# Inclusion of the heating sector in the EU ETS

*Finnish Energy Industries*

*GreenStream Network Ltd*

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# Preface

This study was commissioned by Finnish Energy Industries in spring 2015. The objective of the report is to provide information and support the discussion on the implementation of the inclusion of the heating sector in the EU ETS. The report is based on a literature review and analysis by GreenStream Network Ltd.

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# 1. Overview of the heating sector

## 1.1 EU`s Climate and Energy Policy framework

This sub-section introduces the EU climate and energy targets, the development of the EU Emission Trading System (EU ETS), the principles of the non-ETS sector and how the heating sector falls between these two policy frameworks.

### 1.1.1 Climate and energy policy targets

**2020 targets**

The European Union`s climate and energy package for 2020 was released in 2009. The framework for 2020 sets 3 different targets: 20% reduction target in greenhouse gas (GHG) emissions compared to 1990 levels, increasing the use of renewables to 20% of total energy production and 20% reduction of final energy consumption compared to business as usual through improved energy efficiency. This framework is also known as the"20-20-20" targets.

The total effort to reduce greenhouse gas emissions has been divided between the EU Emissions Trading System (EU ETS) and non-ETS sectors. The EU ETS, covering around 45% of the EU's greenhouse gas (GHG) emissions, is the key tool for cutting industrial GHG emissions most cost-effectively. The emission reduction target for 2020 in EU ETS sector is 21% compared to 2005 levels. The total emissions cap under the EU ETS is declining by the annual linear reduction factor of 1.74 %.

The framework for the reduction efforts in the non-ETS emissions is regulated under the Effort Sharing Decision, which establishes binding annual greenhouse gas emission reduction targets for Member States for the period 2013–2020. The national targets under the Effort Sharing Decision collectively deliver a reduction of around 10% compared with 2005 levels by 2020.[1]

Currently the heating sector falls in both the EU ETS and non-ETS sectors.

**2030 targets**

The European Council reached on 24 October 2014 an agreement on the 2030 climate and energy policy framework for the European Union. According to the Council conclusions, the EU`s domestic reduction target for greenhouse gas emissions will be at least 40% by 2030 compared to 1990 levels. The reduction target in the EU ETS sector will be 43% by 2030. This will be implemented by the change in the linear reduction factor from 1.74% to 2.2% from 2021 onwards. In addition, the Council conclusions indicate that a Market Stability Reserve (MSR) will be established in the EU ETS. The MSR has been planned to address

[1] European Commission (2015): Climate Action, Effort Sharing Decision

the current market imbalance and low emission unit allowance (EUA) prices[2] associated with it.

The reductions in the non-ETS sectors will be 30% by 2030 compared to 2005 emissions level, with efforts distributed on the basis of relative GDP per capita. For renewable energy the Council set an EU target of at least 27% by 2030. This target will be binding on EU level and it will be fulfilled through Member States' contributions guided by the need to deliver collectively the EU target, without preventing Member States from setting their own more ambitious national targets and supporting them. For energy efficiency the Council agreed on an indicative target at the EU level of at least 27 %. [3]

For 2050, EU leaders have endorsed the objective of reducing Europe's greenhouse gas emissions by 80-95 percent compared to 1990 levels.

### 1.1.2 Development of the EU ETS

The EU ETS covers currently more than 11,000 power stations and manufacturing plants and works on the 'cap and trade' principle. The overall emission volume that companies can emit each year under the scheme has been set on EU level. Within this cap, companies receive free emissions unit allowances (EUAs) or buy allowances from the auctions or from the secondary market, which they can trade if they want. The purpose of the 'cap-and-trade' approach is to give flexibility to companies to cut their emissions in the most cost-effective way.[4] The EU ETS is regulated under the EU ETS Directive.[5]

#### Extensions of the EU ETS

The EU ETS started in 2005 aiming to reduce greenhouse gases in a cost efficient way and to facilitate the EU to meet its international emission reduction targets.[6] At first, the purpose was to create the critical mass for a liquid trading market and to establish the necessary monitoring, reporting and verification infrastructure. In its early stages the EU ETS focused mainly on large stationary sources like power generation and energy-intensive industrial sectors, meaning a small number of economic sectors but with significant emissions. The objective was, however, for the system to be open for gradual sectoral, geographical and gas coverage extension.[7] In practice, there are two procedures for enlarging the scope of the EU ETS; amending (at least Annex 1 of) the Directive (EU-wide amendment of the scope) or opt-in (per and on initiative of Member States).

[2] Current Dec-2015-2020 prices are ranging around 7-8 € and higher price assumption around 20 €/EUA for 2020 has been forecasted e.g. by Thomson Reuters Point Carbon.

[3] European Council (2014): Conclusion on 2030 Climate and Energy Policy

[4] European Commission (2013): The EU Emission Trading System (EU ETS)

[5] European Commission (2015): Climate Action, The EU Emission Trading System (EU ETS)

[6] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending the Council Directive 96/61/EC OJ L 275

[7] COM(2000) 87 Final Green Paper on Greenhouse gas emissions trading within the European Union

Since the start in 2005, the scope of the EU ETS has been extended several times, both by the Community and unilaterally by Member States, through the so-called opt-in mechanism

- Some countries (Finland and Sweden) opted-in small installations in the heating sector below the minimum threshold for the scope of the EU ETS Directive already during the first trading period between 2005 and 2007.[8]
- Romania and Bulgaria joined the EU ETS in the beginning of 2007.
- The geographical scope was extended again in the beginning of the 2nd trading period on 2008 when Iceland, Liechtenstein and Norway chose to join the EU ETS.
- Norway included the gas nitrous oxide (N20) associated with production of nitric acid in 2009.
- Sectoral scope was extended through inclusion of aviation in 2012
- The scope of the EU ETS was further extended in the beginning of the third trading period (2013) by inclusion of new industries, such as aluminium and partially the chemical industry, as well as two new gases nitrous oxide and perfluorocarbons.

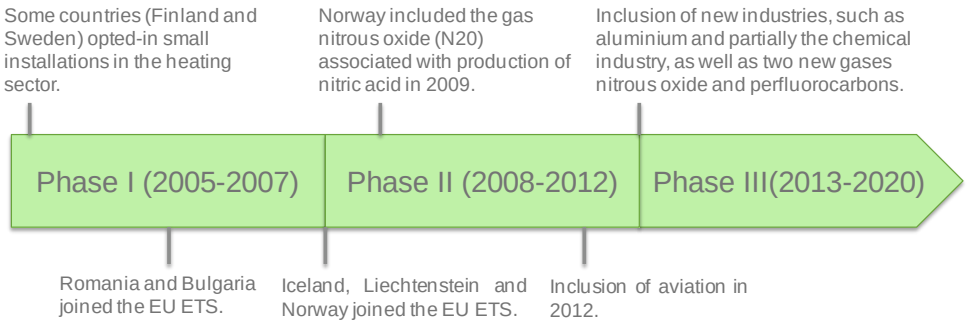


**Figure 1. Extensions of the EU ETS**

The largest extension has been the inclusion of aviation into the system. The number of aviation allowances was decided to be around 212 million tonnes (97% of historic aviation emissions) in 2012, and from 2013 onwards the allowances amount to 208.5 million tonnes (95% of historic aviation emissions) annually.[9] Another major extension was done in 2007 when Romania and Bulgaria joined the EU ETS with the cap extension of 108.8 Mt $CO_2$ eq.[10] and in 2013 when the scope of the EU ETS was further extended by around 100 Mt $CO_2$ eq. related to the inclusion of new industries and a few new gases.

Expanding the sectoral coverage of the EU ETS even further has been on the agenda from time to time. In 2012 the option of including the fuel consumption of the current non-ETS

[8] In Finland district-heating plants with a capacity of 20 MW or less that operate in district-heating networks where one or more installation fall under the EU ETS are under the scope of the Finnish Emissions Trading Act. Sweden has opted-in installations having a rated thermal input below 20 MW but being connected to a district heating network with a total rated thermal input above 20 MW. Both Finland and Sweden started by opting-in separate installations in 2005 and 2004 respectively but the opt-in was extended to cover all installations fulfilling the criteria.

[9] European Commission (2015): Climate Action, Reducing emissions from aviation

[10] EEA (2015): EU Emissions Trading System (ETS) data viewer. The verified emissions of the Romania and Bulgaria together in 2007

sectors to the EU ETS sector was suggested by the Commission in its Carbon Market Report 2012, as a possibility to balance demand and supply within the EU ETS.[11]

The Commission`s impact assessment of a policy framework for climate and energy in the period from 2020 up to 2030[12] discussed about the extension of the scope of the EU ETS to other sectors, in particular to heating of buildings and road transport. The report outlines, that including these sectors would require addressing a number of administrative challenges, such as the large number of end consumers (emitters) in the energy sector. According to the impact assessment an upstream approach could be a solution for adding these sectors into the EU ETS and other ETS systems in the world, such as California's cap-and-trade programme, which has developed ways to include small-scale sources in the scheme. The impact assessment also notes that further analysis is required to explore how extending the EU ETS would work with current policy measures like energy taxation and other $CO_2$ policy measures.[13]

### Allocation methods

There have been two allocation methods for emission unit allowances (EUAs) in the EU ETS; auctioning and free allocation. The auctions of the emission allowances generate revenues for the Member States. The amount of the revenues per country depend on the auction volume of the allowances by the individual Member State and the auction clearing price, which usually corresponds to the market price on the secondary markets.

Between 2005-2012, in the phases 1 and 2, the emission unit allowances were delivered for the company mostly by free allocation. The set-up for the allocation methods has been changed considerably for the years 2013-2020 (Phase 3). In Phase 3 around half of all allowances will be auctioned and the rest of the allowances will be delivered for free. For the power sector in most of the Member States the auction share is 100% and the manufacturing industry will receive the majority (80% in 2013) of the allowances for free. But the share of free allocation for the manufacturing industry will decrease annually and the level of auctioning will reach the level of 70% in 2020[14], leaving the free allocation only to the sectors subject to international competition. According to the European Council (2014), free allocation will continue after 2020 to prevent the risk of carbon leakage, as long as no comparable efforts are undertaken in other major economies.[15].

### Heating in the EU ETS

The EU ETS covers combustion installations with a rated thermal input exceeding 20 MW.[16][17] So basically a large share of the combined heat and power plants (CHP plants)

[11] European Commission (2012): Report from the Commission to European Parliament and the Council, The State of the European Carbon market in 2012, COM (2012), 652 Final.

[12] European Commission: Commission staff working document, impact assessment COM(2014) 15 final/SWD(2014) 16 final

[13] European Commission (2014): Commission Staff Working Document Impact Assessment Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A policy framework for climate and energy in the period from 2020 up to 2030 SWD/2014/015 final

[14] European Commission (2015): Climate Action, Auctioning

[15] European Council (2014): Conclusion on 2030 Climate and Energy Policy

[16] Except in installations for the incineration of hazardous or municipal waste.

[17] EC (2009): DIRECTIVE 2009/29/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community.

and district heating exceeding that threshold are regulated under the EU ETS. In addition, smaller installations have been opted-in by e.g. Finland and Sweden.

