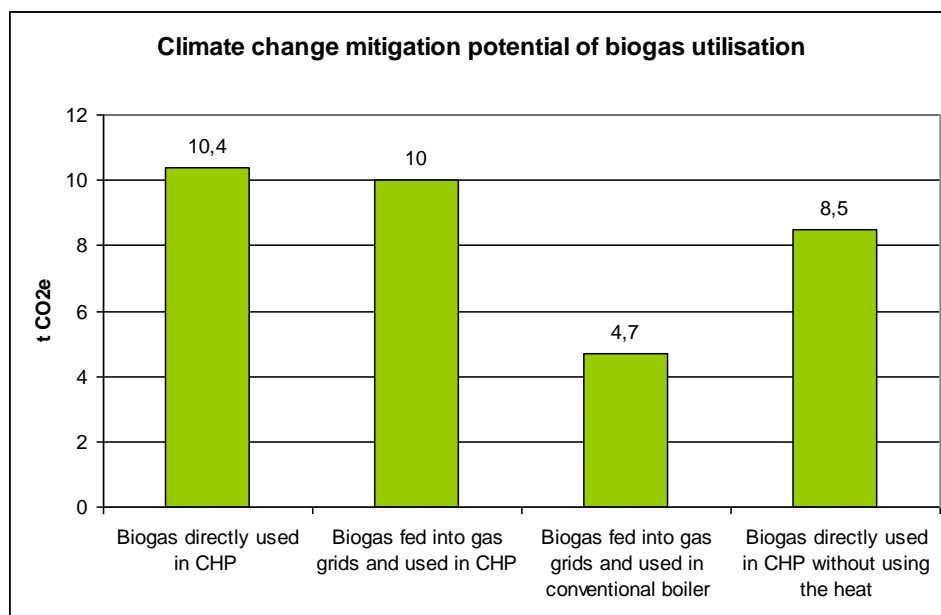
⁴ European Environmental Bureau, Eurostat (2009)



Source: European Environmental Bureau, Eurostat (2009)

Climate Change Mitigation Potential

The climate change mitigation potential of biomass fuels can roughly be doubled by using them in CHP systems, which clearly underlines the priority which should be given to CHP solutions. For the example of Germany, the climate mitigation potential of biogas has been assessed as follows:



Source: www.unendlich-viel-energie.de, FNR, IFEU, UBA, 1/2011

Applications of bio-energy CHP

There are various kinds of bio-energy CHP systems in operation already today. The applications vary largely in size, usage types and fuel-type used.

Although national regulatory and economic frameworks on CHP and bioenergy have great differences between member states, there is a clear trend that presently bio-energy CHP has its biggest potential in medium to large size applications.

In the example of Germany, the marginal costs for heat produced in micro and mini biogas CHP plants can hardly compete with market heat prices of competing heat producers. So a good business case in the current regulatory regime can normally only be achieved for biogas CHP applications > 300kW_{el}, although there are examples of smaller systems.

Also concerning the primary energy factors (PEF) and the GHG emissions, the size of the bio-CHP system plays an important role. In the example of biomethane CHP systems, the PEF can decrease down to zero for systems of 300kW_{el} or larger due to the much better coefficient of performance (COP) of larger CHP systems.

Therefore, the application of choice for bio-energy CHP systems presently lies clearly on medium to large size systems.

Resulting from the economic frameworks mentioned, the majority of bio-CHP applications has so far been realised in district heating contexts or by autoproducers. However, successful realisations also exist in residential contexts.

Fuel types for bio-energy CHP

Generally speaking, a great variety of biomass can be used for bio-energy CHP applications. The most common ones used in Europe are bio-methane and wood (residues). However, examples exist also for applications with other biofuels, e.g. peat or colza oil. Technological progress will enhance the range of bio-fuels to be used in CHP systems in the future.

Since long supply routes increase the fuel costs and also the carbon footprint significantly, the choice of fuel will normally be strongly connected to the (regional) availability of a certain fuel, as local and regional resources have a price advantage through smaller costs for transport. At the same time, the constant availability of the respective resource in sufficient amounts has to be ensured.

In the future the competition between traditional and energy farming is likely to increase and bioenergy utilizations are challenged increasingly due to unresolved sustainability issues. Therefore, further biomass types, which are currently not in the general focus, will become increasingly interesting. The project Biomass Futures⁵ identified in different scenarios amounts of cost-efficient, sustainably achievable biomass resources on member state level in Europe.

⁵ Alterra, IIASA: „Atlas of EU biomass potentials: Spatially detailed and quantified overview of EU biomass potential taking into account the main criteria determining biomass availability from different sources“, 2012.

	2010	2020 (Sustainability Scenario)	2030 (Sustainability Scenario)	Cost- efficiently available
	ktoe	ktoe	ktoe	
Agriculture				
Dedicated Perennial Cropping (woody)		21.742	9.043	yes
Dedicated Perennial Cropping (grassy)		29.879	27.774	yes
Manure	56.815	46.724	49.852	yes
Straw		49.287	47.495	yes
Woody residues of fruit trees etc.		10.106	8.836	yes
Forestry				
Round wood	56.735	56.115	56.115	no
Additionally harvestable round wood	41.046	34.973	35.595	no
Primary forestry residues	20.285	18.738	18.769	no
Landscape care wood	9.073	11.417	11.004	yes
Secondary forestry residues				
Saw Dust	4.496	4.984	5.597	yes
Other sawmill residues	9.072	10.093	11.316	yes
Tertiary forestry residues				no
Black Liquor	6.223	16.751	8.742	yes
Post consumer Waste	7.593	8.793	9.839	yes
Industrial wood residues	4.637	5.461	6.488	yes
Paper Cardboard	13.874	14.295	13.068	no
Waste				
Grassland cuttings on road verges	1.098	1.142	1.160	yes
Animal waste	2.775	2.881	2.904	yes
Municipal Solid Waste (MSW)	6.371	8.871	7.247	yes
MSW landfill	22.140	13.320	11.160	yes
Common sludges	7.768	8.078	8.214	yes
Fats and Oils	2.099	2.135	2.159	no

Source: Biomass Futures, 2012

The analysis shows that in a time perspective until 2030, the availability of biomass, sustainably produced in Europe, will decrease. As the EU already recommends to the member states to apply sustainability criteria similar to those for biofuels also to solid and gaseous biomass, the availability of biomass for energy can only be extended, if additional biomass resources can be utilized.

As several biomass resources, e.g. round wood, are likely to be too expensive to be used as a fuel for energy production in the long-term, alternative and more cost-efficient biomass types, for which significant amounts are and will be available, have to be taken in focus. These options should be investigated with priority for bioenergy utilizations (also in CHP) for the post-2020 period.

Approach for bio-CHP potential analysis

EU Potential for bio-energy CHP

The goal of this analysis is to estimate the uptake and thus the implementation potential, not the theoretical maximum potential, for bio-energy CHP in the 27 EU-member states (MS) until 2030.

To this end, the following main sources have been used to arrive at country specific potentials:

1. Data on "Heat demand from CHP and DH" from the EU energy trends to 2030⁶ (based on PRIMES database)⁷
2. Data of targets for "biomass for heating" from the National Renewable Energy Action Plans of the MS⁸
3. Current levels of biofuel inputs to CHP from EEA/Eurostat⁹
4. Biomass potentials from the "Atlas of EU biomass potentials" (Project Biomass Futures)¹⁰

The approach chosen to perform this bio-energy CHP potential analysis and the basic assumptions are as follows:

Scope and assumptions, analysis steps

The theoretical potential for bio-energy CHP is seen as the 100% fuel switch to bio-fuels in the CHP systems of a given country – in district heating (DH) as well as in industry. The aim of this study is to project on MS level the heat demand from bio-energy CHP systems – also in relation to the heat demand from all CHP systems – in 2030 with a milestone 2020.

Step 1: Heat demand from CHP and DH

The main data source for the development of CHP in the MS are the figures for *heat demand from CHP and DH* (Source: PRIMES) as published in the EU Energy Trends to 2030, Reference Scenario¹¹ (blue curve in country reports). In countries, for which specific energy trend data for CHP were available (e.g. Germany), these were chosen instead of the PRIMES data.

Step 2: Current and future bio-energy penetration rate

Coming from the current level of bio-energy CHP utilisation (EEA/Eurostat; 2010 value of green curve in country reports), the assumption is that the markets for bio-energy CHP will develop in close relation with the targets of the Renewable Energy Directive and the projections for renewable energy utilization as stipulated in the EU Energy Roadmap (30% in

⁶ European Commission, DG Energy: "EU energy trends to 2030"; 2009.

⁷ In some MS additional data or projections have been identified for "Heat demand from CHP and DH" or "bio-fuel input in CHP" and have been used instead of the sources mentioned here. Wherever this was done, the respective sources are mentioned in the respective country report.

⁸ Energy Research Centre of the Netherlands, European Environment Agency: "Renewable Energy Projections as Published in the National Renewable Energy Action Plans of the European Member States"; 2011.; no figures available for Romania

⁹ European Environmental Bureau, Eurostat: "Fuel input to CHP plants in EU-27 and EEA countries in 2009", <http://www.eea.europa.eu/data-and-maps/figures/fuel-input-to-chp-plants-4>

¹⁰ Alterra, IIASA: „Atlas of EU biomass potentials: Spatially detailed and quantified overview of EU biomass potential taking into account the main criteria determining biomass availability from different sources“, 2012.

¹¹ Reduced by the share of non-CHP heat according to IEA and EUROSTAT statistics.

2030). These figures are then further adapted on country level using specific national sources and in contact with national experts to arrive at a development path for the heat demand from bio-CHP for each MS (2030 value of green curve in country reports).

Step 3: Determination of growth curve

To determine the curve shape for the development of bio-CHP (green curve in country reports), two sets of data are used as reference (normally weighed 50:50): Firstly, the national target figures *Biomass for Heating* (2015 and 2020, own extrapolation for 2025 and 2030) as laid down in the member states' National Renewable Energy Action Plans (yellow curve in country reports). Secondly, the development of the *final heat demand from CHP & DH* as projected by PRIMES (blue curve in country reports). Using IEA figures¹², the non-CHP parts of DH in the PRIMES figures has been eliminated.

The intermediate result is a *projected heat demand from bio-energy CHP* under favourable framework conditions (green curve in country reports).

Step 4: Assessment of framework conditions through scorecard

In a further step, the bio-energy CHP penetration curve is modified by assessing the national frameworks for biomass fuelled cogeneration with a score card¹³. In this scorecard, the following aspects have been assessed and weighed:

- Legislative environment
- Suitability of heat market for switch to bio-energy CHP
- Share of Citizens served by DH
- National supply chain for biomass for energy
- Awareness for DH and CHP

Applying the scorecard results then results in the projection of the bio-energy heat demand from CHP and DH (in ktoe) for 2020 and 2030 (red curve in country reports).

Step 5: Assessing biomass availability

To cross-check, whether the projected demand can be satisfied with cost-efficient biomass available within the MS, the demand figures are compared with national biomass availability figures as published by the project "Biomass Futures" in the Atlas of EU biomass potentials (2012)¹⁴ (pink curve in country reports). Due to the ongoing discussion in the EU about sustainability criteria for bio-energy, the figures from the Atlas' sustainability scenario were chosen, which take into account not only existing legislation but assume stricter sustainability rules to be applied in the future also for solid and gaseous biomass. As the Biomass Futures project also investigated price-levels, the figures used here describe a rather conservative assumption of biomass availability per country. It is assumed, that the technology to use the different sorts of cost-efficient biomass resources (largest groups: straw, manure, perennial cropping, forestry residues, waste) for CHP purposes will be available.

¹² Website International Energy Agency, Statistics section:
<http://www.iea.org/stats/prodresult.asp?PRODUCT=Electricity/Heat>

¹³ Score ratings by member state CHP experts.

¹⁴ Assumptions for arriving at the available biomass for bioenergy CHP: 65% of available biomass used for heating; CHP factor 0.8.

Areas not covered

Although being important factors for the future development of bio-energy CHP markets, due to limited availability of data the following aspects have not been incorporated in the potential this analysis:

- Small-scale CHP
- Trigeneration
- Regional or local biomass availability
- Biomass imports

Bio-energy CHP potential in EU-27

25 member states¹⁵ have been assessed with the approach described and are summarised each in a 2 page country report. These reports will be subject to further discussions on MS level in the context of the CHP road maps which are presently under development.

For the European Union, an overall assessment was established by aggregating the individual country figures. As country specific frameworks and policies are important aspects, which were assessed through the scorecards, this section is not depicted in the EU summary.