CHP plants received free allowances in the phases I and II of the EU ETS. For the phase III, the rules governing free allocation of allowances for CHP`s was modified. Full auctioning is the rule from 2013 onwards for the power sector. In order to avoid distortions of competition, electricity generators may receive free allowances for district heating and cooling and for heating and cooling produced through high-efficiency cogeneration.[18] The amount of free allowances available for the heat is a function of a number of factors, in particular the Carbon Leakage status of the heat consumer. The exact amount of free allowances to be distributed relies on a complex calculation process.[19]

### 1.1.3 The Effort Sharing Decision

The Effort Sharing Decision (ESD) established on 2009 sets binding targets for EU Member States for reducing emissions from activities not covered by the EU ETS. The sectors that fall outside of EU ETS are heating of buildings (partly), road transport, waste and agriculture. The national emission targets vary according to Member States' relative wealth. They range from a 20 % reduction target (compared to 2005) by the richest countries to a 20% increase by the least wealthy.

The Member States have the responsibility to introduce policies to reach the non-ETS targets for 2020, which have been set for them in the EU`s Effort Sharing Decision. However, the national policies are not the only regulations that are reducing emissions in non-ETS sector. There are community-wide policies and measures, which will act upon emissions of the ESD sectors and therefore drive action in Member States that will help to meet their targets.

#### Heating in non-ETS sector

Most of the energy used in heating, like single boilers and heating of individual buildings with fossil fuels, fall outside the scope of the EU ETS[20]. The non-ETS sector is regulated with other means, typically a combination of taxes and command-and-control regulations, like energy efficiency measures.

## 1.2 Overview of the non-ETS heating sector

To analyse further the dimensions of the possible inclusion of the total heating sector into EU ETS, it is important to understand the fuel use, $CO_2$ emissions and abatement costs of the heating sector as well as the current regulation to curb the $CO_2$ emissions of the non-ETS sector part of the heating. The objective of this sub-section is to bring out the relevant statistics and current policy instruments in the heating sector for the analysis in following sections. The focus is on the heating of residential and commercial buildings.

[18] EC (2009): DIRECTIVE 2009/29/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community.

[19] Cogen Europe (2013): A CHP Guide to the Revised EU ETS Directive –Rules applying as of 1st January 2013

[20] Eurelectric (2014):CHP as part of energy transition

### 1.2.1 Fuel use, emissions and abatement potential in heating of buildings

The total primary energy supply in EU27 was 18 333 TWh in 2010. The heat market within the EU for residential and service sector buildings was about 3300 TWh/year[21]. This corresponds 18% of the primary energy supply in the EU27.[22]

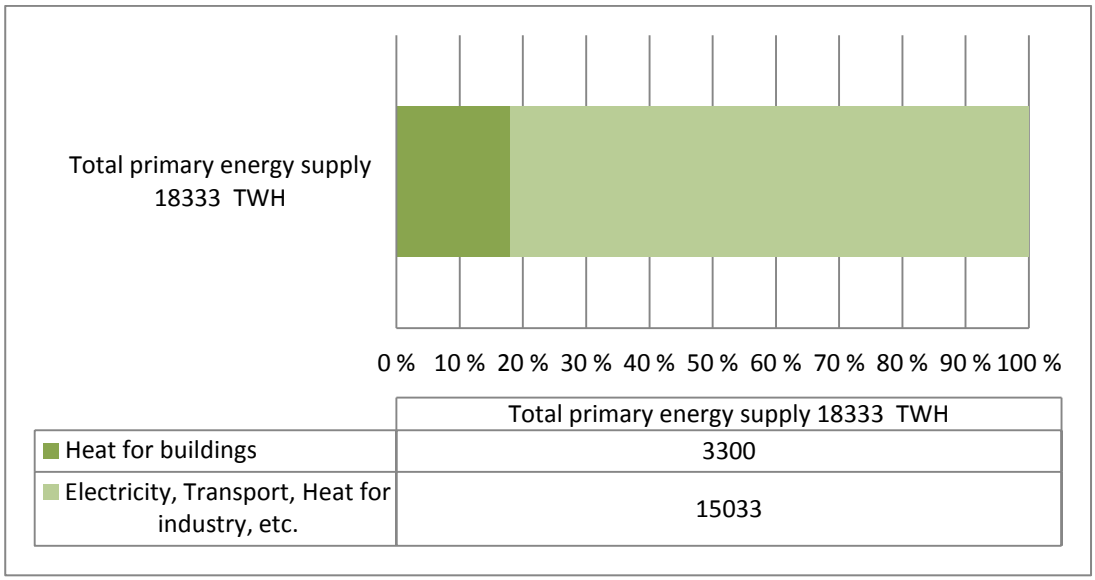


**Figure 2. Total primary energy supply in EU**

The heat market for buildings is dominated by the use of fossil fuels in on-site boilers, which is estimated to be around two-thirds of the heat supply.[23] The total number of boilers in residential buildings in the EU area has been estimated to be on the level of 132 million. Over half of the total number are gas boilers and 20% are oil boilers.

**Table 1. Estimation of the number of boilers in the EU in 2012 (Million units)**

| Boilers | Gas | Oil | Pellet | Heat Pump | el-direct and coal | Totat |
|---|---|---|---|---|---|---|
| **Residential** | 73.2 | 21.3 | 10.6 | 11.2 | 7.1 | **123** |
| **non-Residential*** | 5.3 | 2.3 | 0.5 | 0.5 | 0.3 | **9** |
| **Total** | 78.5 | 23.6 | 11.1 | 11.7 | 7.4 | **132** |

*The non-residential buildings (retail, wholesale and office buildings etc.) account for 25% of the total building stock in Europe.

The share of district heating in buildings is approximately 13%, corresponding to heat deliveries of about 430 TWh/year. According to the content of the Halmstad University DHC database, the number of district heating systems in the EU is around 3500.[24]

[21] The indirect heat supply from all indoor electricity use is not included.

[22] Aalborg University, Halmstad University, Ecofys Germany GmbH ,PlanEnergi (2013): Heat Roadmap Europe 2050

[23] Ibid

[24] District heat is also used for low-temperature heat demands in industry, which are estimated to be about 180 TWh/year. In addition, 220 TWh/year is delivered from industrial CHP plants to industrial demands.

**Fuel use in the heating sector**

Natural gas is the most used fuel in the heating sector with a 44% share and the second most used fuel are the petroleum products with a 17% share of heat supply.

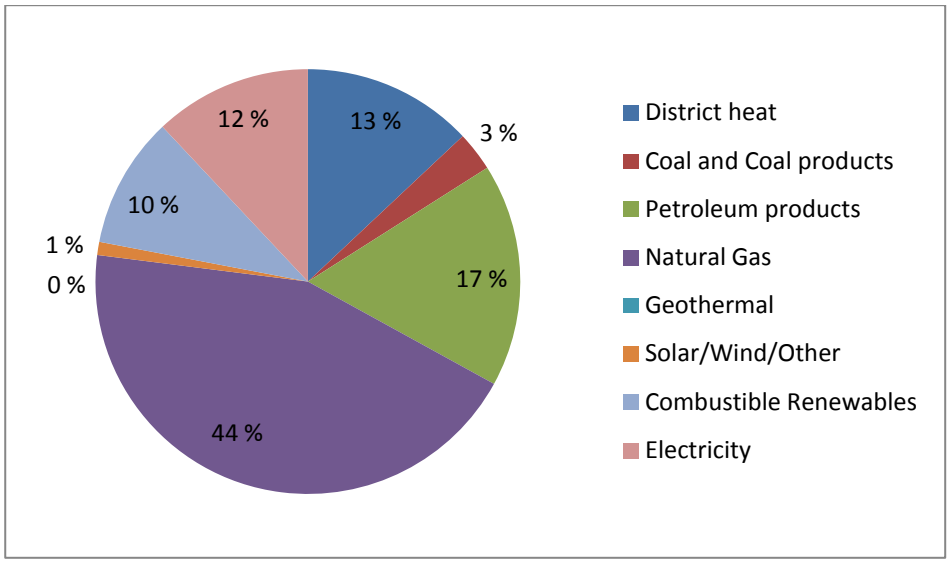


**Figure 3. Composition of the origin of heat supply to residential and service sector buildings in EU (2010)**

**The energy use in the EU ETS heating sector and in the non-EU ETS heating sector**

As the EU ETS covers combustion installations with a rated thermal input exceeding 20 MW, most of the district heat is covered by the EU ETS. In addition, emissions from production of electricity (12%) used in heating is regulated under the EU ETS. So the total heat supply which is covered by the EU ETS can be assumed to be around or a bit below 25% of the total heat supply.

The rest of the energy use in the heating sector falling to the non-ETS sector is generated by natural gas (44%), petroleum products (17%), coal (3%), combustible renewables (10%) and other renewables (1%).

The total share of the heating, which generates $CO_2$ emissions in the non-ETS sector, can be estimated to be around 64% or a bit above of the total heat supply.

**The emissions and abatement potential in the buildings sector**

The statistics of the EU-wide $CO_2$ eq. emissions both in the ETS and non-ETS heating sector are relatively poor and the exact data about the division of the emissions in these two categories is not available. However, some estimations have been done, e.g. Thomson Reuters has estimated that the $CO_{2eq.}$ emissions from public heating facilities in the ETS sector were around 88 million tons in 2013.[25]

Most of the emissions in the non-ETS heating sector can also be tracked. A large portion of the non-ETS emissions of the heating sector comes from the heating of buildings. The direct CO2 emissions of the buildings (basically heating) in the non-ETS sector falls in the

[25] Note, that the number does not include emissions from autoproducers and some countries (CYP, HRV, MT, PT).

IPCC Energy categorization to Commercial/Institutional category (IPPC 1A4a) and Residential category (IPPC 1A4b).[26] The emissions from the buildings sector (1A4a and 1A4b) in EU were around 600 Mt $CO_2$ eq. in year 2012[27]. This corresponds to around 13.2% of the total emissions in EU in 2012. The amount of the emissions from the heat in buildings sector (non-ETS) is 32 % compared to the total amount of emissions of the EU ETS sector in 2012 and around 7 times higher than the emissions from public heating facilities in the ETS sector.

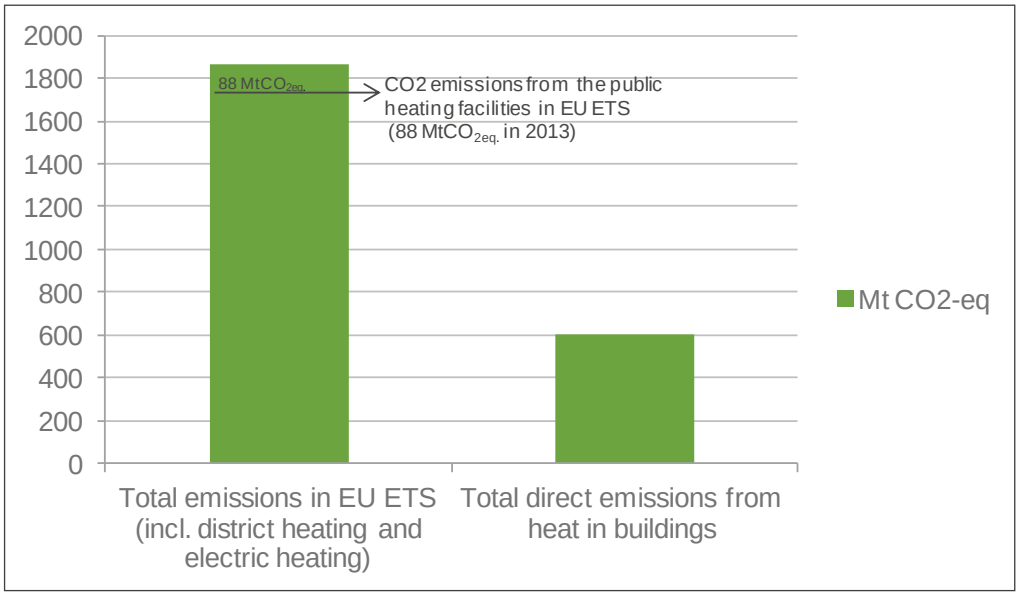


**Figure 4. Emissions in EU ETS and the emissions from heat in buildings sector in 2012**

The projected direct emissions from the buildings sector (1A4a, 1A4b) are estimated to be 584 Mt $CO_2$ eq. in 2020 with the policy measures implemented at the time of the projection[28]. In addition there is further abatement potential of 118 Mt $CO_2$ eq. by 2020, which would bring the baseline emissions to 466 Mt $CO_2$ eq. Of this potential 88 Mt $CO_2$ eq is cost-effective at a carbon price of <€25/t $CO_2$ eq.[29]

[26] Note, that the emissions from electricity use which arise within the electricity generation sector are part of the EU Emissions Trading Scheme. In addition, part of the emissions from IPCC category 1.A.4.C Agriculture/Forestry/Fisheries contains $CO_2$ emissions also from heating. However, the amount of the CO2 emissions related to heating from the sector is not available. In addition, the non-ETS district heating emissions are not included in the total amount.

[27] EEA (2015): EEA greenhouse gas - data viewer

[28] Note that this estimation has been done before implementing the EE directive, which may have impact for the emissions projections for 2020 in building sector.

[29] AEA (2012); Next phase of the European Climate Change Programme: Analysis of Member States actions to implement the Effort Sharing Decision and options for further communitywide measures A report for DG Climateaction Appendix 1: Greenhouse gas emissions projections, emissions limits and abatement potential in ESD sectors.

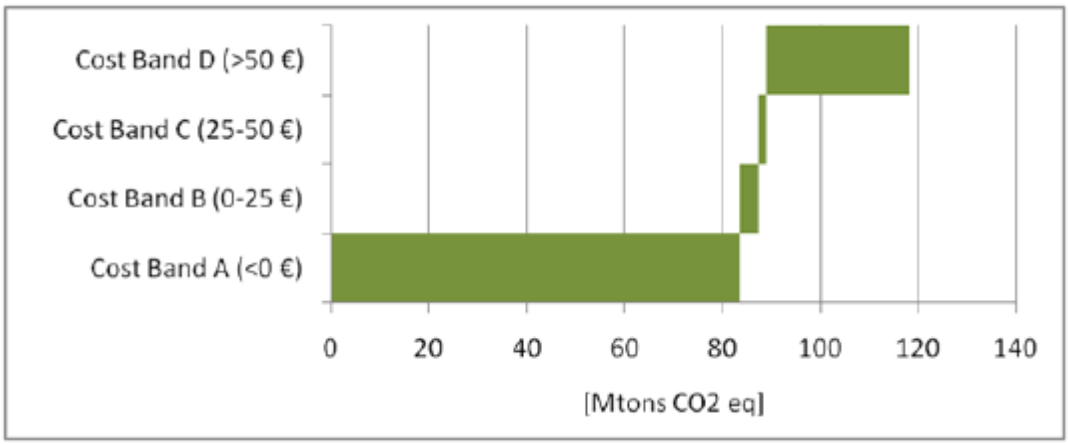


**Figure 5. Abatement potential and cost bands of the underlying options in the building sector in the EU27 (residential and non-residential) in 2020.**[30]

The highest abatement potential is located in France, Germany, Italy, UK, Poland and Spain. Altogether, these countries constitute about 75% of the remaining potential in the EU. Most of the remaining abatement potential in the buildings sector lies in the existing building stock. The most cost-effective measures (abatement potential in the Cost Band A) have been found to be in the improvement of the building shell in terms of insulation and in the replacement of heating systems by more efficient ones or shifting to lower carbon fuels. The following table shows the measures that fall in categories A and B (carbon price of <€25/$tCO_2$ eq) and other measures that fall in categories C and D (carbon price of >€25/$tCO_2$ eq).[31]

**Table 2. Abatement measures by 2020 in building sector and cost categories defined in Figure 5 above.**[32]

| Measure | Retrofit | | New Buildings | |
|---|---|---|---|---|
| | **Small building** | **Large buildings** | **Small buildings** | **Large Buildings** |
| **Improving building shell** | A | A | Not investigated | Not investigated |
| **Improved regulation & heat distribution** | A | A | | A |
| **Heating: Condensing boilers** | A | A | | |
| **Efficient tap water** | A | A | A | A |
| **Passive houses** | Not investigated | Not investigated | B | C |
| **Heating: Biomass** | C | A | D | B |
| **Heat pumps** | D | A | D | A |
| **Solar water heater** | D | | D | |
| **Micro CHP** | D | D | D | D |
| **Ventilation system with heat recovery** | | | D | D |

In addition to the mitigation options presented in Table 2, it is notable that currently about half of the primary energy in the EU27 is lost in the conversion from the primary energy supply to the end use. District heating allows the recycling of the heat that would otherwise be wasted. The new infrastructure and re-design of the heating and cooling supply is one way to reduce the $CO_2$ emissions in heating sector, especially in long-term. [33]

[30] Ibid

[31] Ibid

[32] Ibid

[33] Aalborg University, Halmstad University, Ecofys Germany GmbH ,PlanEnergi (2013): Heat Roadmap Europe 2050

### 1.2.2 Current policy instruments

The policy measures for $CO_2$ reduction in the heating of buildings can be divided into supply-side measures and demand-side measures:

- Supply-side measures cover the heat production and their purpose is to reduce the carbon intensity of the production by increasing the conversion efficiency or shifting to lower carbon fuels.
- The demand-side measures reduce the $CO_2$ emissions indirectly by lowering the energy consumption in residential/commercial as well as industrial sectors. The policy measures contain basically different energy efficiency measures like reducing the energy intensity of end-use technologies and improving the energy efficiency of new and existing buildings.

Some of the policy measures can be categorized in both supply-side and demand-side measures. For example the taxation of fuels may drive the energy generator's decisions when selecting the used fuels and on the other hand the energy user may face the cost of taxation and it may affect the amount of used energy.

#### 1.2.2.1 EU-wide policies

There are EU-wide policy measures, which will cut emissions in the non-ETS sectors both in the supply-side and the demand-side, and therefore drive action in Member States that will help in meeting their targets. Especially policy actions to achieve the EU`s headline targets for 2020, including raising the share of EU's energy consumption produced from renewable resources to 20% and a 20% improvement in the EU's energy efficiency, are affecting GHG emissions in the heating sector.

**Minimum requirements for taxation**

The Energy Tax Directive regulates taxation of energy in the EU by providing for example minimum levels of taxes for heating fuels and electricity. The Directive entered into force in 2004. The minimum rates that the Directive sets for taxes are:[34]

**Table 3. Minimum levels of taxation applicable to heating fuels**

| Fuel | Tax in euros |
|---|---|
| Gas oil (in euro per 1 000 l) | 21 |
| Heavy fuel oil (in euro per 1 000 kg) | 15 |
| LPG (in euro per 1 000 kg) | 0 |
| Natural gas (in euro per gigajoule gross calorific value) | 0.3 |
| Coal and coke (in euro per gigajoule gross calorific value) | 0.3 |

The current EU tax directive leaves a lot of options for individual Member States to decide on their tax framework and its impact as a policy driver is minor.

The Commission issued a proposal to revise the Energy Tax Directive in 2011. The objective was to divide the energy taxes into energy and $CO_2$ components. The latter would

[34] Official Journal of the European Union (2003): COUNCIL DIRECTIVE 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity

not be applied in the EU ETS sector.[35] The tax directives have to be accepted unanimously and several Member States have been opposing and critical towards the proposal. The Council negotiations resulted in a draft compromise text that has fully denatured the substance of the Commission proposal and there isn't even agreement in the Council on the draft compromise. So finding an agreement has proved to be very difficult and the Directive hasn't stepped into force.[36] This has resulted in the situation, where the withdrawal of the proposed Energy Tax Directive is on the list of the Commission work program for 2015.

## Demand-side measures

### Energy efficiency measures

The EU has set multiple policy measures to enhance the overall energy efficiency in European buildings. The key directives are the 2010 Energy Performance of Buildings Directive (EPBD) and the 2012 Energy Efficiency Directive (EED).[37]

The EPBD sets minimum requirements regarding the energy performance of new and existing buildings, ensures the certification of their energy performance and requires the regular inspection of boilers and air conditioning systems in buildings. In addition, the EED set on 2012 establishes a common framework of measures for the promotion of energy efficiency in the Member States in order to ensure the achievement of the 20 % headline target on energy efficiency by 2020. The directive requires[38]

- Establishment of a national long-term strategy for mobilising investment in the renovation of the national stock of residential and commercial buildings, both public and private.
- Member States to set up national energy efficiency obligation schemes or alternative measures in order to save 1.5% of the annual energy sales to final customers each year.

### Raising product standards and consumer information

The Ecodesign Directive lays down minimum requirements for individual products and the Energy Labelling Directive ables consumers to better assess and compare their options in terms of energy efficiency. Both of the directives are continuously raising product standards for energy efficiency and other ecological parameters, as well as promoting most efficient appliances available on the market. They have a major impact in shaping the heating sector, by phasing out inefficient products and speeding up the uptake of state of the art solutions.[39]

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[35] EC (2011): Proposal for a COUNCIL DIRECTIVE amending Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity

[36] EC (2014): ANNEX to the COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Commission Work Programme 2015 A New Start COM(2014) 910 final.

[37] Association of the European Heating Industry (2014) Heating in the Energy and Climate Policy Framework

[38] Ibid

[38] Ibid

[39] Ibid

**Supply-side measures**

### Renewable energy measures

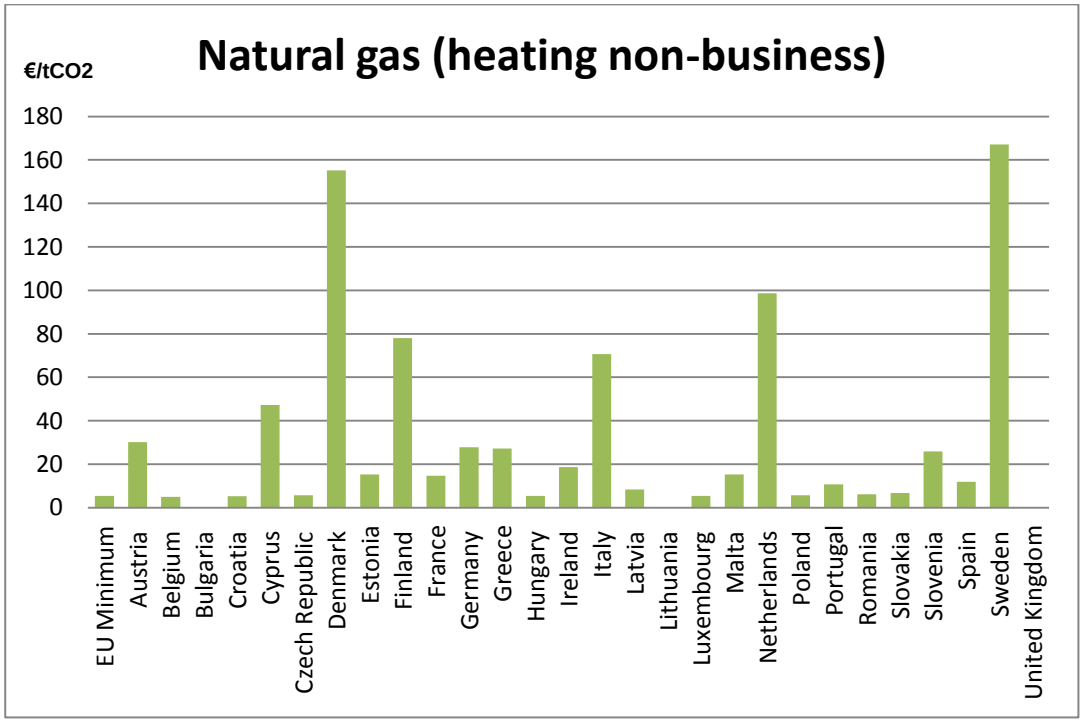
The Renewable Energy Directive establishes an overall policy framework for the production and promotion of energy from renewable sources in the Member States and sets renewables targets for 2020 across the EU. The Directive specifies national renewable energy targets for each country, ranging between 10 - 49% of the total energy needs by 2020. The EU countries have to set out their plans to meet these targets and the general course of their renewable energy policy in their national renewable energy action plans. Progress towards national targets is measured every two years.[40]

### 1.2.2.2 Member State policies

There are a number of existing economic instruments (such as fuel taxes) and non-economic instruments (such as energy efficiency measures) that Member States have implemented in the heating of buildings sector.