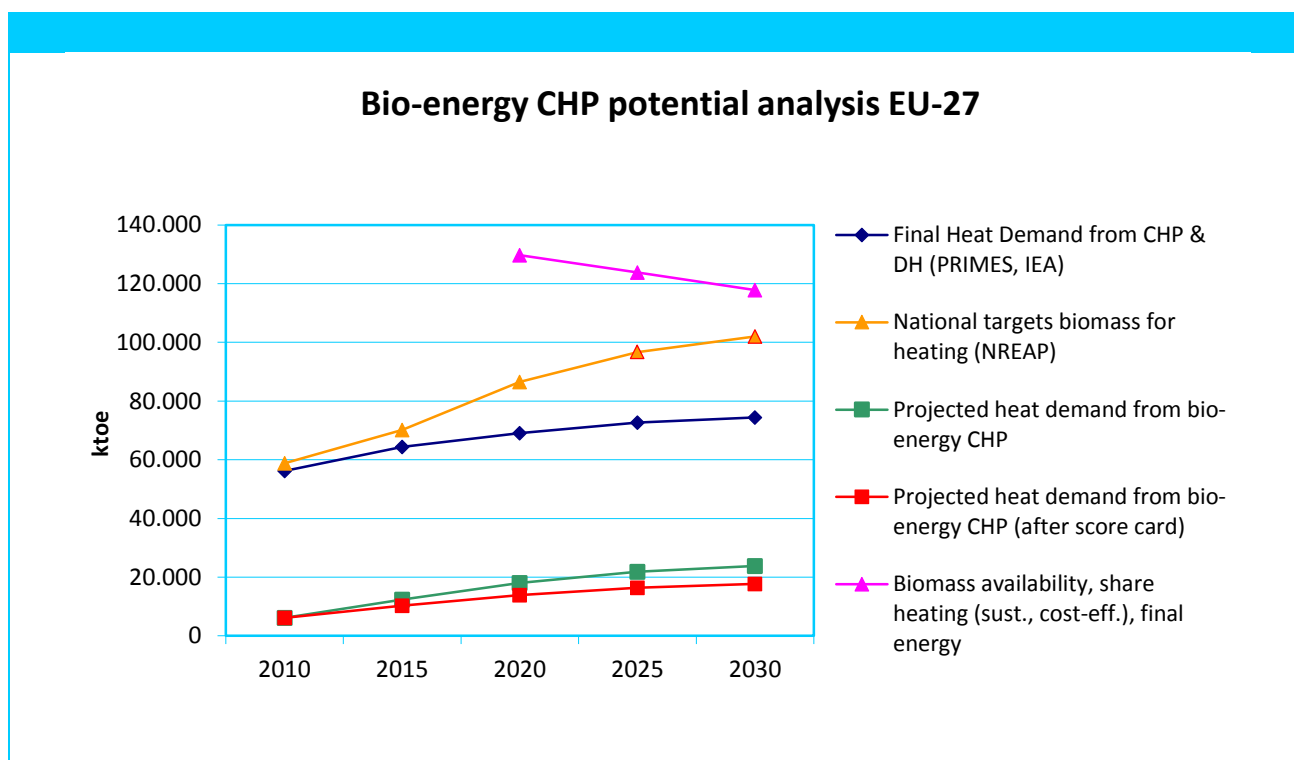
Analysing the overall picture from the member state level bio-energy CHP potential analyses, the following trends and conclusions can be made:

- There will be a steady increase in CHP heat demand in the EU until 2030
- The strong increase in biomass for heating as stipulated in the MS's NREAPs will also support the development of bio-energy CHP
- The expected penetration rate of bio-energy CHP in CHP markets is expected to reach 27,1% in 2030 (up from 19,5% in 2009)¹⁶
- The framework conditions – politically, economically, regarding awareness – for (bio-energy) CHP vary greatly throughout EU
- Under optimum framework conditions on national level, the penetration rate could reach 33% in 2030
- For the projected development, sufficient cost-efficient and sustainably produced biomass resources are available on a national level for further growth of bio-energy CHP. Again, the situation varies greatly between member states. In densely populated countries the nationally available biomass resources may fall short of the demand.
- To maximise the potential, technological progress towards the use of the whole range of biomass fuels should be promoted

¹⁵ France: still in discussion with experts; Malta: insufficient data, no (foreseeable) relevance for CHP

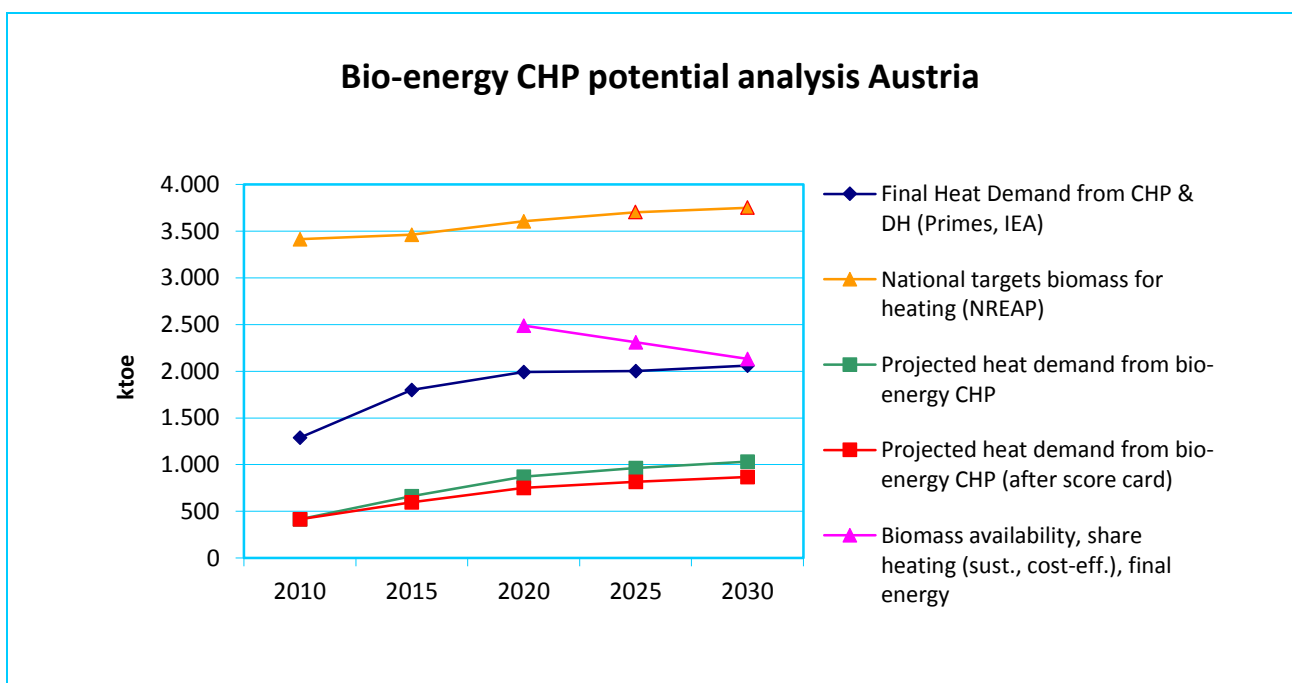
¹⁶ The three countries Germany (large CHP market by volume), Sweden and Finland (both good CHP markets with high biofuel share) account for 76% of the bio-CHP heat demand in EU-27 (2009).

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA, UBA), ktoe	56.233	69.056	74.465
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	6.185,6	13.913,2	17.676,9
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	11,0% (2009)	20,1%	23,7%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		129.756	117.868



EU-27 figures are aggregated from the 27 MS figures of the respective items.

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	1.291	1.993	2.062
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	416	750	867
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	32,2% (2009)	37,6%	42,0%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		2.488	2.132



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	+ 2 (of 3)	Limited support by eco-power law
Suitability of heat market for switch to bio-energy CHP	++ 3 (of 3)	High interest in bio-fuels by consumers in all market segments
Share of Citizens served by DH	o 1 (of 3)	21% of households supplied with DH
National supply chain for biomass for energy	+ 2 (of 3)	Large parts available only at high costs
Awareness for DH and CHP	++ 3 (of 3)	

Comments on country analysis

General comments

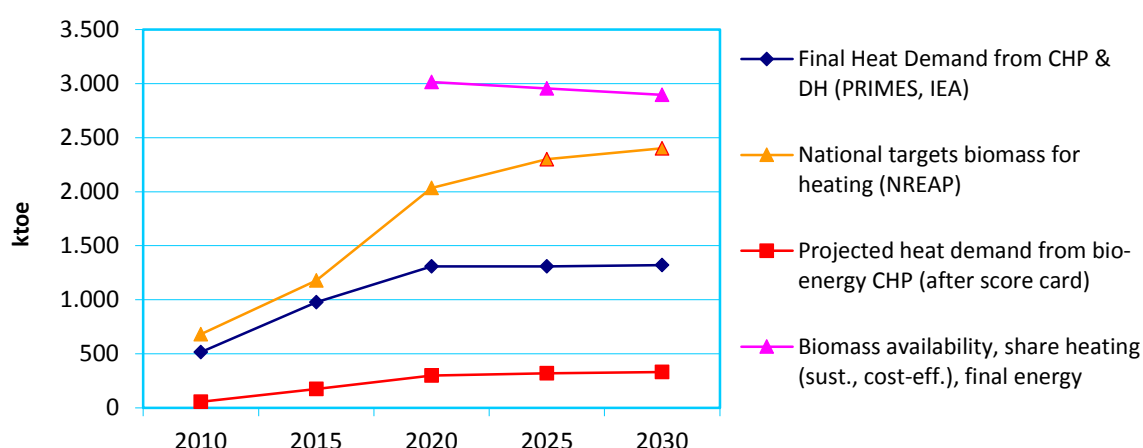
- The national framework assessment through the scorecard results in a good score (11 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 73%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 50%
(the country's RE target according to RED (28/2009) is at 34% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to rise from 32,2% (2009) to 42% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030
- For the fuelling of the expected bio-CHP, the shown biomass resources are sufficient, but for meeting the national targets for biomass for heating, biomass has to be either imported or taken from sources not meeting strong sustainability criteria.

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees a strong growth between 2010 and 2015
- National targets for biomass for heating (yellow curve) see strongest growth after 2015
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	515	1.308	1.321
(Projected) heat demand from bio-energy CHP and DH, ktoe ¹⁷	57	299	330
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	11,0% (2009)	22,9%	25,0%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		3.015	2.895

Bio-energy CHP potential analysis Belgium



Framework Assessment	Score	Short analysis
Legislative environment	+ 2 (of 3)	Wallonia: support through certificates with extra support for bio-CHP; Flanders: both CHP and green certificates for bio-CHP Many bio-CHP installations are not qualified as 'qualitative' and therefore receive no certificates.

¹⁷ Based on assessment of the following sources:

- *Prognoses voor hernieuwbare energie en warmtekrachtkoppeling tot 2020*, VITO, 2009 (Flanders)
- *Doorrekening ter ondersteuning van evaluatie GSC en WKC-systeem*, VITO, 2011 (Flanders)
- Cogeneration region Wallonne (directive 2004/8/EC), Direction générale Energie, 2011 (Wallonia)
- CHP Supplementary Reporting for European Union Countries Under the EU DIRECTIVE 2004/8/EC, 2011 (Brussels).

Suitability of heat market for switch to bio-energy CHP	+ 2 (of 3)	Large heat demand in the industry, however not always suitable for biomass CHP.
Share of Citizens served by DH	- 0 (of 3)	Almost no district heating
National supply chain for biomass for energy	o 1 (of 3)	Flanders: large competition for use of biomass, according to the waste chain materials should first be reused, recycled, composted and only the remains can be used for burning. Also large competition with paper industry.
Awareness for DH and CHP	++ 3 (of 3)	Bio-CHP fits well within the general idea of changing towards an energy policy with 100% renewables, therefore there is a more positive awareness for bio-CHP than for fossil fired CHP.

Comments on country analysis

General comments

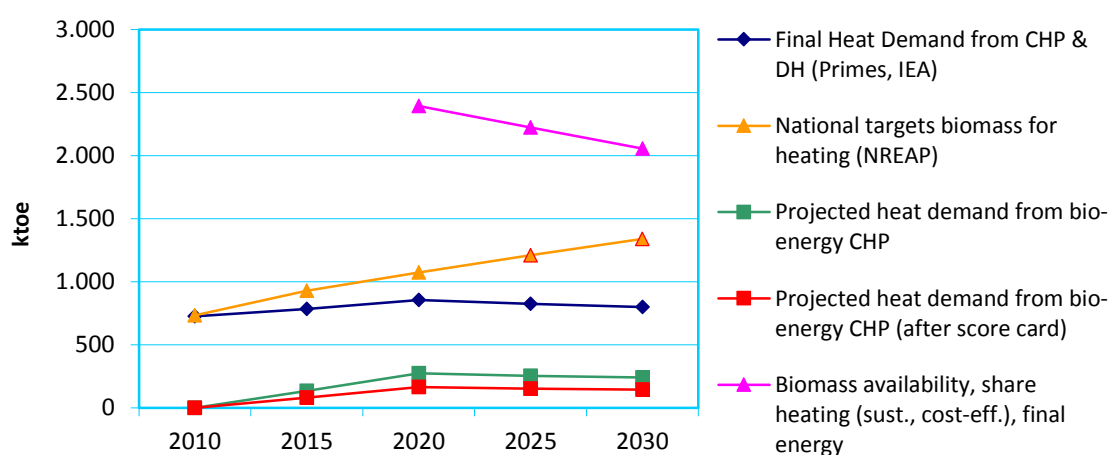
- In the Belgian report, the framework assessment was not used as score card, since national experts came to the conclusion, that the scorecard criteria (e.g. DH penetration) lead for Belgium to a score more negative than the actual situation,
- The national framework assessment thus serves as information background, however without influencing the development of the bio-energy CHP heat demand (red curve)
- Instead, additional national sources have been used for the bio-energy CHP heat demand projection (red curve), as mentioned in the footnote underneath the country report.
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to rise from 11% (2009) to 25% (2030)
(the country's RE target according to RED (28/2009) is at 13% in 2020)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees a strong growth between 2010 and 2020
- National targets for biomass for heating (yellow curve) see strongest growth after 2015
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	725	854	800
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	0	164	144
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	0,0% (2009)	19,2%	18,0%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		2.393	2.055

Bio-energy CHP potential analysis Bulgaria



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	+ 2 (of 3)	The Bulgarian legislation is favorable towards DH.
Suitability of heat market for switch to bio-energy CHP	+ 2 (of 3)	
Share of Citizens served by DH	+ 2 (of 3)	An important presence of heat demanding industries.
National supply chain for biomass for energy	o 1 (of 3)	16% of citizens are served by DH. (Bulgarian DH Association)
Awareness for DH and CHP	+ 2 (of 3)	New area with good potential

Comments on country analysis

General comments

- The national framework assessment through the scorecard results in a good score (9 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 60%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 30%
(the country's RE target according to RED (28/2009) is at 16% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to rise from 0% (2009) to 18% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

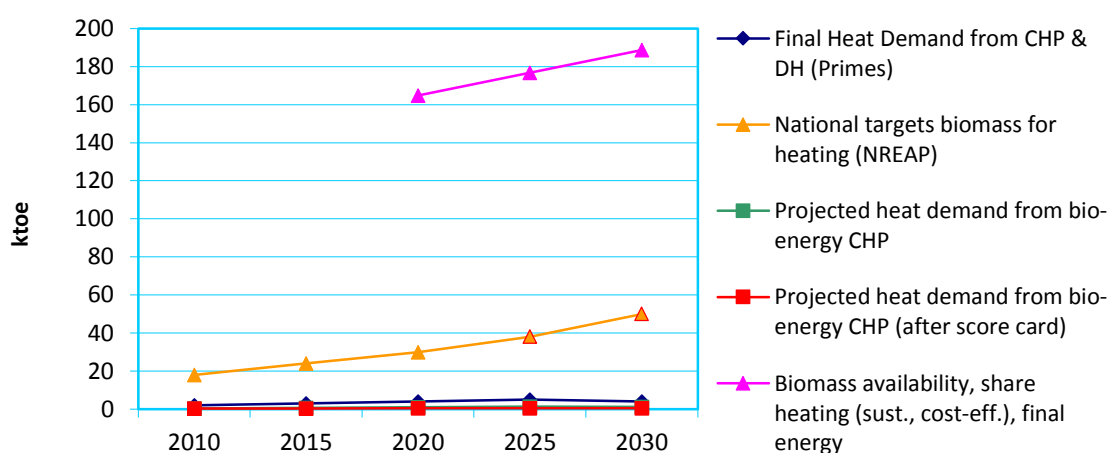
- The projected development of CHP heat demand (PRIMES, blue curve) foresees a slight growth until 2020, after that a slight decline
- National targets for biomass for heating (yellow curve) see a stronger and more constant growth
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

To be re-confirmed

- No bio-CHP in BG at all today?
- If so, is 18% by 2030 realistic?

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES), ktoe	2,0	4,0	4,0
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	0,0	0,2	0,2
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat, own assessments)	0,0% (2009)	4,1%	6,0%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		165	189

Bio-energy CHP potential analysis Cyprus



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	- 0 (of 3)	The use of district heating in Cyprus is not promoted, because of the inexistence of a heat distribution system.
Suitability of heat market for switch to bio-energy CHP	- 0 (of 3)	
Share of Citizens served by DH	- 0 (of 3)	Limited industry presence.
National supply chain for biomass for energy	o 1 (of 3)	There are no DH systems in Cyprus.
Awareness for DH and CHP	+ 2 (of 3)	New area with good potential

Comments on country analysis

General comments

- The national framework assessment through the scorecard results in a low score (3 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 20%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 30%
(the country's RE target according to RED (28/2009) is at 13% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to increase from 15% (2009) to 18% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

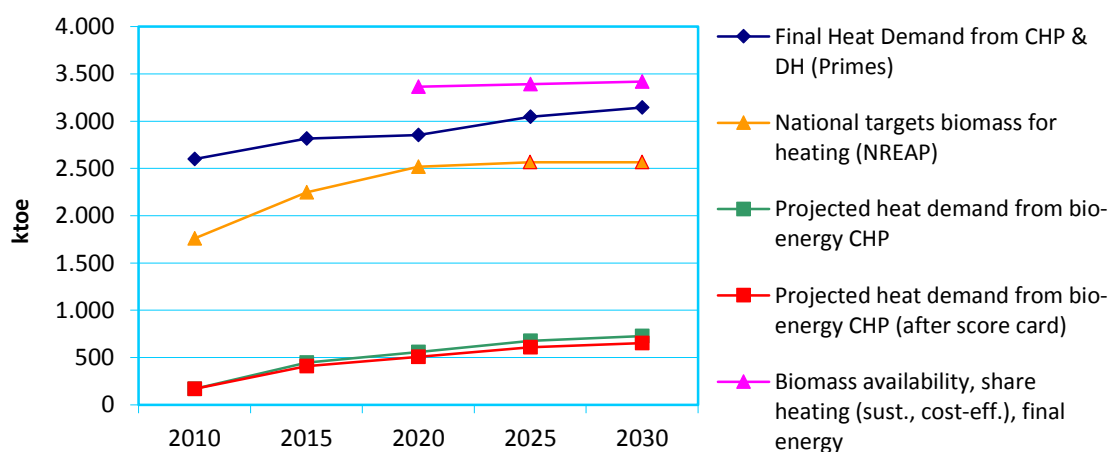
- The projected development of CHP heat demand (PRIMES, blue curve) foresees almost no growth on a very low level
- National targets for biomass for heating (yellow curve) see a strong and constant growth
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

To be re-confirmed

- 15% bio-CHP in CY at all today?
- 18% by 2030 realistic?

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	2.600	2.853	3.145
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	168	507	652
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	6,4% (2009)	17,8%	20,7%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		3.362	3.416

Bio-energy CHP potential analysis Czech Republic



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	++ 3 (of 3)	Support scheme for CHP and heat from RES: 2 schemes of operational support: feed-in prices and green bonuses
Suitability of heat market for switch to bio-energy CHP	+ 2 (of 3)	Support for eco-energy in industry (efficient energy generation)
Share of Citizens served by DH	+ 2 (of 3)	The share of citizens served by DH is about 38%
National supply chain for biomass for energy	++ 3 (of 3)	Available biomass potential Wooded country with 63% of land covered by forest

Awareness for DH and CHP	++ 3 (of 3)	<ul style="list-style-type: none"> • Biomass association, • NGO for sustainable development • Public campaign, workshops and conferences
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Comments on country analysis

General comments

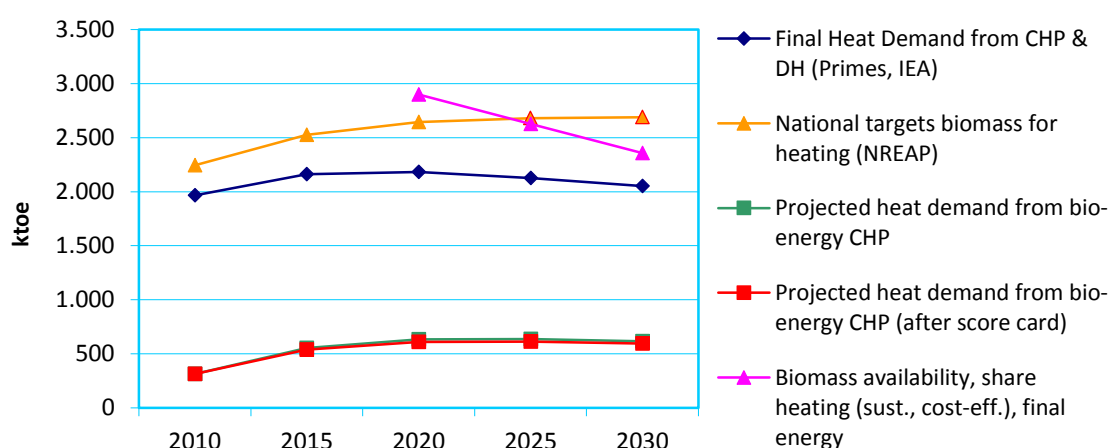
- The national framework assessment through the scorecard results in a good score (13 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 87%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 23,1% (the country's RE target according to RED (28/2009) is at 13% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to increase from 15% (2009) to 18% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees growth especially between 2010 and 2015 and again between 2020 and 2025
- National targets for biomass for heating (yellow curve) see a strong growth especially until 2020
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	1.965	2.182	2.051
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	314	611	595
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	16,0% (2009)	28,0%	29,0%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		2.899	2.356

Bio-energy CHP potential analysis Denmark



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	++ 3 (of 3)	Large political support, high priority in the national energy plan
Suitability of heat market for switch to bio-energy CHP	++ 3 (of 3)	High interest of consumers for bio-fuels in all market segments
Share of Citizens served by DH	++ 3 (of 3)	44% share in the room heating market
National supply chain for biomass for energy	+ 2 (of 3)	
Awareness for DH and CHP	++ 3 (of 3)	

Comments on country analysis

General comments

- The national framework assessment through the scorecard results in a very good score (14 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 93%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 30% (the country's RE target according to RED (28/2009) is at 30% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to increase from 16% (2009) to 29% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030
- For the fuelling of the expected bio-CHP, the shown biomass resources are sufficient, but for meeting the national targets for biomass for heating, biomass has to be either imported or taken from sources not meeting strong sustainability criteria.

Specific issues

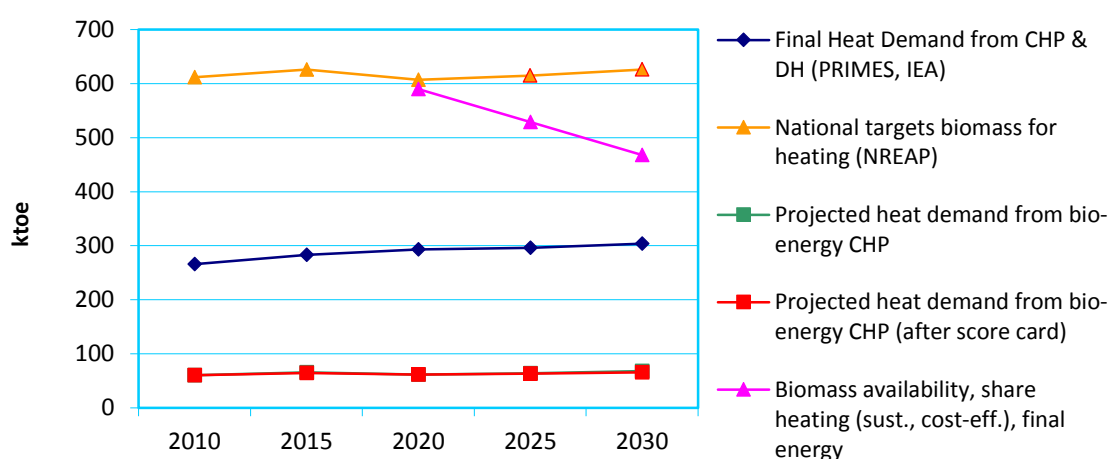
- The projected development of CHP heat demand (PRIMES, blue curve) foresees some growth until 2020, then a slow decline
- National targets for biomass for heating (yellow curve) also see some growth until 2020
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve, however with a (weighting 10:90); this specific weighting has been applied to express the slow but ongoing growth of bi-CHP as foreseen by experts, even in a decreasing CHP market after 2020

To be re-confirmed

- Specific growth rate (weighting 10:90)

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	266	293	304
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	60	61	66
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	22,7% (2009)	20,9%	21,6%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		590	468

Bio-energy CHP potential analysis Estonia



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	++ 3 (of 3)	<ul style="list-style-type: none"> No barriers to administration procedure No barriers for access to DH grid Support for biomass CHP power
Suitability of heat market for switch to bio-energy CHP	o 1 (of 3)	<ul style="list-style-type: none"> A small industry sector Decrease of heat consumption High price of imported primary energy
Share of Citizens served by DH	++ 3 (of 3)	<ul style="list-style-type: none"> 53% citizen served by DH

National supply chain for biomass for energy	○ 1 (of 3)	<ul style="list-style-type: none"> • A small available potential of biomass in country • Import of biomass in the future
Awareness for DH and CHP	++ 3 (of 3)	<ul style="list-style-type: none"> • Large utilization of biomass in residential sectors, • Intensive information activities about bioenergy • Biomass association