### Energy taxation

Energy taxation of fuels used in heating varies to a large extent between the Member States and between fuels. The following tables introduce the excise taxation of the main fuels used in heating of buildings in the non-ETS sector of different Member States.




[40] EC (2015): Energy, Renewable energy directive

**Figure 6. Excise duty rates for natural gas in different Member States converted to €/t $CO_2$. (situation in January 2015).**[41]

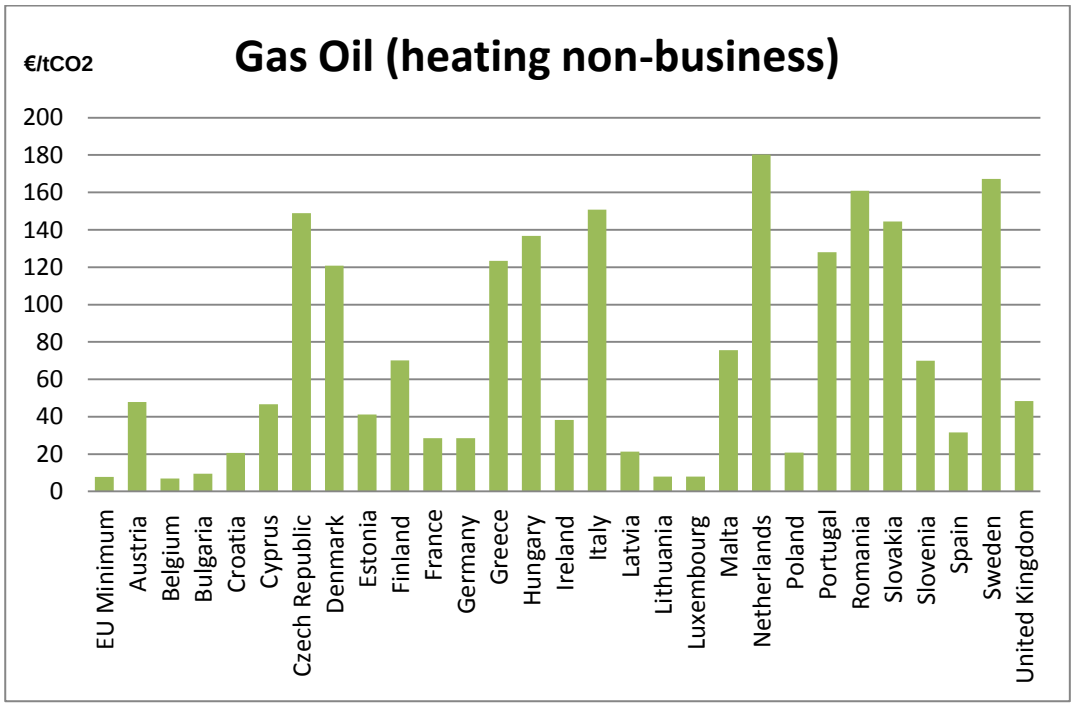



**Figure 7. Excise duty rates for gas oil in different Member States converted to €/t $CO_2$ (situation in January 2015).**[42]

The structure of the taxation in the heating sector is not so straightforward. The Member States have different structures for energy taxation, e.g. some of them have adjusted their energy taxation to follow the proposed Energy Tax Directive (2011), where the objective is to divide the energy taxes into energy and $CO_2$ components. In addition, the Member States have implemented different forms of tax exemptions for the business use and for CHP to avoid overlaps with the EU ETS.

To specify the different structures and levels of the exemptions of the energy taxation, the next chapter will introduce the taxation structure in 5 selected countries (Finland, Sweden, Denmark, Germany and UK). The following sub-section shows that the tax rates have been introduced in different units of energy in different countries and the comparability between the member states is troublesome without converting those to similar energy units.

**Taxation of heating fuels in selected countries**

**Denmark**

The energy taxation in Denmark consists of an energy tax and a $CO_2$ tax. The energy tax varies depending on the energy content of the product. All biofuels are exempt from the energy tax. The $CO_2$ tax on the burning of fossil fuels has been set to increase the

[41] EC (2015): Excise duty tables, Part II -Energy products and Energy, Ref 1042 Rev 1.

[42] EC (2015): Excise duty tables, Part II -Energy products and Energy, Ref 1042 Rev 1.

incentives towards less $CO_2$-intensive fuels. The tax rate for $CO_2$ was EUR 20 per tonne and is automatically increasing by 1.8% p.a.[43][44]

**Table 4. Energy and CO2 taxation of different energy sources in 2013 in Denmark.[45]**

| Fuel | Tax | Tax rate |
|---|---|---|
| Light Fuel Oil<br>EUR/GJ | Energy Tax<br>CO2 Tax<br>Total | 9.41<br>1.71<br>11.12 |
| Heavy Fuel Oil<br>EUR/GJ | Energy Tax<br>CO2 Tax<br>Total | 9.70<br>1.67<br>11.37 |
| Natural gas<br>eurocent/ nm3 | Energy Tax<br>CO2 Tax<br>Total | 37.48<br>4.96<br>42.44 |
| Pit coal<br>EUR/GJ | Energy Tax<br>CO2 Tax (EUR per tonne)<br>Total | 9.47<br>58.49<br>67.96 |

When the EU ETS was introduced the $CO_2$ tax was exempted from the sectors, which were regulated under the ETS. The tax coverage was reviewed in 2008 but there are still some overlaps with the sectoral coverage of the EU ETS (for example in district heating).[46] [47]

### Germany

The energy duty in Germany is an excise duty regulated by federal law. In general, energy duty is charged only on the consumption of energy products (especially mineral oils, natural gas and coal) for energy purposes.

As an excise duty, the energy duty is designed to be borne by the consumer. Because of the administrative considerations, it is collected higher up in the delivery chain, from the producer or reseller, who then passes the cost on to the consumer via the price of the product.[48]

**Table 5. Energy and CO2 taxation of different energy sources in 2012 in Germany.[49]**

| Fuel | Tax | Tax rate |
|---|---|---|
| Light oil fuel EUR/1.000l | Total | 61.35 |
| Heavy fuel oil EUR/1000kg | Total | 25.00 |
| Natural gas EUR/Mwh | Total | 5.50 |
| Coal EUR/GJ | Total | 0.33 |

Some of the combined heat and power (CHP) plants benefit from reduced energy duty rates. High-efficiency CHP plants with a monthly or annual utilisation rate of at least 70%

[43] Norden (2014): The Use of Economic Instruments in Nordic Environmental policy 2010-2013

[44] Entracte (2012): An Overview on Current Climate Policies in the European Union and its Member States.

[45] Norden (2014): The Use of Economic Instruments in Nordic Environmental policy 2010-2013 and Nordenergi WG Taxes and Levies (2014), Nordic tax report 2013, electricity sector

[46] Entracte (2012): An Overview on Current Climate Policies in the European Union and its Member States.

[47] Norden (2014): The Use of Economic Instruments in Nordic Environmental policy 2010-2013

[48] Federal Ministry of Finance, Germany (2013), An ABC to taxes

[49] Ibid

are fully exempt from the energy duty during the depreciation period. CHP plants that do not qualify as high-efficiency units as well as fully depreciated plants receive an additional tax reduction if they achieve a monthly or annual utilisation rate of at least 70%.[50]

In addition, there are a number of special rules providing tax reliefs for the use of energy products for energy purposes, with the aim of promoting environment-friendly energy sources. For trade and industry the tax benefits have been set in order to prevent German companies from being placed at a competitive disadvantage in relation to their foreign competitors. [51]

### Sweden

The energy taxation in Sweden is based on two elements: a carbon dioxide tax and an energy tax. The $CO_2$ tax is levied on energy use, and is basically set as a price on emissions from fossil fuels (oil, coal and natural gas) and fuels (petrol and diesel), with some sectoral and fuel exemptions, e.g. agriculture and forestry or peat. The objective is to achieve cost-effective reductions of $CO_2$ emissions.[52]

The energy tax in Sweden consists of a tax on fossil fuels and a tax on electricity consumption. The tax levied on fossil fuels is differentiated by dividing products into environmental classes, and by taking into account the use of the fuel. The energy tax is imposed for example on fossil fuels used in heating and operation of stationary equipment in industry and heat production in CHP plants. For these sectors, the energy tax is 30 per cent. [53]

**Table 6. Energy and CO2 taxation of different energy sources in 2013 in Sweden.**

| Fuel | Tax | Tax rate |
|---|---|---|
| Light oil fuel<br>EUR/litre | Energy tax<br>CO2<br>Total | 0.09<br>0.36<br>0.45 |
| Heavy fuel oil (MK1)<br>EUR/litre | Energy tax<br>CO2 Tax<br>Total | 0.20<br>0.36<br>0.56 |
| Natural gas<br>eurocent/ litre | Energy Tax<br>CO2 Tax<br>Total | 0.10<br>0.27<br>0.37 |
| Coal<br>EUR/kilo | Energy Tax<br>CO2 Tax (EUR per tonne)<br>Total | 0.07<br>0.31<br>0.38 |

Most of the fuels used for production of combined heat and power in facilities covered by the EU ETS receive 70% exemption of the energy tax and 100 % exemption of the $CO_2$ tax. The use of the fuels in other heat production in facilities that are covered by the EU ETS receive 20% exemption from the $CO_2$ tax. In addition, industries within the EU ETS do not pay any $CO_2$ tax.

### Finland

Excise taxes and fees levied on fossil fuels for heating are mainly based on the energy content and $CO_2$ emissions of the fuel.