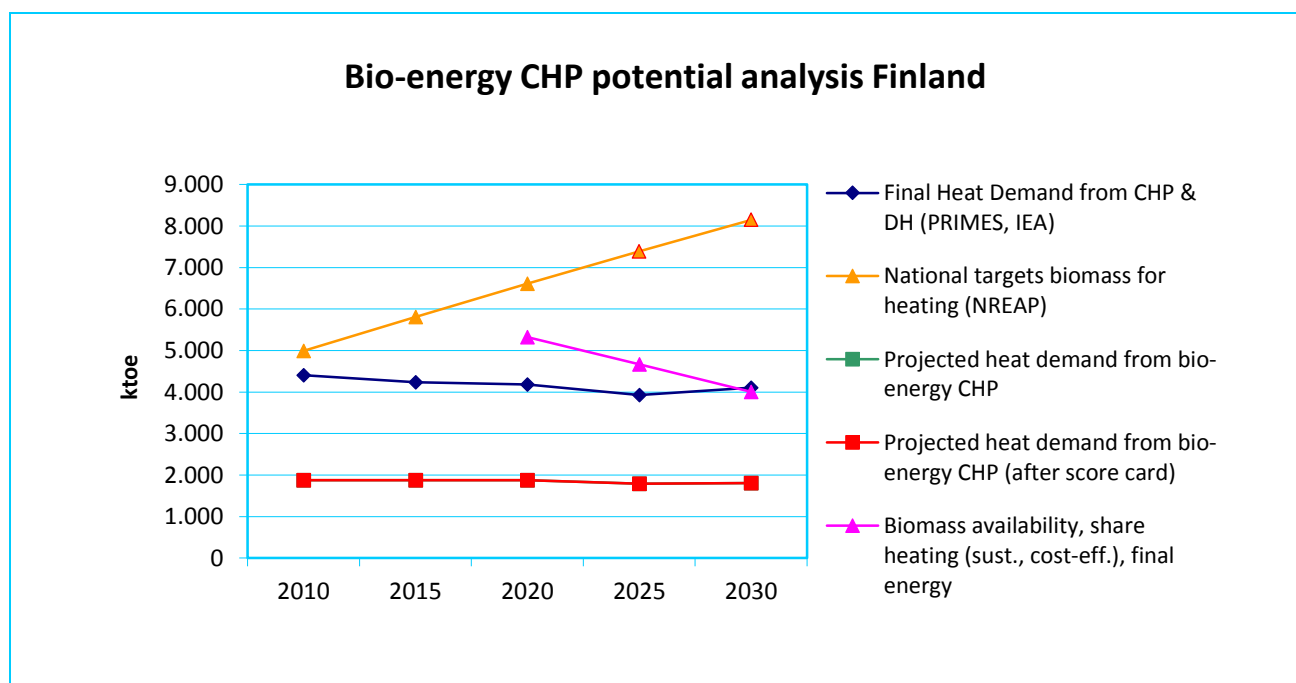
General comments

- The national framework assessment through the scorecard results in a good score (11 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 73%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 22,3% (the country's RE target according to RED (28/2009) is at 25% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to slightly fall from 22,7% (2009) to 21,6% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030
- For the fuelling of the expected bio-CHP, the shown biomass resources are sufficient, but for meeting the national targets for biomass for heating, biomass has to be either imported or taken from sources not meeting strong sustainability criteria.

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees only very little growth in a small market
- National targets for biomass for heating (yellow curve) also remain at a more or less constant level
- Consequently, almost no growth for bio-CHP can be projected for Estonia. The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)
- Since the projected growth of bio-CHP is very low, the green and red curve are very close, as the score card determines the extent of the market growth

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	4.402	4.184	4.105
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	1.876	1.876	1.806
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	42,6% (2009)	44,8%	44,0%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		5.321	4.008



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	++ 3 (of 3)	High political support
Suitability of heat market for switch to bio-energy CHP	++ 3 (of 3)	High interest of consumers on bio fuels in all market segments
Share of Citizens served by DH	++ 3 (of 3)	46% share in the room heating market
National supply chain for biomass for energy	++ 3 (of 3)	80% of the country are covered by forests
Awareness for DH and CHP	++ 3 (of 3)	High political support

Comments on country analysis

General comments

- The national framework assessment through the scorecard results in an excellent score (15 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 100%, resulting in the red curve being identical with the green curve
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to slightly rise from 42,6% (2009) to 44% (2030)¹⁸ (the country's RE target according to RED (28/2009) is at 38% in 2020)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030
- For the fuelling of the expected bio-CHP, the shown biomass resources are sufficient, but for meeting the national targets for biomass for heating, biomass has to be either imported or taken from sources not meeting strong sustainability criteria.

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees a slight decline on a high level between 2010 and 2030
- National targets for biomass for heating (yellow curve) see a strong and constant growth
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)
- As there is no absolute growth for bio-CHP is expected in this mature market, the application of the growth curve in the case of Finland has only minimal effect.

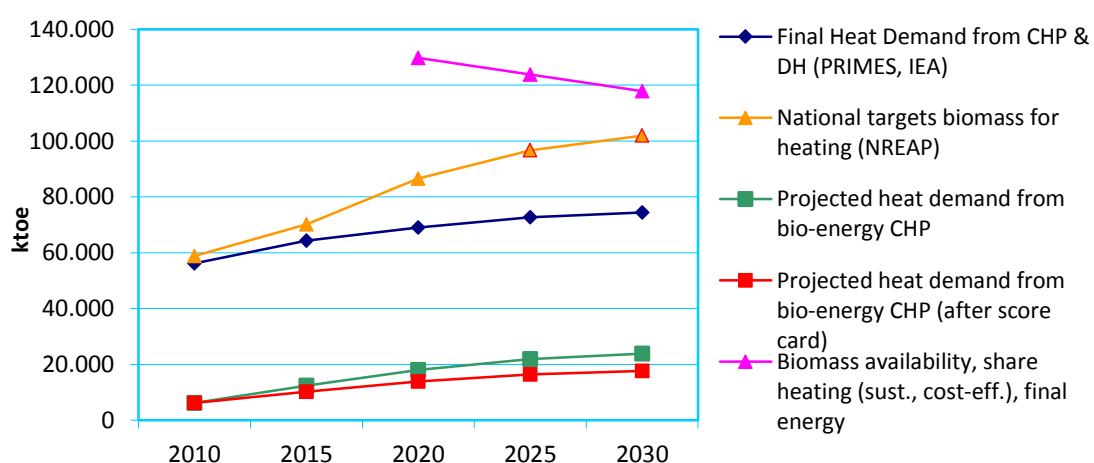
To be re-confirmed

- A significant share of Finnish bio-CHP is fuelled with peat. Is Finnish peat production sustainable according to the Renewable Energy Directive (2009/28/EC)? (Protection of areas of high carbon stock); Art. 17.5 [...] "Peatland can only be used when it is proven that cultivation and harvesting of biomass does not involve drainage of previously undrained soils."

¹⁸ Ministry of Employment and the Economy: "REPORT UNDER DIRECTIVE 2004/8/EC" (2009), p. 42, Figure 31.

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	1.606,8	3.789,8	4.063,5
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	411,8	667,7	745,0
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	25,6% (2009)	17,6%	18,3%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		22.211	21.695

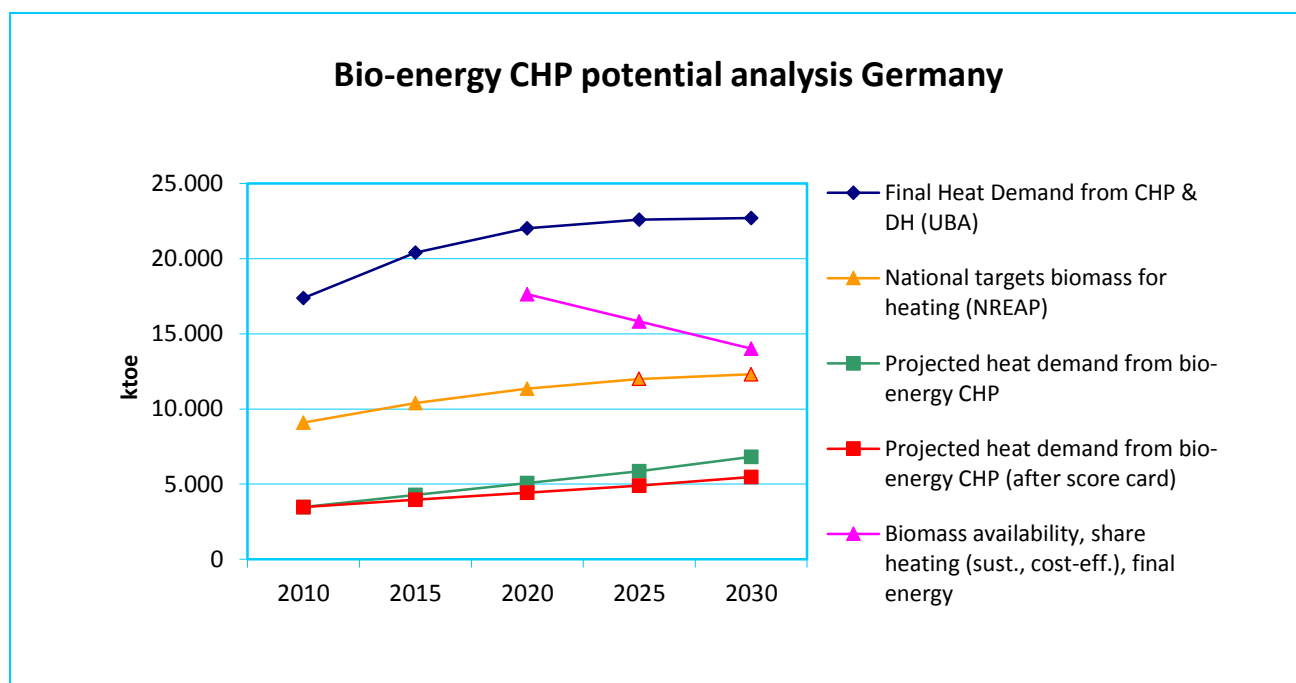
Bio-energy CHP potential analysis EU-27



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	+ 2 (of 3)	Analysis of the national potential for the application of high efficiency cogeneration; in accordance with Article 6 of Directive 2004/8/EC of the European Union
Suitability of heat market for switch to bio-energy CHP	+ 2 (of 3)	
Share of Citizens served by DH	+ 2 (of 3)	"Analysis of the national potential for the application of high efficiency cogeneration"; In accordance with

		Article 6 of Directive 2004/8/EC of the European Union – p15
National supply chain for biomass for energy	+ 2 (of 3)	France NREAP 2014, “Analysis of the national potential for the application of high efficiency cogeneration”; In accordance with Article 6 of Directive 2004/8/EC of the European Union
Awareness for DH and CHP	o 1 (of 3)	

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (UBA) ¹⁹ , ktoe	17.369	22.012	22.700
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	3.474	4.433	5.476
Bio-energy penetration rate in CHP markets (UBA, DLR) ²⁰	20,0% (2011)	20,1%	24,1%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		17.643	14.014



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	○ 1 (of 3)	After long time favourable conditions with a strong increase of bio CHP since 2004, the conditions have substantially worsened with the new RES law 2012 with the effect of a sharp decrease in investments.
Suitability of heat market for switch to bio-energy CHP	++ 3 (of 3)	High interest on bio fuels in all market segments
Share of Citizens served by DH	○ 1 (of 3)	14% of End Energy Heat consumption

¹⁹ Figures provided by the Federal Environmental Office (Umweltbundesamt, UBA) for the CODE2 project are being used instead of the PRIMES figures.

²⁰ DLR et al.: "Langfristszenarien und Strategien für den Ausbau der erneuerbaren Energien in Deutschland bei Berücksichtigung der Entwicklung in Europa und global", 2011.

National supply chain for biomass for energy	○ 1 (of 3)	High population density.
Awareness for DH and CHP	++ 3 (of 3)	

Comments on country analysis

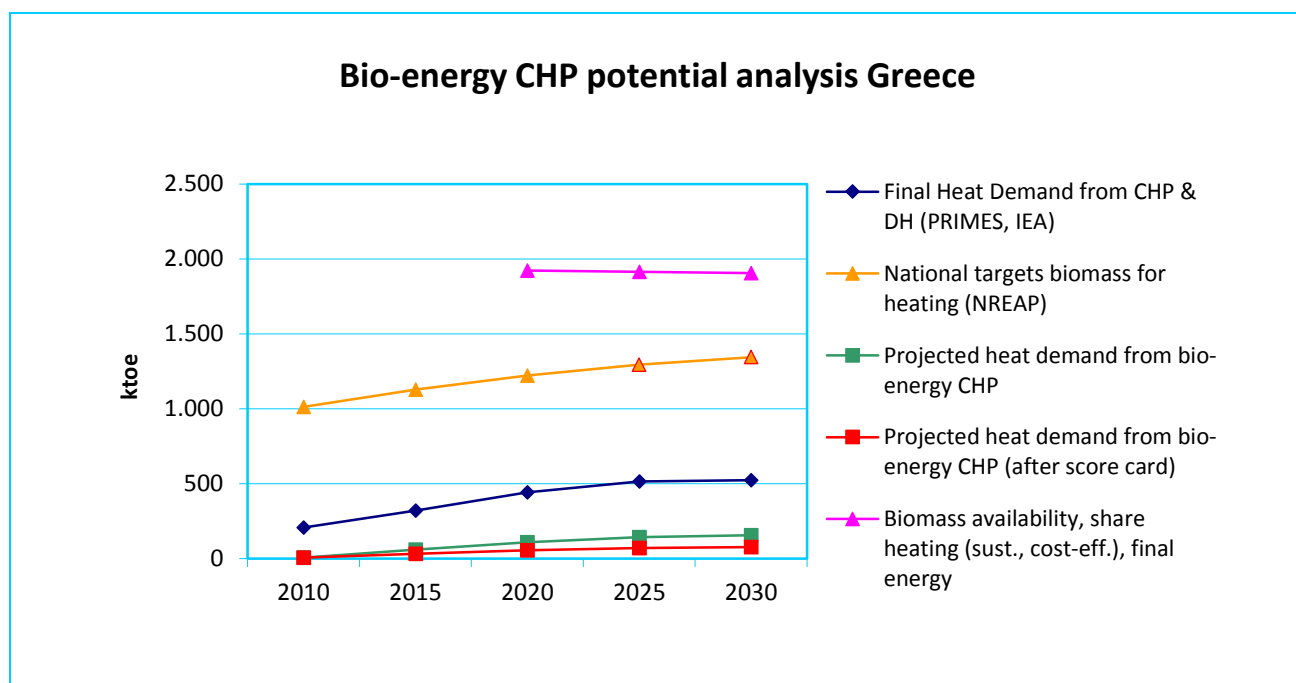
General comments

- The national framework assessment through the scorecard results in an average score (9 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 60%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 30%
(the country's RE target according to RED (28/2009) is at 18% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to increase from 20% (2009) to 24,1% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees growth especially between 2010 and 2020 in a strong market
- National targets for biomass for heating (yellow curve) see a slightly slower growth
- The growth projection for the bio-energy CHP heat demand (green curve) is derived from specific national data sources (UBA, see footnote 1 page back), resulting in a bio-CHP market with slowly increasing dynamics in a mature CHP market