In 2013, the $CO_2$ tax was calculated using the price of $CO_2$ at EUR 35/ton for heating fuels. The energy content tax reflects the volumetric energy content of the fuel, which is based on

[50] Ibid

[51] Ibid

[52] Norden (2014): The Use of Economic Instruments in Nordic Environmental policy 2010-2013

[53] Norden (2014): The Use of Economic Instruments in Nordic Environmental policy 2010-2013

the calorific values specified in the RES Directive (2009/28/EC) and it is levied on fossil fuels and on bio liquids by the same criteria and levels (EUR/MJ).[54]

**Table 7. Energy and CO2 taxation of different energy sources in 2013 in Finland.** [55]

| Fuel | Tax | Tax rate |
|---|---|---|
| Light oil fuel c/l | Energy content tax<br>CO2<br>Strategic stockpile fee<br>Total | 9.30<br>9.34<br>0.35<br>18.99 |
| Heavy fuel oil c/kg | Energy tax<br>CO2 Tax<br>Strategic stockpile fee<br>Total | 7.59<br>11.34<br>0.28<br>19.21 |
| Natural gas<br>EUR/MWh | Energy Tax<br>CO2 Tax<br>Strategic stockpile fee<br>Total | 4.45<br>6.93<br>0.008<br>11.46 |
| Coal<br>EUR/t | Energy Tax<br>CO2 Tax (EUR per tonne)<br>Strategic stockpile fee<br>Total | 47.10<br>84.43<br>1.18<br>132.71 |

There are some exceptions in the $CO_2$ taxation. To improve the competiveness of combined heat and power production (CHP) and to avoid overlaps between the ETS and $CO_2$ taxation, the $CO_2$ tax for coal, natural gas, bio-oil, as well as light and heavy oil used in combined heat and power production has been halved (Ministry of Finance, 2010). In addition, a refund scheme has been set for the energy intensive companies if the total burden of excise duties (fuels, district heating, process steam and electricity) of energy exceeds 0.5 % of the value added for the given company.[56]

**UK**

Gas oil and heavy fuel oil for heating purposes, whether imported or domestically produced, is liable to excise duty in UK.

The excise rates for different fuels in non-heating-business use.

- Gas oil EUR 129.59 per 1000 litres.
- Heavy fuel oil EUR 124.47. per 1000 litres.

The gas and coal are charged via a Climate Change Levy (CCL). The CCL is charged on taxable commodities supplied for lighting, heating and power purposes to business customers in the industrial, commercial, agricultural and public service sectors. The other heating fuels that are already liable to excise duty are not subject to CCL. Gas and solid fuel are normally exempt from the main rates of the CCL if they're supplied to or from certain combined heat and power (CHP) schemes registered under the CHP quality assurance (CHPQA) programme.[57]

[54] Norden (2014): The Use of Economic Instruments in Nordic Environmental policy 2010-2013

[55] Ibid

[56] Ibid

[57] Government UK (2014), Environmental taxes, reliefs and schemes for businesses

## Other policy instruments

In addition to energy taxation, there are numerous other policy instruments which affect the emissions in the heating sector. The following table gives an overview of the main policy instruments implemented by the selected Member States. The table follows the split between supply-side and demand-side policy measures.

**Table 8. Sample of policy measures reducing $CO_2$ emissions of the heating sector in selected Member States**.[58][59][60]

| Country | Supply-side measures | Demand-side measures |
|---|---|---|
| Denmark | Several support schemes for the electricity and heat production.<br><br>Concrete programmes and measures to foster renewable energy.<br><br>Heat Supply Act (ban on electric heating in buildings that are located within a district heating or natural gas supply network). | Multiple policy measures to improve energy efficiency among all sectors.<br>Multiple policies related to buildings, mostly as a result of implementing the EPBD:<br>• Regular inspection of boilers and heaters and of ventilation and air conditioning systems.<br>• Maximum energy use in new buildings should be based on an energy performance calculation. |
| Finland | Grants for investments in RES production facilities and research projects related to it.<br><br>Feed-in tariffs for renewable energy production. (Heat premiums) | Grants for different research purposes and promoting different energy efficiency measures.<br><br>Interest subsidy system promoting loans for renovations that improve energy efficiency.<br><br>Energy efficiency agreements: a voluntary scheme for industry and municipalities.<br><br>The Energy Audit Programme to analyse the energy use of the facility being audited.<br><br>Building codes and regulations for new and existing buildings. |
| Germany | The Guidelines for the support of RES-H set out in the Market Incentive Programme (MAP), stipulating support schemes for the promotion of heat produced from renewable energy.<br><br>Owners of new buildings and buildings under renovation are obliged in form of a quota to use a particular share of heat and cooling produced from renewable energy.<br><br>Funding for district heating networks supplied with heat from renewable energy.<br><br>BAFA investment support is given for heat produced in existing buildings. Installations in new buildings are only eligible if process heat is used. | Requirements for the energy efficiency of buildings and incentives for the replacement of off-peak-power storage heating.<br><br>Programmes and campaigns to promote energy efficiency. Among others, they provides costless information for households on appliances and renewable energy microgeneration projects.<br><br>The Special Fund for Energy Efficiency in SMEs provides advice and financial support, tackling the informational and cost barriers faced by the SMEs.<br><br>Grants are provided for consultation by accredited energy advisors on thermal insulation of houses.<br><br>Funding available also for advice concerning electricity-saving measures, thermographic surveys, and airtightness inspections. |

[58] Entracte (2012): An Overview on Current Climate Policies in the European Union and its Member State.s

[59] Res Legal (2015): Legal sources on renewable energy

[60] Norden (2014): The Use of Economic Instruments in Nordic Environmental policy 2010-2013

| | | |
|---|---|---|
| | For new buildings, renewable energy for space and water heating is mandatory. Depending on the technology installed, 15% up to 50% of total heating and cooling energy consumption must be generated by renewable energy | For energy saving houses, modernisation in housing inventory and conversion of heating systems is offered, but also for the installation of renewable energy technologies. |
| Sweden | | Energy efficiency potentials in households are addressed by labelling measures.<br><br>Following the EC directive on the Energy Performance of Buildings (EPBD), building owners are required to provide an energy performance certificate for their buildings. |
| UK | A prominent funding method for supporting energy efficiency measures is the Climate Change Levy (introduced in 2001) that increases the energy bill of businesses and public sector consumers by around 15%.<br><br>Different renewable energy supporting schemes like Feed-in tariffs and the Renewables Obligation (RO), which is a green certificate scheme with yearly update of quotas.<br><br>Several measures support the cultivation of crops used for energy production. For example the Energy Crops Scheme provides grants for the cultivation of short rotation coppices or miscanthus used for power and/or heat generation. | Multiple Policies aiming to save energy and increasing energy efficiency of the end consumers.<br><br>Loans for private enterprises for energy efficiency measures that are paid back by energy bill savings<br><br>To incentivize landlords to invest in the housing standards of the property they let or own, the Landlords Energy Saving Allowance (launched in 2004) provides grants for upfront costs.<br><br>Gas and electricity suppliers are required to invest in the energy efficiency of their customer's dwellings and put an emphasis on low income households. |

# 2. Effects of the inclusion of the heating sector in the EU ETS

The motivation behind expanding the sectoral coverage of the EU ETS is to improve the cost efficiency of climate policies on EU level. Efficiency is improved if the burden for future emission reductions is placed on sectors with low abatement costs, while sectors with high abatement costs are allowed to emit as before or even increase their emissions. As discussed in the previous section, there is a wide spectrum of policy instruments for the heating sector, on EU and national level for demand- and supply-side, that are currently regulating the emissions from activities outside the EU ETS. In theory, the current situation is inefficient. There are two sources of inefficiency. First, within a single non-ETS sector, the instruments do not always create equal incentives to reduce emissions. Second, the cost of emitting CO2 varies greatly between sectors as a result of different tax rates and as a result of the difference between the tax rate and the market price of emission allowances. As a result, the marginal abatement costs (MAC) across sectors are not equal.

## 2.1 Overlapping policies

The current supply- and demand-side policies (described in sub-section 1.2.2) to reduce emissions from heating in the EU countries can be divided in the following six categories as follows.

1. Compulsory energy efficiency standards
2. Voluntary energy efficiency agreements for industry and municipalities
3. Subsidies for energy efficiency improvements
4. Investment subsidies
5. Fuel taxes
6. Production subsidies for renewable heat generation, heat only or co-generation

The first four categories affect the fixed cost, whereas the fifth and sixth category affects the variable cost of heating. Introducing EU ETS as the seventh category to this already crowded policy space will increase instrument congestion. Majone (1989) describes the concept as follows: ”in an already crowded policy space, solutions beget new problems in the form of policy overlaps, jurisdictional conflicts and unanticipated consequences”.[61]

The question of policy overlap between the six existing categories of instruments and between the existing six categories of the instruments and the EU ETS raises more fundamental questions about policy reform. Are all of the existing instruments needed? With is the optimal balance between compulsory (and voluntary) standard instruments that increase the fixed costs and instruments that increase variable costs of heating?

The most likely candidate for removal or lowering as a result of the inclusion of the total heating sector in the EU ETS are fuel taxes (excise duties), which have likely the worst overlap with the ETS of the categories mentioned above. Energy taxation of fuels used in heating varies to a large extent between the Member States and between fuels. The fuel taxes obfuscate the price signals of the EU ETS, and consequently reduce efficiency. Efficiency is reduced because emissions are not reduced in order of ascending marginal

[61] Majone, G. (1989): Evidence, Argument, and Persuasion in the Policy Process, New Haven, CT, and London, Yale University Press, pp. 158-159.

abatement cost. Other problematic policy instruments in the case of the inclusion are the production subsidies for renewable heat generation.

Existing policy instruments that affect the variable cost of emissions will distort the price signals created by the EU ETS. After the inclusion, existing instruments will not reduce emissions since heating is included in the cap of the EU ETS, and by assumption the cap is binding, in the sense that any emission reduction by the heating sector will be matched by an emission reduction by some other sector within the EU ETS.

The least likely candidate for removal as result of the inclusion of total heating sector in the EU ETS are energy efficiency standards, such as building codes. Proponents of compulsory energy efficiency standards claim that consumers severely discount the value of future energy savings, which prevents them from carrying any upfront costs for energy efficiency technologies. As a result, the technologies do not diffuse through the society or do so very slowly, for discussion see e.g. Greene et al. (2013).[62] In addition, there can be mismatches between incentives and benefits (e.g. between builder & buyer and landlords & tenants). In practice, the builder or landlords may not face the value of energy savings. These mismatches can be overcome with the energy efficiency regulation and there is already a lot of empirical evidence that energy savings measures often provide an effective, cost-efficient approach to reducing greenhouse gas emissions in building sector.[63]

## 2.2 Demand and price effects

The analysis of how inclusion of the heating sector affects the EU ETS and the current sectors covered by the EU ETS is done along two lines, by analysing the own-prices elasticities and by analysing the abatement potentials in the buildings sector of individual EU countries.

### 2.2.1 Own-price elasticity of demand

The own-price elasticity refers to changes in consumption of a particular fuel when the price of that fuel changes. Typically, responses are larger in the long run than in the short run. An example of a short-run response is lowering the indoor temperature with a couple degrees in response to increased energy bills. An example of a long-run response is upgrading the windows and insulation of a building. Elasticities for energy use in buildings found by the U.S. Energy Information Administration (2014) are reported in table 9.[64] The elasticities are believed to be very similar in Europe and the US.

[62] Greene, D., Evans, D., Hiestand, J. (2013): Survey evidence on the willingness of U.S. consumers to pay for automotive fuel economy. Energy Policy, Vol. 6, pp. 1539-1550.