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	207	442	524
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	7	55	77
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	3,4% (2009)	12,5%	14,7%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		1.922	1.906



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	+ 2 (of 3)	New Development Law with incentives on Energy Efficiency, including DH – There are private DH network in operation in GR, with good results
Suitability of heat market for switch to bio-energy CHP	- 0 (of 3)	Not yet an industrial attempt for bio-energy in industry
Share of Citizens served by DH	o 1 (of 3)	There is one DH system in GR with a partial biomass boiler, but the operating results are not known yet
National supply chain for biomass for energy	+ 2 (of 3)	New area with good potential

Awareness for DH and CHP	+ 2 (of 3)	There is an awareness for HECHP and DH, as well as for bio-energy
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Comments on country analysis

General comments

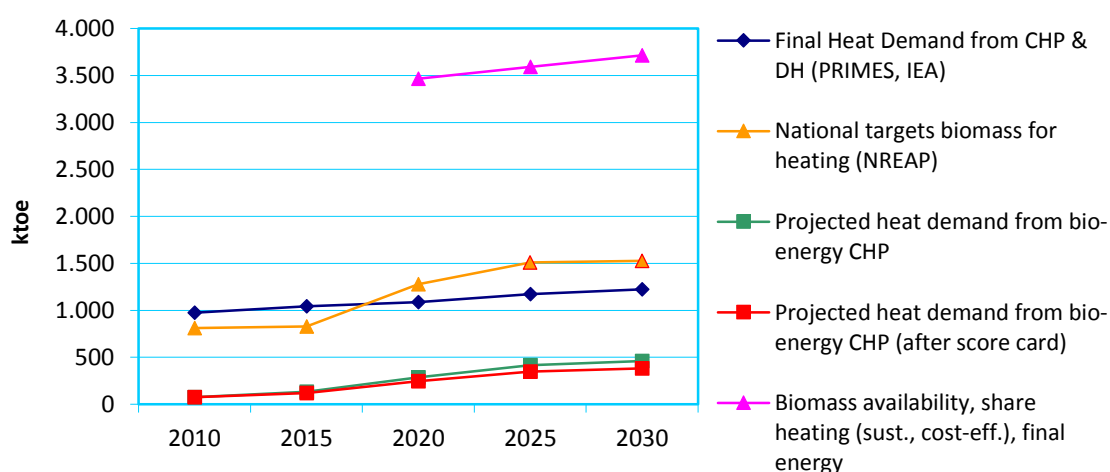
- The national framework assessment through the scorecard results in an average score (7 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 47%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 30%
(the country's RE target according to RED (28/2009) is at 18% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to rise from 3,4% (2009) to 14,7% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees constant growth especially between 2010 and 2020
- National targets for biomass for heating (yellow curve) also see a constant growth
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	974	1.087	1.223
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	74	244	383
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	7,6% (2009)	22,5%	31,3%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		3.466	3.715

Bio-energy CHP potential analysis Hungary



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	++ 3 (of 3)	<ul style="list-style-type: none"> Simple procedures for CHP (> 0.5 and < 50 MW) Single license for small power plant and an operating license for DH producer in a single procedure and a single license Support for electricity and heat from CHP & DH from biomass
Suitability of heat market for switch to bio-energy CHP	+ 2 (of 3)	<ul style="list-style-type: none"> 53% share of CHP in total heat production (2010) 10% share of industry Heat consumption mostly in households

Share of Citizens served by DH	○ 1 (of 3)	15% citizen served by district heating
National supply chain for biomass for energy	++ 3 (of 3)	Measures for utilization of biomass from different sources
Awareness for DH and CHP	++ 3 (of 3)	Several organizations supporting the CHP sector, including the Hungarian Energy Association or the Professional Alliance of Hungarian District Heat Providers, and also the Hungarian Biogas Association

Comments on country analysis

General comments

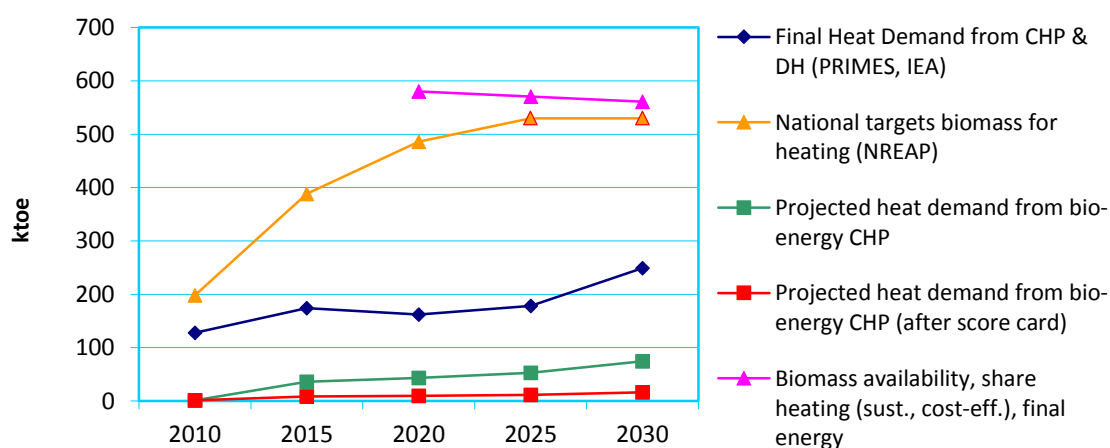
- The national framework assessment through the scorecard results in a good score (12 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 80%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 30% (the country's RE target according to RED (28/2009) is at 13% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to grow from 7,6% (2009) to 31,3% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees a constant growth between 2010 and 2030
- National targets for biomass for heating (yellow curve) see a strong growth especially until after 2015
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	128	162	249
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	1	10	16
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	1,1% (2009)	6,0%	6,4%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		580	561

Bio-energy CHP potential analysis Ireland



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	○ 1 (of 3)	Renewable energy feed-in-tariff (REFIT) scheme, but unfavourable conditions; no new bio-CHP systems through new legislation so far
Suitability of heat market for switch to bio-energy CHP	+ 2 (of 3)	Dairy processors with > 9 months continual load, pharmaceutical sector.
Share of Citizens served by DH	- 0 (of 3)	Minimal

National supply chain for biomass for energy	- 0 (of 3)	Co firing plants and panel board manufacturers will consume 100% of limited indigenous supply.
Awareness for DH and CHP	- 0 (of 3)	Very slight awareness

Comments on country analysis

General comments

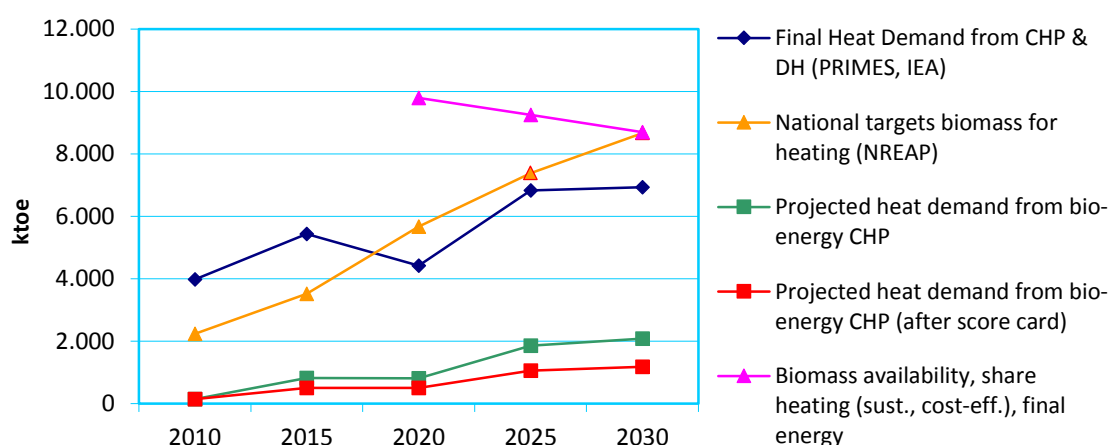
- The national framework assessment through the scorecard results in a low score (3 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 20%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 30%
(the country's RE target according to RED (28/2009) is at 16% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to increase from 1,1% (2009) to 6,4% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees growth especially between 2010 and 2015 and again after 2020
- National targets for biomass for heating (yellow curve) see a very strong growth especially between 2010 and 2015
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	3.984	4.424	6.930
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	150	501	1.179
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	3,8% (2009)	11,3%	17,0%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		9.796	8.693

Bio-energy CHP potential analysis Italy



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	+ 2 (of 3)	Legislation is active and decrees issued; sometimes ambiguous as approving body
Suitability of heat market for switch to bio-energy CHP	+ 2 (of 3)	Heat market increased in last years; Unknown from prices and crisis
Share of Citizens served by DH	o 1 (of 3)	Penetration poor respect to potential
National supply chain for biomass for energy	o 1 (of 3)	Availability is expected to decrease

Awareness for DH and CHP	+ 2 (of 3)	Awareness good among administrative bodies, industries, associations and citizens
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Comments on country analysis

General comments

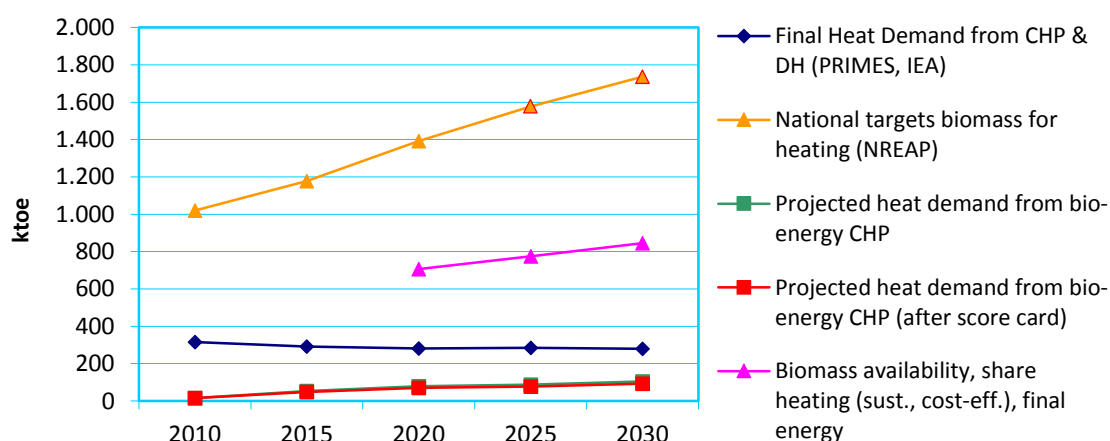
- The national framework assessment through the scorecard results in an average score (8 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 53%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 30%
(the country's RE target according to RED (28/2009) is at 17% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to increase from 3,8% (2009) to 17% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees growth especially between 2010 and 2015 and again after 2020
- National targets for biomass for heating (yellow curve) see constant growth
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	315	282	279
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	15	71	92
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	4,8% (2009)	25,3%	33,1%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		706	845

Bio-energy CHP potential analysis Latvia



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	+ 2 (of 3)	Lack of optimized and simplified procedures for issuing permits, certificates, licenses; High investment cost for local communities (owner of DH)
Suitability of heat market for switch to bio-energy CHP	+ 2 (of 3)	Decrease of DH in last decade Small share of industry in final energy consumption
Share of Citizens served by DH	++ 3 (of 3)	64% citizen served by DH 59% share of heat from CHP in total heat produced in DH

National supply chain for biomass for energy	++ 3 (of 3)	High solid biomass potential Low price of wood in comparison to natural gas
Awareness for DH and CHP	++ 3 (of 3)	High % of DH and CHP Bioenergy promotion Latvian biomass association

Comments on country analysis

General comments

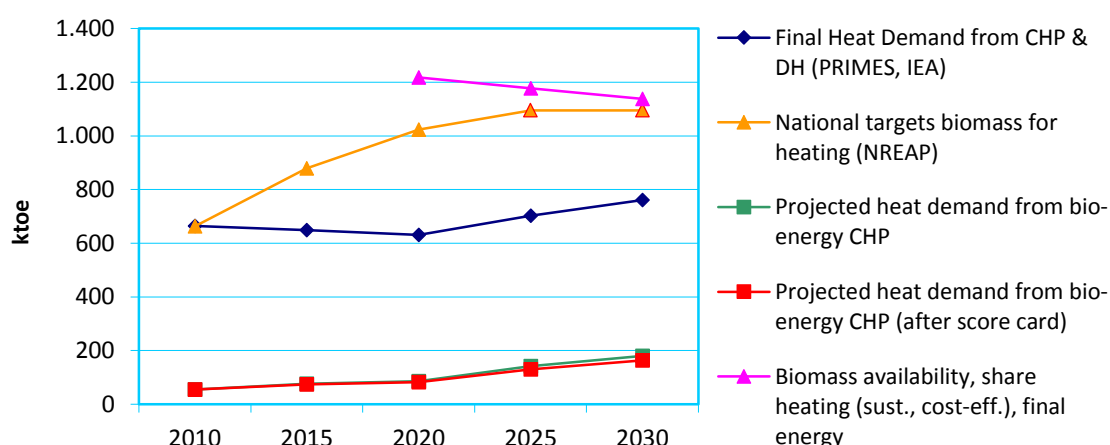
- The national framework assessment through the scorecard results in a good score (13 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 87%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 37,3%
(the country's RE target according to RED (28/2009) is at 42% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to grow from 4,8% (2009) to 33,1% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030
- For the fuelling of the expected bio-CHP, the shown biomass resources are sufficient, but for meeting the national targets for biomass for heating, biomass has to be either imported or taken from sources not meeting strong sustainability criteria.

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees almost constant figures until 2030
- National targets for biomass for heating (yellow curve) see a strong and constant growth in the coming years
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	664	632	761
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	55	82	164
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	8,2% (2009)	13,0%	21,5%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		1.217	1.137

Bio-energy CHP potential analysis Lithuania



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	++ 3 (of 3)	Support is granted to CHP supplying heat to DH grids High share of district heat Priority to sale heat from CHP and RES to DH companies
Suitability of heat market for switch to bio-energy CHP	+ 2 (of 3)	Expected increase of the share of heat and electricity from RES in the future
Share of Citizens served by DH	++ 3 (of 3)	63% citizen served by DH 39% share of heat from CHP in total heat produced in DH
National supply chain for biomass for energy	+ 2 (of 3)	The availability of biomass in the future (imported biomass).

Awareness for DH and CHP	++ 3 (of 3)	High increase of the share of CHP and DH from 2004
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Comments on country analysis

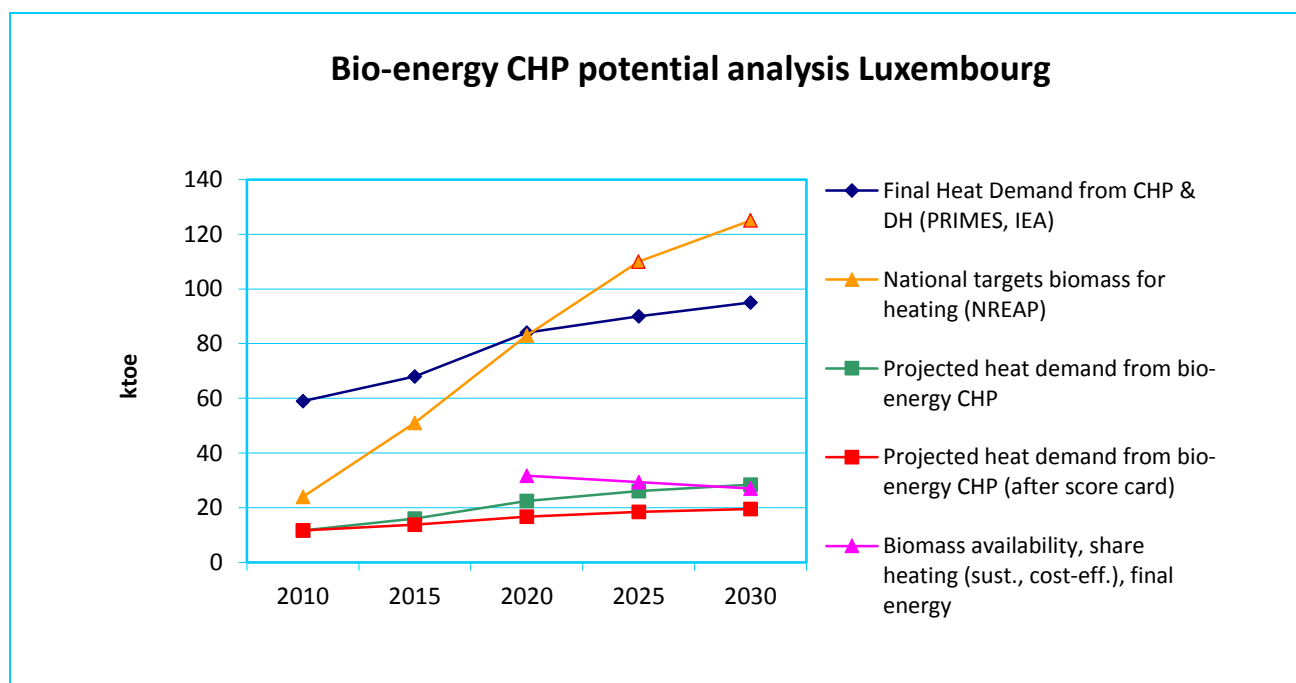
General comments

- The national framework assessment through the scorecard results in a good score (13 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 87%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 23,7% (the country's RE target according to RED (28/2009) is at 23% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to grow from 8,2% (2009) to 21,5% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees almost constant figures until 2020, followed by significant growth
- National targets for biomass for heating (yellow curve) see a strong growth in the years to 2020, which is expected to be slightly less strong after 2020
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	59	84	95
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	12	17	20
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	20,0% (2009)	20,0%	20,6%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		32	27



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	+ 2 (of 3)	Good (future) DH grid access in Luxembourg (ville); Good support for DH and CHP
Suitability of heat market for switch to bio-energy CHP	+ 2 (of 3)	Good (future) DH grid access in Luxembourg (ville); No large industries
Share of Citizens served by DH	o 1 (of 3)	Good (future) DH infrastructure in the capital (7 DH grids with CHP)
National supply chain for biomass for energy	o 1 (of 3)	Big biomass potential but still too expensive in comparison with fossil fuel

Awareness for DH and CHP	<ul style="list-style-type: none"> 1 (of 3) 	Good awareness around DH; no independent sources of information on cogeneration
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Comments on country analysis

General comments

- The national framework assessment through the scorecard results in a medium score (7 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 47%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 30% (the country's RE target according to RED (28/2009) is at 11% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to slightly increase from 20% (2009) to 20,6% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is just sufficient to enable the projected growth; in Luxembourg, however, biomass availability is an issue which could in long-term hamper the further development of bio-CHP; even more so, since the depicted biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

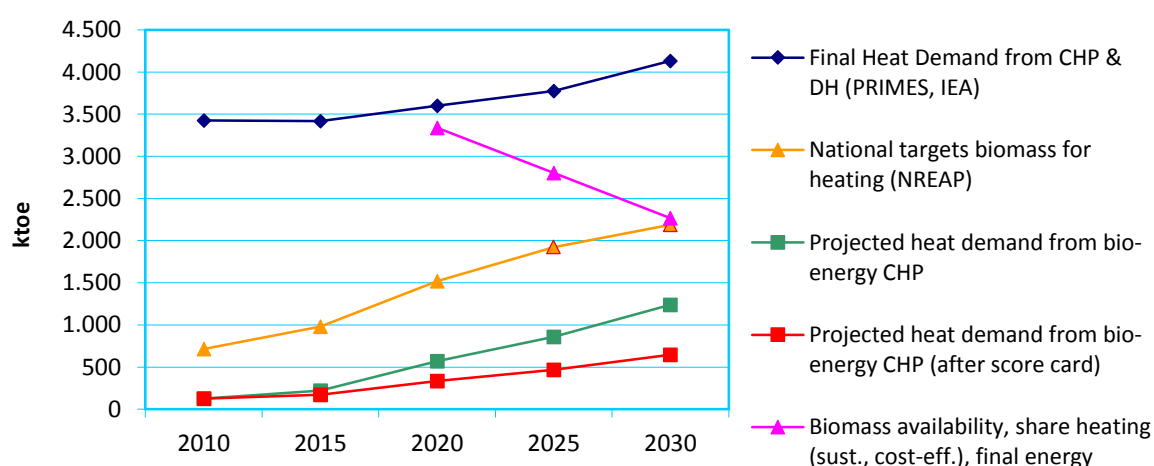
- The projected development of CHP heat demand (PRIMES, blue curve) foresees a stable growth until 2030
- National targets for biomass for heating (yellow curve) see a strong growth in the years to 2020, which is expected to be slightly less strong after 2020
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

To be confirmed / checked

- A further growth of bio-CHP (or other applications of biomass for heating) is realistic not within the borders of the country, but only through biomass imports
- This is especially obvious when considering the national targets for biomass for heating (yellow curve) from the NREAP
- As this assessment does not include biomass imports, but only resources available on the national level, the growth of bio-CHP will be limited by the scarcity of biomass in the country

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	3.424	3.602	4.134
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	126	334	646
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	3,7% (2009)	9,3%	15,6%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		3.339	2.268

Bio-energy CHP potential analysis Netherlands



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	+ 2 (of 3)	Both CHP types have good grid access, but only bio CHP gets financial support
Suitability of heat market for switch to bio-energy CHP	+ 2 (of 3)	Industry has good CHP penetration but bio supply too little reliable. Bio CHP has biggest penetration in agricultural applications.
Share of Citizens served by DH	- 0 (of 3)	Based on the total installed DH capacity the DH penetration is estimated to be 9%
National supply chain for biomass for energy	o 1 (of 3)	Little domestic biomass supply possible vs. big energy demand. We

		lobby for a CHP obligation to be applied to all bio fuels burned.
Awareness for DH and CHP	+ 2 (of 3)	

Comments on country analysis

General comments

- The national framework assessment through the scorecard results in a medium score (7 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 47%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 30%
(the country's RE target according to RED (28/2009) is at 14% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to increase from 3,7% (2009) to 15,6% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is still sufficient to enable the projected growth; in the Netherlands, however, biomass availability is an issue which could in long-term hamper the further development of bio-CHP; even more so, since the depicted biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

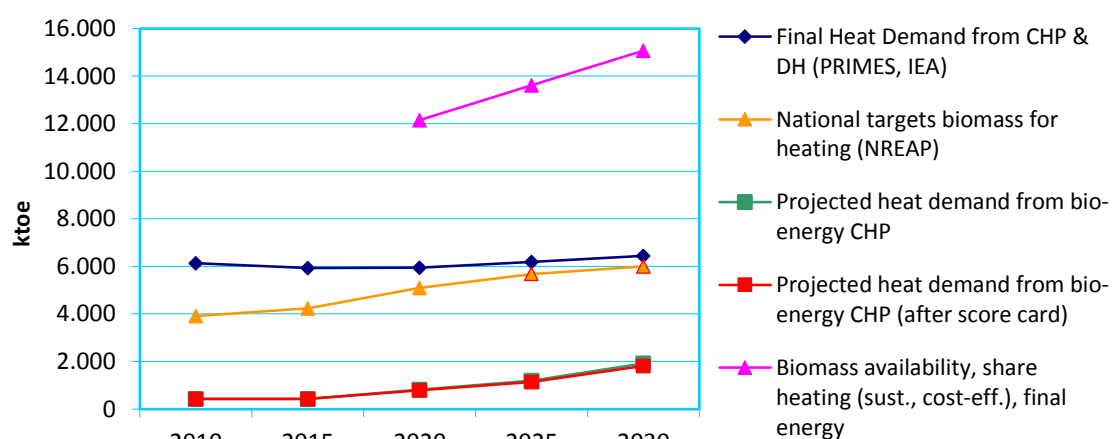
- The projected development of CHP heat demand (PRIMES, blue curve) foresees a stable growth after 2015
- National targets for biomass for heating (yellow curve) see a strong growth in the years to 2020, which is expected to be slightly less strong after 2020
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

To be confirmed / checked

- A further growth of bio-CHP (or other applications of biomass for heating) is in medium-term not realistic within the borders of the country, but only through biomass imports
- This is especially obvious when considering the national targets for biomass for heating (yellow curve) from the NREAP

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	2010	2020	2030
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	6.133	5.948	6.447
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	429	785	1.816
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe	7,0% (2009)	13,2%	28,2%

Bio-energy CHP potential analysis Poland



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	+ 2 (of 3)	Green certificate support scheme; CO2 reduction goals; High cost of investment loans; The cost of CHP connection to the power grid
Suitability of heat market for switch to bio-energy CHP	++ 3 (of 3)	Expected growth of heat demand in industry in the future
Share of Citizens served by DH	++ 3 (of 3)	The share of citizens served by DH is over 50%; Energy plan: one biogas

		plant in each municipality should be created by 2020
National supply chain for biomass for energy	++ 3 (of 3)	The biomass market potential is sufficient
Awareness for DH and CHP	++ 3 (of 3)	The share of citizens served by DH is over 50%; Extension of CHP biomass co-firing Good practice of CHP biomass co-firing

Comments on country analysis

General comments

- The national framework assessment through the scorecard results in a very good score (14 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 93%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 29,7% (the country's RE target according to RED (28/2009) is at 15% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to increase from 7% (2009) to 28,2% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