[63] Institute for European Environmental Policy (2014): Review of costs and benefits of energy savings, Task 1 Report 'Energy Savings 2030'

[64] EIA (2014): Price elasticities for energy use in buildings of the United States

**Table 9. Own-price elasticity of demand for energy use in buildings found by the U.S. Energy Information Administration (2014)**

| Main category | Sub category | Short Run | | | Long Run |
|---|---|---|---|---|---|
| | | Year 1 | Year 2 | Year 3 | Year 25 |
| **Residential** | Electricity | -0.12 | -0.21 | -0.24 | -0.40 |
| | Natural gas | -0.08 | -0.14 | -0.17 | -0.28 |
| | Distillate fuel | -0.08 | -0.14 | -0.17 | -0.20 |
| **Commercial** | Electricity | -0.12 | -0.20 | -0.25 | -0.82 |
| | Natural gas | -0.14 | -0.24 | -0.29 | -0.45 |
| | Distillate fuel | -0.14 | -0.24 | -0.29 | -0.42 |

Table 9 shows that in the short-run the own-price elasticity for gas and oil is very low, both for residential and commercial use. In the long run, the elasticities are somewhat higher, especially for commercial use. However, even for the commercial use, long-run elasticities are less than 0.5 in absolute terms. For comparison, the own-price elasticities for transport fuels, which have also been suggested to be included in the EU ETS, are in the same range. In an extensive review of past research, Dahl (2012) reports that gasoline own-price elasticities vary between -0.33 and -0.11, while diesel own-price elasticities vary between -0.38 and -0.13.[65]

### 2.2.2 Analysis of the abatement potential in the buildings sector

According to AEA (2014) the buildings sector has significant abatement potential. The projected direct emissions (excluding emissions from electricity use) are 584 Mt $CO_2$ in 2020. There is potential to reduce these projected emissions by 118 Mt $CO_2$ down to 466 Mt $CO_2$. According to AEA (2014), most of the abatement potential lies in the existing building stock and can be realised by renovation measures. The most cost-effective renovations measures are related to improvements of insulation and the replacement of heating systems by more efficient ones.

Table 10 shows a side by side comparison of abatement potential in the use of heating fuels not included in the EU ETS and abatement potential in the use of fuels for mainly electricity generation (current EU ETS). The comparison includes both supply and demand side abatement measures. The table shows significant potential to reduce emissions from the use of heating fuels. The total potential is in the range of 100 Mt $CO_2$. As in generation of electricity, some of the costs are negative.

[65] Dahl A. (2012): Measuring global gasoline and diesel price and income elasticities.

**Table 10. Comparison of abatement potentials [66] [67]**

| Estimated marginal abatement cost bands for heating that are not included in the EU ETS in 2020 | | | Estimated marginal abatement cost for the EU ETS in 2030 | | |
|---|---|---|---|---|---|
| **Measure** | **Cost in euro/tCO2** | **Potential in MtCO2** | **Abatement measure** | **Cost in euro/tCO2** | **Potential in MtCO2** |
| Cost Band A | < 0 | 83.7 | IGCC (Build integrated gasification combined cycle plants in place of ultra-supercritical coal plants | -34 | 64 |
| Cost Band B | 0-25 | 3.6 | EE in Industry | 10 | 100 |
| | | | Nuclear energy | 17 | 141 |
| | | | Hydropower | 20 | 1 |
| Cost Band C | 25-50 | 1.6 | Energy efficiency 1st tranche | 35 | 60 |
| | | | Onshore wind | 39 | 39 |
| | | | Replace old lignite with new gas | 40 | 230 |
| Cost Band D | > 50 | 29.1 | Replace old coal with new gas 1st tranche | 64 | 184 |
| | | | Biomass | 74 | 200 |
| | | | Offshore wind 1st tranche | 83 | 103 |
| | | | Offshore wind 2nd tranche | 49 | 32 |
| | | | CCS 1st tranche | 127 | 14 |
| | | | CCS 2nd tranche | 68 | 28 |
| | | | CCS 3rd tranche | 51 | 229 |
| | | | CCS industry | 80 | 95 |

The costs, as reported by AEA (2014), of this emission reduction of 118 Mt $CO_2$ are shown in Table 10. Surprisingly, 84 Mt $CO_2$ comes with a negative cost. This is one manifestation of the energy paradox. The energy paradox refers to a situation where apparently cost-effective energy-saving technologies do not diffuse though through the society, or do so very slowly. One explanation of the energy paradox is that consumers severely discount the value of future fuel savings, which prevents them from carrying any upfront costs for fuel efficiency technologies (Green et al., 2013). The energy paradox has been used as an argument for compulsory building codes and efficiency standards in favour of market-based instruments.

The potentials are very unevenly distributed across member countries. Table 11 shows the ten largest EU countries in terms of abatement potential in the buildings sector. Jointly these countries represent 92% of the total abatement potential of 118 Mt $CO_2$. Germany, UK, France, Poland, Spain and Italy cover 75% of the remaining reduction potential.

Excise taxes are determined nationally. This is evident in Table 11. Tax levels vary within a very large range. In Germany the tax level per t$CO_2$ is the same for light fuel oil for heating and gas for heating. In all other countries the tax level for natural gas is lower. The tax rates for light fuel oil are above the current EUA price (7-8 euros/t $CO_2$), whereas some tax rates for natural gas are above and some below the current EUA price.

[66] AEA (2012); Next phase of the European Climate Change Programme: Analysis of Member States actions to implement the Effort Sharing Decision and options for further communitywide measures A report for DG Climate Action Appendix 1: Greenhouse gas emissions projections, emissions limits and abatement potential in ESD sectors

[67] Blyth and Bunn (2011): Coevolution of policy, market and technical price risks in the EU ETS

**Table 11. Abatement potentials in the buildings sector and costs for the 10 largest EU countries, in terms of remaining abatement potential in the building sector in 2020, as well as the current excise duty rates of the selected countries.** [68] [69]

| Member state | Remaining potential in 2020 | Remaining abatement potential per cost band in MtCO2 per year | | | | Current excise duties €/tCO2 | |
|---|---|---|---|---|---|---|---|
| | | Cost Band A (< 0 Euro) | Cost Band B (0-25 Euro) | Cost Band C (25-50 Euro) | Cost Band D (> 50 Euro) | Light fuel oil in heating | Natural gas in heating |
| **Germany** | 23.2 | 16.3 | 0.2 | 0.7 | 6.1 | 29 | 28 |
| **UK** | 17.1 | 12.3 | 0.6 | 0.0 | 4.3 | 48 | 0 |
| **France** | 15.2 | 10.1 | 0.2 | 0.5 | 4.5 | 29 | 15 |
| **Poland** | 10.7 | 8.6 | 0.1 | 0.0 | 2.0 | 21 | 6 |
| **Spain** | 10.9 | 8.3 | 0.8 | 0.1 | 1.7 | 32 | 12 |
| **Italy** | 12.1 | 8.0 | 1.1 | 0.1 | 3.0 | 151 | 71 |
| **Belgium** | 6.4 | 5.3 | 0.2 | 0.0 | 0.9 | 7 | 5 |
| **Netherlands** | 6.9 | 5.2 | 0.0 | 0.0 | 1.6 | 180 | 99 |
| **Ireland** | 2.8 | 2.3 | 0.0 | 0.1 | 0.5 | 38 | 19 |
| **Czech Republic** | 2.3 | 1.6 | 0.1 | 0.0 | 0.5 | 149 | 6 |
| **SUM** | **107.8** | **78.0** | **3.2** | **1.5** | **25.1** | **N/A** | **N/A** |

The potential in Cost band A has negative cost and includes, in addition to energy efficiency measures, abatement options like condensing boilers, use of biomass or heat pumps in heating. The fact that the current excise taxes reported in Table 11 have failed to unlock this potential can be attributed to a large extent to the long renovation cycle of buildings, which is typically in the range of 20 years.[70] With appropriate incentives in place, the potential will be realised over time as buildings are renovated. However, due to the energy paradox it is likely that market-based instruments, whether they are tax based or rely on emissions trading, will not give sufficient incentives but must be completed with compulsory energy efficiency requirements (due to the energy paradox).

The potentials in Costs Bands B and C are negligible.

Some of the abatement potential in Cost Band D could, in theory at least, be unlocked with a significant increase in the cost per $tCO_2$. Germany, UK, France, Poland and Spain all have significant potentials in Cost Band D, 18.6 $MtCO_2$ in total, and excise taxes of less than 50 Euros per $tCO_2$. To unlock this potential, even partly, the price per $tCO_2$ should increase with multiple tens of euros. A price increase in the range of 7-8 Euros which is the range where current EUA forward contract are traded is likely to have little effect in Cost Band D. Italy and the Netherlands have also significant potentials in Cost band D (4.6 $MtCO_2$in total). However, Italy and Netherlands already have very high excise taxes. Thus, increasing the tax burden further is likely contribute little to further unlocking the abatement potential in Italy and the Netherlands.

[68] AEA (2012); Next phase of the European Climate Change Programme: Analysis of Member States actions to implement the Effort Sharing Decision and options for further communitywide measures A report for DG Climate Action Appendix 1: Greenhouse gas emissions projections, emissions limits and abatement potential in ESD sectors

[69] EC (2015): Excise duty tables, Part II -Energy products and Energy, Ref 1042 Rev 1

[70] Ecofys (2012): Renovation tracks for Europe up to 2050

The abatement potentials introduced in tables 2 and 11 are short term (2020) potentials and the data lacks the discussion of the possible long term potential of the large scale CHP and efficient district heating and cooling (DHC) systems. According to the International Energy Agency, large scale CHP and DHC can play an essential role in a low carbon economy and the potential of these systems remains an untapped resource that has not been effectively pursued within the energy policy[71]. As mentioned above (in section 1) large quantities of heat are currently wasted in the EU in the conversion from the primary energy supply to the end use. In residential and commercial buildings heating and cooling needs could be met through better optimization of the energy supply and demand matrix. CHP and district heating could play an important role in achieving this optimization through technology solutions for a more efficient, integrated energy system[72] and in that way release abatement potential in the long term.

### 2.2.3 Effect on the EUA price

Both lines of analysis suggest the same conclusion; the demand for heating fuels is inelastic. The own–price elasticities are very low in the short term both for residential and commercial use and the abatement potential that could be unlocked with very high $CO_2$ prices is no more than 20 $MtCO_2$, i.e. 3 per cent of total emissions from heating of buildings. As consequence, an inclusion of the heating sector is likely to have little effect on fuel use. This is regardless of whether the current excise taxes are adjusted or not as a result of the inclusion.

With inelastic demand, the effect on the EUA price is determined by the stringency of the cap for emissions from heating fuels. If the cap is larger than current emissions, the heating sector will be a net seller of emissions allowances, which will push the EUA price down. If the cap is smaller than the current emission, the heating sector will be a net buyer of emission allowances, which will push the EUA price up.

## 2.3 Fiscal aspects

Extending the scope of the EU ETS to cover the entire heating sector is likely to affect the fiscal revenues of the member states. This sub-section describes the possible changes in terms of government revenue and how reasonable fiscal neutrality could be achieved at member state level.