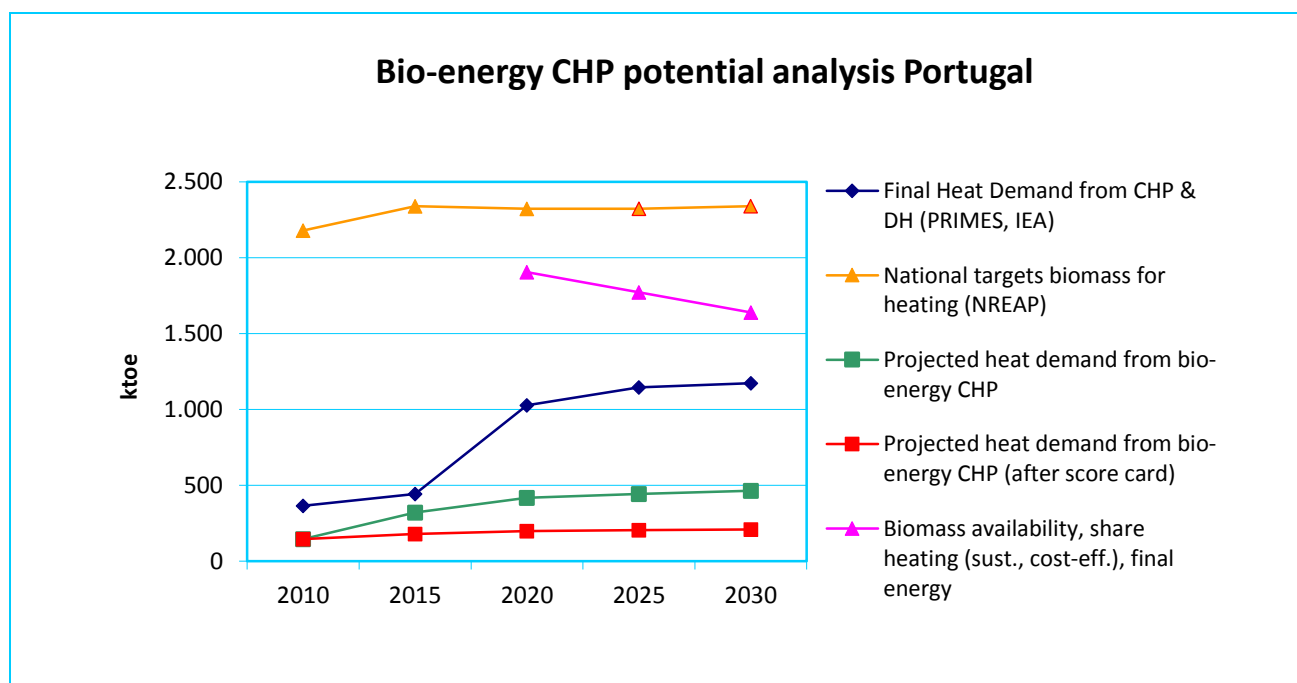
Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees stable figures with a slow growth after 2020
- National targets for biomass for heating (yellow curve) also see a growth until 2020, which is expected to continue in a lesser intensity
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

To be re-confirmed, checked

- Is maybe the growth in the bio-CHP market (red and green curves) too low between 2015 and 2020? Should the growth rate be adapted (e.g. weighting 20:80), so that it more follows the shape of the yellow curve?

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	366	1.027	1.174
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	145	200	209
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	39,6% (2009)	19,4%	17,8%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		1.906	1.639



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	○ 1 (of 3)	Legal framework demotivating; grid access very limited; financing difficulties.
Suitability of heat market for switch to bio-energy CHP	○ 1 (of 3)	Industrial plants with continuous heat demand are: pulp and paper using already biomass; chemical not suitable for bio-energy
Share of Citizens served by DH	- 0 (of 3)	
National supply chain for biomass for energy	○ 1 (of 3)	No National supply chain; Main users are pulp/paper and wood industries,

		as raw material and residual fuel; Remaining biomass is expensive.
Awareness for DH and CHP	- 0 (of 3)	

Comments on country analysis

General comments

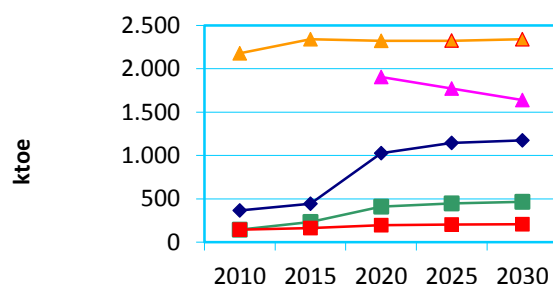
- The national framework assessment through the scorecard results in a low score (3 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 20%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 39,6%
(the country's RE target according to RED (28/2009) is at 31% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to decrease in a growing CHP market from 39,6% (2009) to 17,8% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030
- For the fuelling of the expected bio-CHP, the shown biomass resources are sufficient, but for meeting the national targets for biomass for heating, biomass has to be either imported or taken from sources not meeting strong sustainability criteria.

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees strong growth between 2015 and 2020
- National targets for biomass for heating (yellow curve) foresees only a slight growth at the same time
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

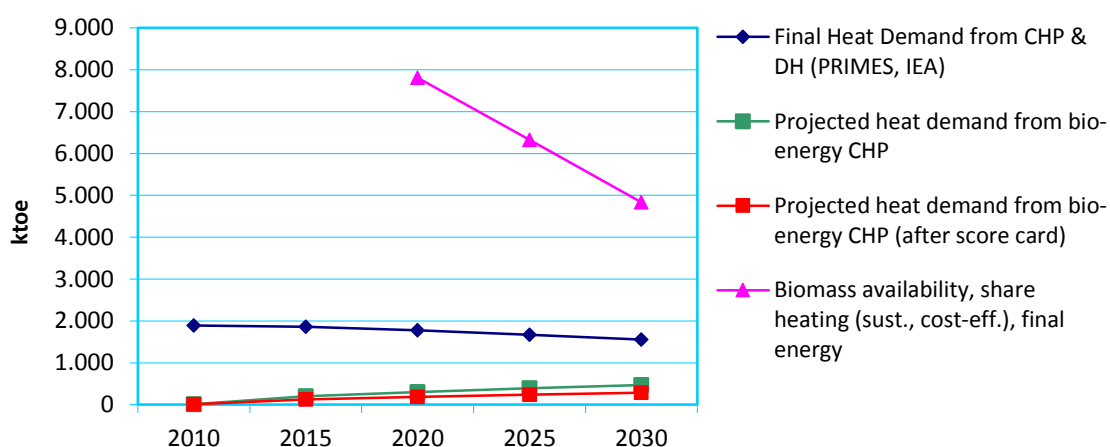
To be re-confirmed, checked

- The strong growth of CHP heat demand (PRIMES, blue curve) between 2015 and 2020 is to be counterchecked with national sources; maybe national data exist which can confirm or adapt this surprising development projected by PRIMES
- With the present weighting of 50:50, the potential for bio-CHP under ideal frameworks (green curve) comes very close to the complete CHP heat demand, which may not be realistic. It should be considered to link the growth of the bio-CHP development stronger to the general CHP market development (blue curve), e.g. with a weighting of 80:20 (see curve below). This would give the green curve a more plausible shape.



Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	1.894	1.774	1.558
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	10	186	284
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	0,5% (2009)	10,5%	18,3%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		7.812	4.838

Bio-energy CHP potential analysis Romania



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	+ 2 (of 3)	DH is promoted and there is an adequate DH grid access.
Suitability of heat market for switch to bio-energy CHP	+ 2 (of 3)	Adequate number of Industries with rather continuous heat demand.
Share of Citizens served by DH	+ 2 (of 3)	There is an important level of DH penetration.
National supply chain for biomass for energy	o 1 (of 3)	New area with good potential
Awareness for DH and CHP	+ 2 (of 3)	There is an awareness for HECHP and DH, as well as for bio-energy

Comments on country analysis

General comments

- The national framework assessment through the scorecard results in a good medium score (9 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 60%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 30%
(the country's RE target according to RED (28/2009) is at 24% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to grow from 0,5% (2009) to 18,3% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

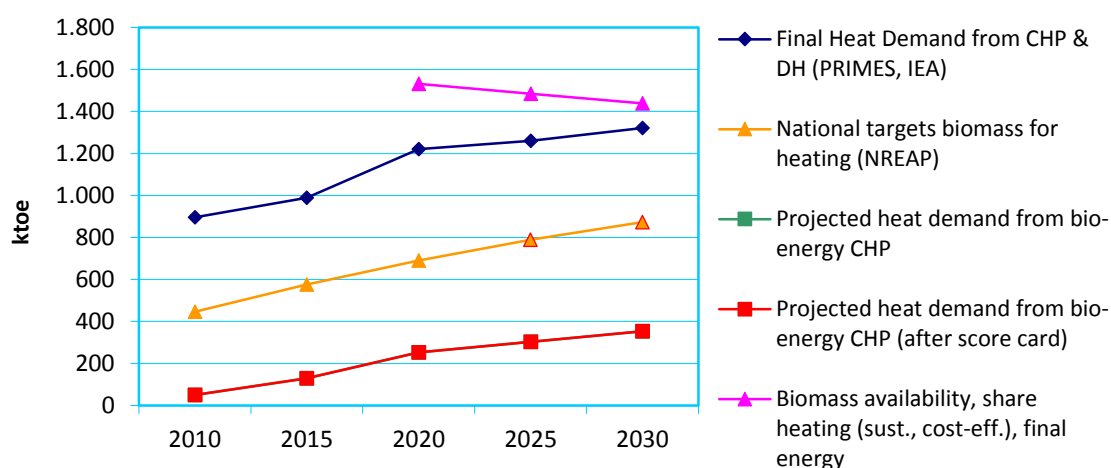
- The projected development of CHP heat demand (PRIMES, blue curve) foresees a slight but constant decrease after 2015
- From the Romanian NREAP, no figures for biomass for heating are reported, therefore the sole reference for the growth of the bio-CHP sector is the general expected development of CHP in Romania.

To be checked

- Are there maybe new data projections on biomass for heating until 2020? Has maybe Romania supplemented the NREAP?

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	896	1.221	1.321
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	50	253	354
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	5,6% (2009)	20,7%	26,8%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		1.531	1.439

Bio-energy CHP potential analysis Slovakia



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	++ 3 (of 3)	Support price for CHP electricity, agricultural biogas plants; High share of district heat; Preferential connection of CHP to network
Suitability of heat market for switch to bio-energy CHP	++ 3 (of 3)	Increase share of heat from RES from mostly biomass and biogas; High increase of electricity production from wood biomass and biogas
Share of Citizens served by DH	++ 3 (of 3)	41% citizen served by DH; 44% share of heat from DH systems in total heat

National supply chain for biomass for energy	++ 3 (of 3)	Support of the production of wood biomass for energy; Support of the processing of fuel wood biomass; Support for the establishment of energy crops
Awareness for DH and CHP	++ 3 (of 3)	Biomass association; Public campaign, workshops, and conferences

Comments on country analysis

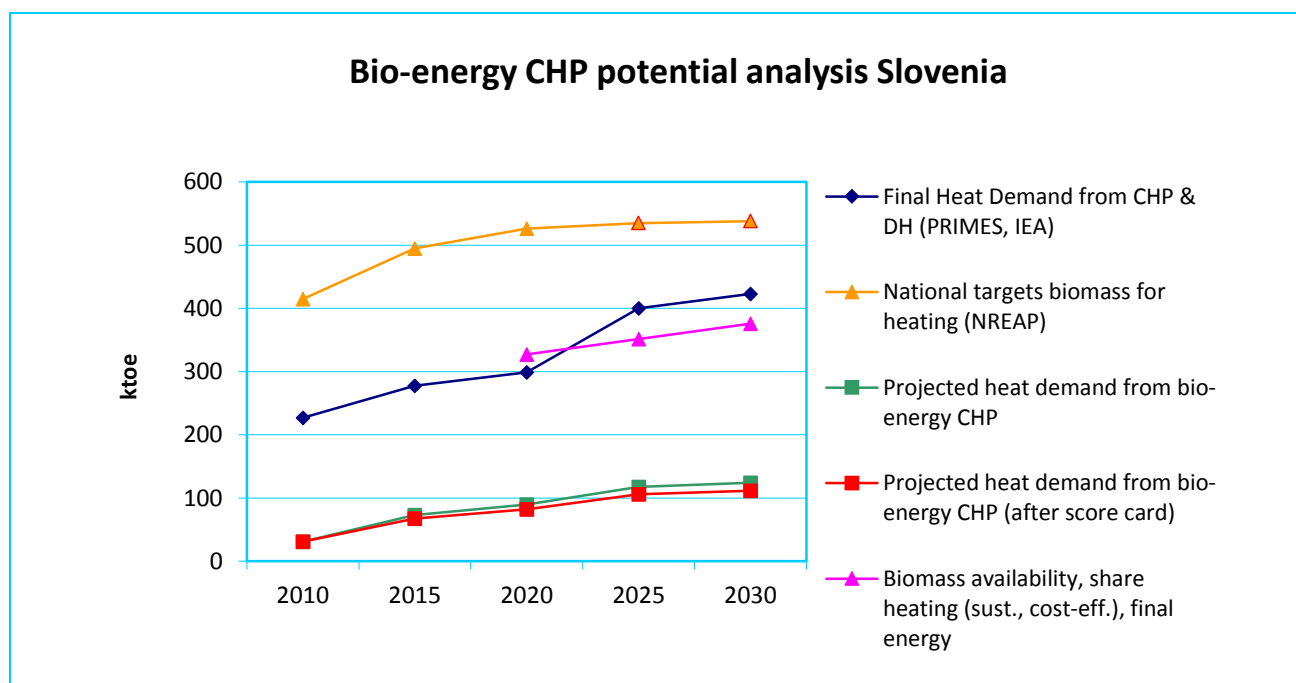
General comments

- The national framework assessment through the scorecard results in an excellent score (15 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 100% (red and green curve identical).
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 26,8% (the country's RE target according to RED (28/2009) is at 14% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to grow from 5,6% (2009) to 26,8% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees a steady growth with a stronger growth between 2015 and 2020
- National targets for biomass for heating (yellow curve) see a steady growth
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	227	299	423
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	31	82	112
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	13,6% (2009)	27,4%	26,4%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		327	376



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	++ 3 (of 3)	Support for CHP and RES; Ambition goals for CO ₂ reduction
Suitability of heat market for switch to bio-energy CHP	+ 2 (of 3)	Potential in paper and chemical industry; 50% of heat use directly in industrial process (cement, steel...), not appropriate for CHP.