### 2.3.1 Auction revenues

The total revenues collected from the energy taxes (excise duties) in the heating sector may be considerable in some EU countries and repealing the current energy taxes in the case of inclusion the sector into EU ETS could mean serious fiscal problems caused by the lost of tax revenues. As the allocation method in the EU ETS has been moving towards the auctioning mechanisms in recent years, the auction revenues could compensate at least a part of the lost tax revenue. In the phase 3, the allocation method for the power sector is mainly auctioning and after 2020 free allocation will be allocation method only for the sectors subject to international competition. This indicates that the allocation method in the case of the inclusion of the $CO_2$ emissions of the heating sector into the EU ETS, especially the heating of residential and commercial sector, would be auctioning.

[71] IEA (2014): Linking Heat and Electricity Systems, Co-generation and District Heating and Cooling Solutions for a Clean Energy Future

[72] Ibid

It is also notable that the auctioning of the EUA`s will be the main allocation method on the other sectors in the future. The total amount of the auctioned emissions unit allowances (EUA`s) in the EU ETS was around 808 million in 2013[73] and in 2020 the auction volume has been estimated to be around 973 million EUA`s[74]. The increasing auction revenues from other sectors could compensate partially lost government revenue caused by the removal or lowering the rates of the excise duties from the heating sector. The inclusion of the heating of buildings (600 $MtCO_2$ eq) into the EU ETS could raise the EUA price depending on how the cap will be set. Given the inelastic demand for heating fuels, the increase in the ETS cap as a result of inclusion will determine whether the heating sector will be a net buyer or net seller of emissions allowances. If the cap is decreased more than current emissions from heating fuels, the heating sector will be a net buyer, which puts an upward pressure on the EUA price. If the cap is increased more than current emissions, the heating sector will be a net seller, which will put a downward pressure on the EUA price. Any changes in the EUA price due to the inclusion will affect the auction revenue from all sectors subject to auctioning, not just the heating sector. With expected auction volume (973 million EUA) and estimated emissions ($584MtCO_2$ = 584 million EUA) of the heating of buildings in 2020, the multiplier is in the range of 2.5, i.e. a EUA price increase of 1 euro is fiscally equivalent to a 2.5 euro price increase of average excise tax on heating fuels in the EU. Because of the multiplier effect, a 1 euro increase of the EUA price will generate as much additional revenue as a 2.5 euro increase of the average excise tax on heating fuels.

In conclusion, the rising number of the auctions together with the expected increase of the EUA price due to the political decisions (2030 targets and MSR) will raise the revenues from the auctions in future. In addition, the cap set for heating of buildings in the case of inclusion it to the EU ETS may raise the government revenues from the auctions as well.

### 2.3.2 Alternatives to achieve the fiscal neutrality

On the other hand, ensuring single taxation by replacing the fiscal revenues from the current energy taxes with income from auctioning may still pose a serious fiscal problem to some countries. The following figure 8 shows the dispersion of the excise duties, the lowest and highest rates of the excise duties in the EU countries as well as the EU minimum price for the excise duties, current[75] EUA price and the EUA price estimation for the 2020[76].

[73] European Commission (2015): Climate Action, Auctioning

[74] The number doesn't include the backloaded 600 million allowances.

[75] 1.4.2015

[76] Thomson Reuters/Point Carbon

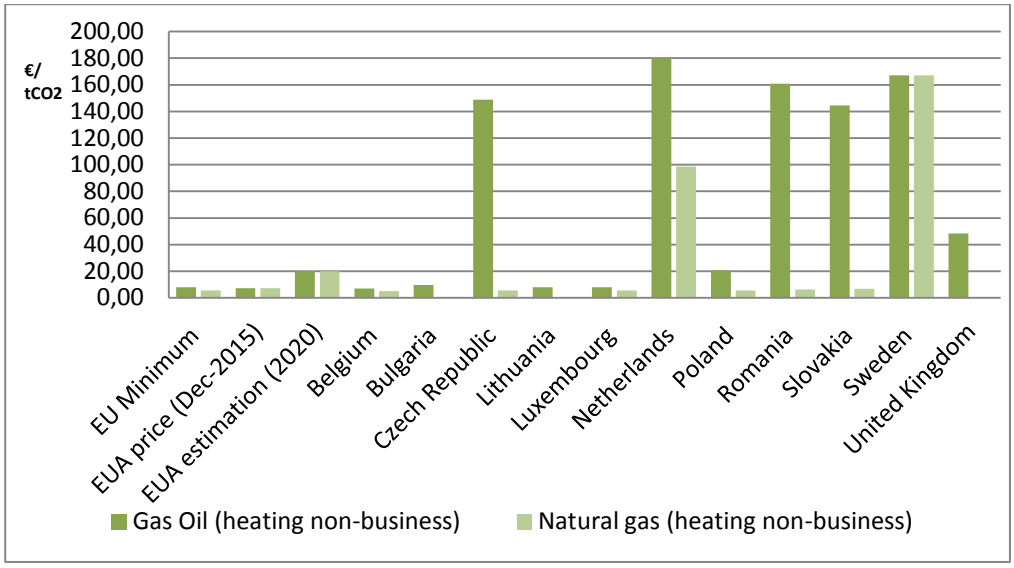



**Figure 8. Excise duty rates for gas oil and natural gas in selected member states as well as the EU minimum price for the excise duties, current (EUA price and the EU price estimation for the 2020).**

As seen in the Figure 8 the tax rates of the most used fuels (natural gas and gas) in the heating sector varies considerably between the countries and the fiscal impact caused by the removing the excise duties would vary a lot between the Member States. In addition, the figure shows that the current and estimated EUA prices are close to excise duties in some countries and clearly below the excise duties in some member states.

The differences in the energy tax rate levels between the EU countries raises the question of how much of the excise duties that actually adjust the emission externality and how much that are fiscally motivated. As already mentioned in the Commission`s proposal to revise the Energy Tax Directive in 2011, the Member States should also be able to continue to tax consumption of heating fuels for other purposes than reduction of $CO_2$ emissions, especially for revenue generation purposes. To allow for such diversified objectives and to ensure to the extent possible that all of them can be pursued in consistent manner, the Commission proposed that other than $CO_2$-related taxation should be linked to the energy content of the energy sources.[77] Some of the EU countries (e.g. Denmark, Finland and Sweden) have already divided their excise duties to the $CO_2$ tax component and energy content component.

The same idea could be used in the case of inclusion of fuels used in the heating sector into the EU ETS. The price of the emission allowance unit (EUA) would replace the $CO_2$ tax on top of the energy content part of the tax. The EUA price would generate revenues for the government via auctioning together with the energy content taxation. However, compared to the $CO_2$ component of the taxation, the difference would be that the EUA price would be determined in the carbon markets and would be fluctuated overtime. The fluctuation of EUA price could cause budgetary uncertainty more than $CO_2$ component in excise duty, which could be a problem for the state budget.

[77] EC (2011): Proposal for a Council Directive, amending Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity

The switch of the $CO_2$ component to the EUA price would lead to the creation of common $CO_2$ emissions price for all the countries and if the energy content part of the taxation wouldn`t be harmonized on the EU level it would still varied between the Member States. Harmonizing the energy content part of the taxes, which could be a cost efficient solution in the way that the "taxation" across the countries would be at the same level, is most likely not viable. The failed Commission proposal of the revising the Energy Tax Directive in 2011, where the objective was to divide the energy taxes into energy and CO2 components and to set a minimum tax rates for both components, is an example that the agreement of the harmonized taxation levels are extremely hard to find on EU level.

As mentioned above, the structure and the level of the taxation in the heating sector varies between the Member States, leaving countries in different starting points related to the compensation aspects for the fiscal revenues. To demonstrate the effects of different combinations of taxing and emissions trading, the examples how reasonable fiscal neutrality could be achieved by Member State level is valuable to outline. The following practices and 4 different alternatives won`t take a side on the cost-efficiency of the different mechanisms, but discuss it in the context of fiscal revenues because fiscal considerations have a huge weight to determine which taxes can or cannot be removed. The following alternatives could be also used on top of each other.

Alternative 1. The EUA price will compensate the entire excise duty of the fuels.

Auctioning revenue from the EUA auctions will compensate the current tax revenue collected via excise duties. This implies in particular for the countries where the current excise duty rates are on a relatively low level. However, the EU`s minimum excise duty rates should be take into account.


**Figure 9. An illustrative example of the compensating mechanisms of the lost revenue from excise duty.**

Alternative 2. The EUA price will compensate the $CO_2$ part of the excise duty.

Some of the countries have adjusted their energy taxation to follow the proposed Energy Tax Directive (2011), where the objective was to divide the excise duties into energy and $CO_2$ components. Removing the $CO_2$ tax component and replacing it by EUA price could be an option to achieve the fiscal neutrality in some countries.

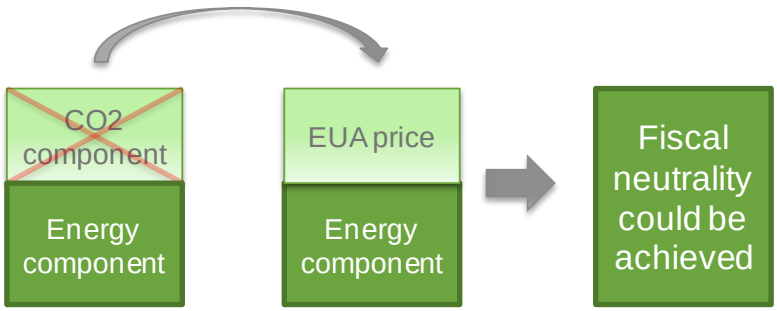



**Figure 10. An illustrative example of the compensating mechanisms of the lost revenue from excise duty if the $CO_2$ component will be removed.**

Alternative 3.The energy content tax could be increased to cover the gap between the removed $CO_2$ component and the EUA price.

For the countries that the $CO_2$ tax component is well above of the current and predicted EUA prices the option could be to set the energy content tax to a higher level to compensate the lost revenue from the $CO_2$ component.

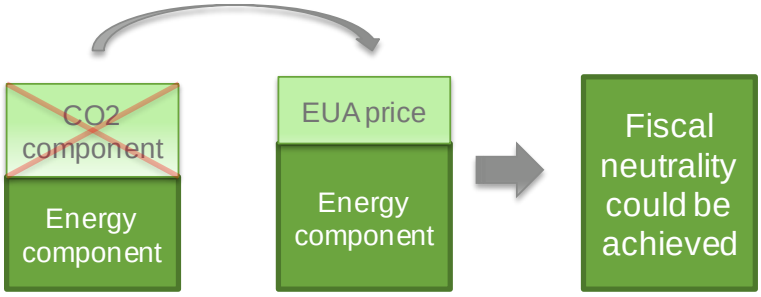



**Figure 11. An illustrative example of the compensating mechanisms of the lost revenue from excise duty if the $CO_2$ component will be removed.**

Alternative 4, A carbon "price floor" or a "carbon tax support"

A potential instrument to guarantee the fiscal revenues is to introduce a top-up carbon tax above the $CO_2$ market (EUA) price which is switched on if the market price of the EUA`s is below the desirable level, i.e. the necessary fiscally neutral carbon price. By securing revenues from both auctioning of the allowances in the heating sector and from the price floor mechanism the fiscal revenues could be upheld and guaranteed to be on the desired level.[78]

[78] Norden (2014): Nordic council of ministers, The Use of Economic Instruments in Nordic Environmental policy 2010-2013

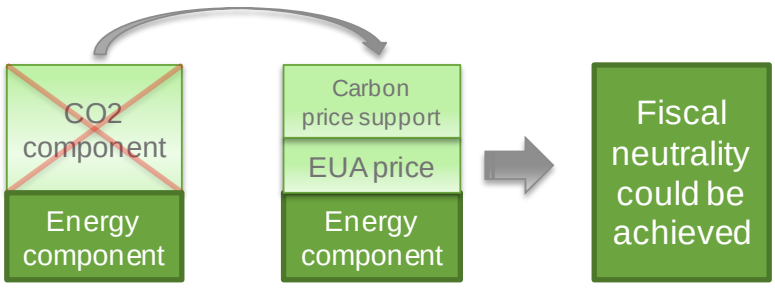



**Figure 12. An illustrative example of the carbon price support (price floor) as compensating mechanisms of the lost revenue from excise duty if the $CO_2$ component will be removed.**

Such a mechanism has been adopted in UK to encourage sufficient investment in low-carbon electricity generation. The government imposes this "carbon floor price" on electricity generators by charging a "carbon price support" on top of the ETS carbon price.