Share of Citizens served by DH	+ 2 (of 3)	17% citizen served by DH; 77% share of heat from CHP in DH systems mostly from coal; Obligatory 20% heat for DH from RES (proposed)
National supply chain for biomass for energy	++ 3 (of 3)	More than 60% of Slovenia covered by forests; Support to for the processing of fuel wood biomass; Support for the establishment of energy crops
Awareness for DH and CHP	++ 3 (of 3)	Biomass association, association for sustainable development; Public campaign, workshops and conferences; Several new small and micro DH on wood biomass (too small for available CHP technologies).

Comments on country analysis

General comments

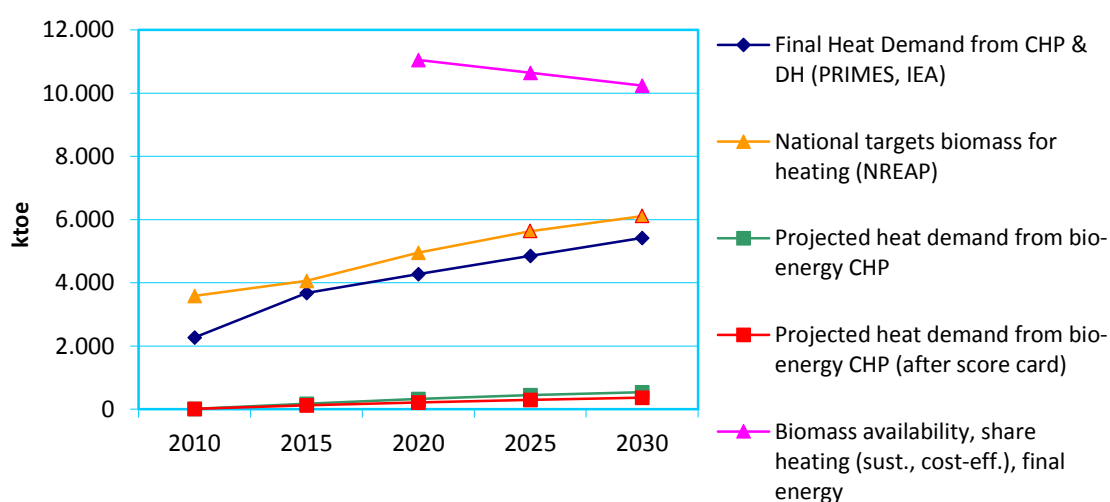
- The national framework assessment through the scorecard results in a good score (13 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 87%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 29,3% (the country's RE target according to RED (28/2009) is at 25% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to grow from 13,6% (2009) to 26,4% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030
- For the fuelling of the expected bio-CHP, the shown biomass resources are sufficient, but for meeting the national targets for biomass for heating, biomass has to be either imported or taken from sources not meeting strong sustainability criteria

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees a steady growth with a stronger growth between 2020 and 2025
- National targets for biomass for heating (yellow curve) see a growth, which is becoming less strong after 2020
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	2.266	4.277	5.418
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	8	218	364
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	0,3% (2009)	5,1%	6,7%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		11.049	10.237

Bio-energy CHP potential analysis Spain



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	++ 3 (of 3)	Legislation and incentives are the key point to ensure any future development, as can be seen in the history in Spain for CHP and EER development.
Suitability of heat market for switch to bio-energy CHP	+ 2 (of 3)	

Share of Citizens served by DH	○ 1 (of 3)	Just a small portion of heat demand is supplied by DH in Spain (mainly because the low heat demand for households, as a south-european country)
National supply chain for biomass for energy	+ 2 (of 3)	Not expensive biomass
Awareness for DH and CHP	+ 2 (of 3)	It is so important is Spain to educate community on how good is bio-chp. Some campaigns are being developed by the government

Comments on country analysis

General comments

- The national framework assessment through the scorecard results in a fair score (10 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 67%.
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 10% (the country's RE target according to RED (28/2009) is at 20% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to grow from 0,3% (2009) to 6,7% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

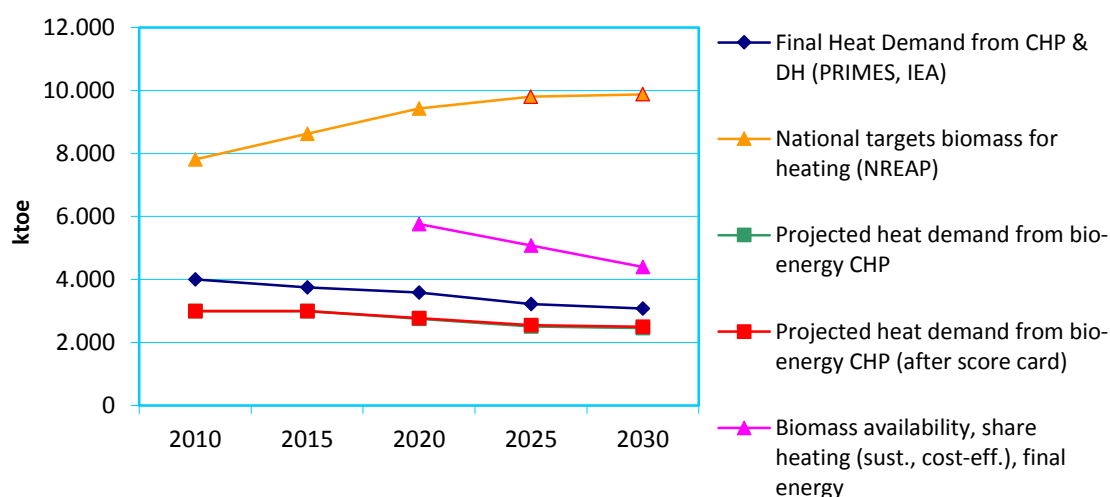
- The projected development of CHP heat demand (PRIMES, blue curve) foresees a steady growth with a stronger growth between 2010 and 2015
- National targets for biomass for heating (yellow curve) see a steady and continuous growth
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

To be checked

- The bio-CHP penetration rate in 2030 (2030 dot of green curve) seems low with only 10%, regarding the yellow and blue curve. If the expectation is, that there will be no major development of CHP, maybe the scores of the score card are too optimistic and should be lowered, but the bio-CHP penetration rate increased?

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	4.001	3.584	3.083
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	2.996	2.770	2.499
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	74,9% (2009)	77,3%	81,0%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		5.761	4.397

Bio-energy CHP potential analysis Sweden



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	++ 3 (of 3)	High support by power quota system and investment grants
Suitability of heat market for switch to bio-energy CHP	++ 3 (of 3)	High interest of consumers on bio fuels in all market segments
Share of Citizens served by DH	+ 2 (of 3)	
National supply chain for biomass for energy	++ 3 (of 3)	
Awareness for DH and CHP	++ 3 (of 3)	

Comments on country analysis

General comments

- The national framework assessment through the scorecard results in an excellent score (15 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 100% (red and green curve identical).
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 79,9% (the country's RE target according to RED (28/2009) is at 49% in 2020)
- In a decreasing CHP market (on very high level), the share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to grow from 74,9% (2009) to 81% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030
- For the fuelling of the expected bio-CHP, the shown biomass resources are sufficient, but for meeting the national targets for biomass for heating, biomass has to be either imported or taken from sources not meeting strong sustainability criteria

Specific issues

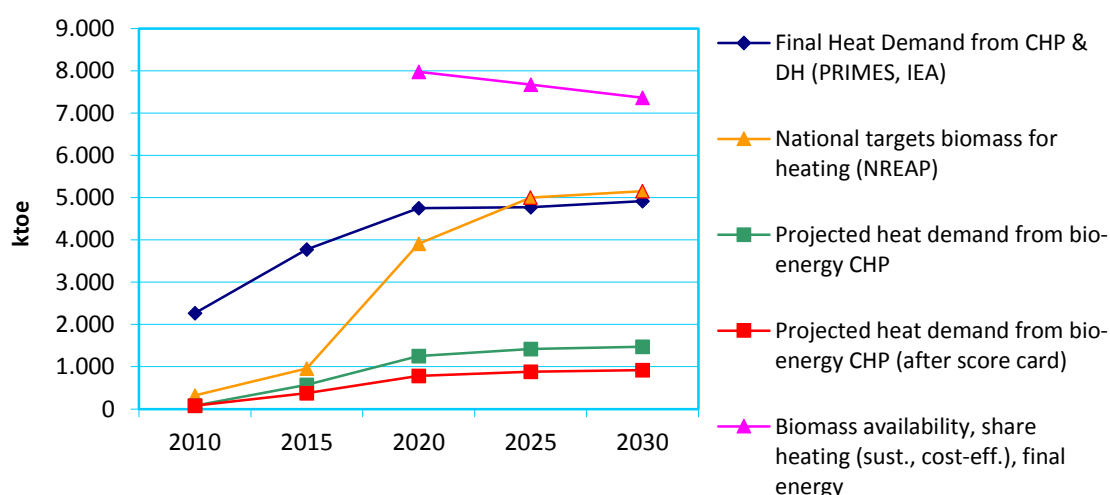
- The projected development of CHP heat demand (PRIMES, blue curve) foresees a steady growth with a stronger growth between 2015 and 2020
- National targets for biomass for heating (yellow curve) see a steady growth
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)

To be confirmed / checked

- The Biomass Futures assumes that the price for round wood and primary forestry residues (Sweden largest biomass resources) are or will be too high in the future to be used for energy related purposes, due to high demand from competing industries
It should be checked, whether these high costs are truly expected in Sweden

Figures (projections)	2010	2020	2030
Final heat demand from CHP and DH (PRIMES, IEA), ktoe	2.265	4.749	4.918
(Projected) heat demand from bio-energy CHP and DH (after score card), ktoe	83	785	918
Bio-energy penetration rate in CHP markets (2009: EEA, Eurostat)	3,6% (2009)	16,5%	18,7%
Biomass availability, share heating (sust., cost-eff.), final energy (Biom. Futures), ktoe		7.976	7.366

Bio-energy CHP potential analysis United Kingdom



Framework Assessment (Score card)	Score	Short analysis
Legislative environment	+ 2 (of 3)	<ul style="list-style-type: none"> - New Heat Strategy helping to create positive investment environment - No DH-specific subsidy support - Ambitious renewable and emissions targets - Strong bio-energy support, especially for bioenergy CHP but limited visibility of future funding.
Suitability of heat market for switch to bio-energy CHP	++ 3 (of 3)	<ul style="list-style-type: none"> - Good industrial opportunity - Challenge overcoming relatively low gas prices

		<ul style="list-style-type: none"> - Challenge banking renewable heat incentives for investment decisions and long-term build (>5 years) - Significant new renewable CHP deployment expected by 2020
Share of Citizens served by DH	- 0 (of 3)	<ul style="list-style-type: none"> - Low current DH deployment - Promise to consider support for bioenergy used on heat networks in 2014. - New heat strategy to help spur DH penetration
National supply chain for biomass for energy	+ 2 (of 3)	<ul style="list-style-type: none"> - Few biomass supply chain difficulties but limited Indigenous biomass production so import dependent - Growing environmental stakeholder concern about impact of imported biomass - Some conflict for wood feedstocks between generators and the wood products, paper and panel industries
Awareness for DH and CHP	+ 2 (of 3)	<ul style="list-style-type: none"> - Strong government and environmental stakeholder support that bioenergy should be CHP - Some environmental stakeholder concerns about biomass for larger-scale (>50MW) use

Comments on country analysis

General comments

- The national framework assessment through the scorecard results in a good score (9 of 15 possible points).
- Thus, it is projected that the growth potential for bio-CHP until 2030 will be exploited to 60% (red and green curve identical).
- The possible bio-CHP penetration rate in 2030 (2030 dot of green curve) under ideal framework conditions is seen at 30% (the country's RE target according to RED (28/2009) is at 15% in 2020)
- The share of bio-fuels in CHP (bio-energy penetration rate in CHP markets) is expected to grow from 3,6% (2009) to 18,7% (2030)
- The national biomass availability (cost-efficient, sustainable; pink curve) is sufficient to enable the projected growth; however, these biomass resources include types of biomass which are currently not usually used in CHP, but are expected to be utilisable by 2030

Specific issues

- The projected development of CHP heat demand (PRIMES, blue curve) foresees a strong growth until 2020, an almost zero-growth after 2020
- National targets for biomass for heating (yellow curve) see a very strong growth after 2015, which expected to decrease after 2020
- The growth projections of the bio-energy CHP heat demand (green and red curves) apply the average growth rates of both the blue and the yellow curve (weighting 50:50)