**Box 1. UK "carbon price support" mechanism for electricity generators.**[7980]

The carbon price support rate is based on the carbon content of primary fuels and it is paid in addition to the emissions allowance (EUA) price that they pay under the EU ETS. The carbon support rates will be set to try to ensure that the sum of the EUA price plus the support rates per ton of CO2 emissions is equal to the targeted total carbon price. UK has set a target carbon price pathway, which it will use to determine the carbon price that UK power generators have to pay each fiscal year from April 2013 out to March 2031 on top of the carbon price.

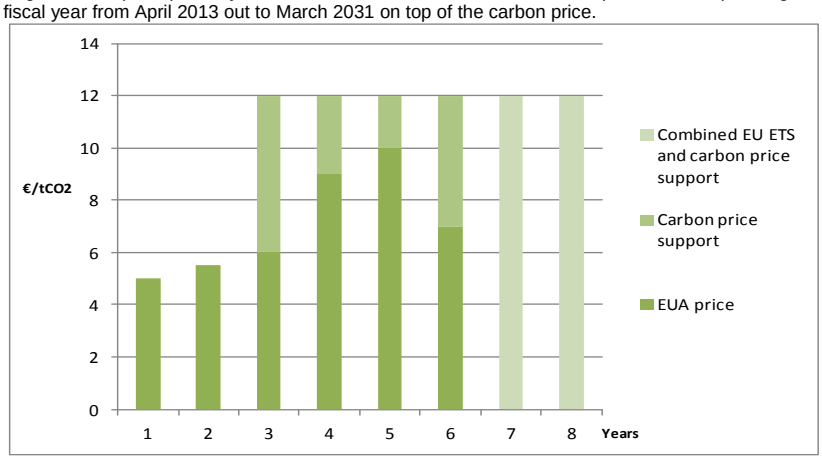



**Figure 13. Illustrative example of the UK carbon tax support mechanism.**

The carbon tax support rates in UK have been set by pre-established rules. At the end of the fiscal year, the government calculates what the inflation adjusted target price will be two years ahead (Y+2), compares this with an futures price for ETS allowances two years ahead, and derives a carbon price support to bridge the gap between them.

[79] CDCClimat (2011): Carbon Price Flaw? The impact of the UK's CO2 price support on the EU ETS

# 3. Implementation of the inclusion of the heating sector in the EU ETS

The heating sector is already included in the scope of the EU ETS through the inclusion of large installations with a capacity over 20 MW. The following section will discuss the criteria for extending the scope of the EU ETS and some of particular challenges relating to the extension of the scheme to cover the entire heating sector. It will also briefly discuss the California cap-and-trade scheme that as of January 2015 covers emissions from residential and commercial buildings and solutions adopted in that scheme to mitigate the barriers relating to the heating sector and the ETS.

## 3.1 The EU ETS Directive and extension of the scope of the Directive

The foundation of the EU ETS is set in the EU ETS Directive,[81] implemented in all EU ETS member states through national legislation. The sectoral scope of the scheme is defined in Annex I of the EU ETS Directive and an activity included in Annex I is consequently included in the coverage of the scheme in all member states, unless expressly opted-out by individual member states.[82] In addition individual member states have been given the option to extend the scope to new installations, activities and gases through the so-called opt-in mechanism in Article 24 of the EU ETS Directive. The current scope includes large stationary emitters and aviation. Stationary combustion installations are included if they have a total rated thermal input exceeding 20 MW.[83] Thus the heating sector is partially included in the EU ETS member states through the inclusion of combustion installations over the capacity threshold of 20MW. When discussing the extension of the EU ETS to the entire heating sector the question is one of including emissions also from combustion installations below the threshold, so called small emitters or installations. As already has been discussed (see section 1) e.g. Finland has already opted-in certain installations below the capacity threshold.

A Community wide extension of the Directive requires an amendment of the EU ETS Directive and Annex I. Article 22 of the EU ETS allows for the adoption of amendments to non-essential elements to the EU ETS through a “comitology” procedure whereby the Commission (assisted by member states through committees) has been granted power to adopt amendments subject to scrutiny by the European Parliament and the Council. However, the coverage of the EU ETS is not a non-essential element and amendment of the scope of the activities has previously taken place in conjunction with a revision of the EU ETS and in accordance with the ordinary legislative procedure. Under the ordinary legislative procedure legislation is jointly adopted by the European Parliament and the Council of the European Union on the basis of a proposal by the Commission.[84] The scope of the EU ETS was extended e.g. in the beginning of 2012 through the inclusion of aviation

[81] EC (2003): Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending the Council Directive 96/61/EC OJ L 275.

[82] Article 27(1) of the EU ETS Directive grants member states the right to exclude small installations (with less than 25 000 tonnes of CO2 equivalent reported to the authorities) subject to the criteria of Article 27 having been met.

[83] With the exception of incineration installations for hazardous or municipal waste that are expressly excluded.

[84] Article 289

and in the beginning of the third trading period through inclusion of certain new industries, e.g. the chemical industry.[85]

When considering the extension of the scope of the EU ETS as a policy option the Commission has taken into account the following aspects:

(i) effectiveness of different policy options to meet the objective of the policy (how effective are different policies targeting emissions at reducing emissions);

(ii) efficiency of the policy i.e. the extent to which the objectives can be met at given level of resources/least costs (the costs for reaching the emission reduction target under different policy options);

(iii) consistency of the policy options with policies already in force (is a policy aimed at reducing emissions consistent or contradictory to other policies in force).

The assessment is further based on the following criteria; environmental effectiveness, economic efficiency, administrative costs, competition and internal market and finally employment. As a starting point the environmental effectiveness of the EU ETS is presumed to increase when extending the coverage, unless the overall cap is not undermined e.g. due to carbon leakage or an unambitious cap. When assessing the economic efficiency of increasing the cap the overall objective of the EU ETS should be taken into account, i.e. achieving emission reductions at least cost and thus costs for implementing the policy should not be disproportionate to the benefits achieved by including new activities. This includes costs entailed by the compliance entities (e.g. for monitoring, reporting and verification) but also the increase of the administrative burden that is a result of a possible increase of entities in the system. As a starting point the cost-efficiency of the scheme has been presumed to increase with a larger scope as more sectors and installations benefit from the flexibility of the EU ETS without compromising the emission reduction target. The carbon price signal set through the ETS reflecting the cost of carbon in the society has also been seen to constitute an important factor and allows for identification of low costs emission reduction measures.[86]

In 2012 the emissions from the buildings sector alone in the non-ETS sector were around 600 MtCO2, which makes the heating sector a significance emission source in the EU (the cap for the entire EU ETS in 2015 was set at 2000MtCO2eq), which speaks for the consideration of inclusion of the entire sector in the scheme.

As mentioned above individual member states have also been given the option under article 24 of the EU ETS Directive to unilaterally extend the scope of the scheme by opting-in new installations, activities and gases. Under Article 24 an individual member state applies for opt-in and the application is to be approved through a comitology procedure. If the opt-in covers new activities and thus amends essential elements of the ETS the proposal is also subject to scrutiny by the European Parliament and the Council.[87] The criteria to take into account for opting-in are relevant impacts of the inclusion: effects on the internal market, potential distortions of competition, the environmental integrity of the scheme and the reliability of the planned monitoring and reporting system.

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[85] EC (2008): Directive 2008/101/EC of the European Parliament and of the Council amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community and Directive 2009/29/EC of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community.

[86] EC (2008): Commission Staff Working Document, accompanying document to the Proposal for a Directive of the European Parliament and of the Council Amending Directive 2003/87/EC so as to improve and extend the EU greenhouse gas Emission allowance trading system, Impact Assessment, SEC(2008) 52

[8787] Article 23(3) of the EU ETS Directive

As mentioned in section 1, Finland and Sweden have e.g. opted in installations under the 20MW threshold to due to domestic circumstances. Both countries have a large share of small installations below the EU ETS capacity threshold. In e.g. Finland there were concerns that the capacity threshold would distort the market in favour of small installations at the expense of large combined heat and power plants (CHP's). This would happen as a result of installations owners attempting to avoid compliance obligations by connecting several small installations to the district heating network rather than large but efficient CHP's. The worst case scenario to be avoided was an increase of emissions from the district heating sector by an increased number small installations and reduction of large CHP's.[88]

## 3.2 Feasibility of Monitoring, Reporting and Verification – a basic condition of extending the scope of the EU ETS

Common for both amending the EU ETS Directive and the opt-in is that both set the technical feasibility of Monitoring, Reporting and Verification (MRV) as a basic condition for extension of the scope of the system. A robust Monitoring, Reporting and Verification of emissions from greenhouse gas sources guarantees the environmental integrity of the EU ETS.[89] In addition to a high level of accuracy of MRV the collection of data necessary for the MRV should not be very complex.[90] In other words, if emissions from a sector cannot be monitored, reported and verified with a sufficient level of accuracy or the process for collecting information on the emissions is very complex, a sector or activity is not a first hand candidate for inclusion in the EU ETS. Inclusion of large combustion installations shows that monitoring is technically feasible but the challenge for extending the EU ETS also to small installations is the cost-efficiency of MRV. The transaction costs for compliance are disproportionately high compared to the size of the individual emission sources. The heating sector is a significant emission source but the total number of boilers in residential buildings in the EU has been estimated to the amount of 132 million (see the table 1 in sub-section 1.2). The large amount of installations poses a challenge for regulation of the installations under an ETS and administration of the scheme.[91]

The transaction costs are accrued from the compliance process. All entities included in the scope of the EU ETS are required to have a permit issued by national authorities to emit greenhouse gases.[92] The emissions are monitored and annually reported to the national authorities by the installation owners and verified by accredited independent entities. After the reported emissions have been verified the entities surrender a corresponding amount of emission allowances through their account in the Union Registry. The MRV and the

[88] Government of Finland (2004): HE 49/2004 Hallituksen esitys Eduskunnalle päästökauppalaiksi sekä laeiksi ympäristönsuojelulain 43 §:n ja Energiamarkkinavirastosta annetun lain 1 § muuttamisesta.

[89] Commission of the European Communities (2008): Commission Staff Working Document accompanying document to the Proposal for a Directive of the European Parliament and of the Council Amending Directive 2003/87/EC so as to improve and extend the EU greenhouse gas Emission allowance trading system: Impact Assessment, SEC(2008) 52

[90] Commission of the European Communities (2008): Commission Staff Working Document accompanying document to the Proposal for a Directive of the European Parliament and of the Council Amending Directive 2003/87/EC so as to improve and extend the EU greenhouse gas Emission allowance trading system: Impact Assessment, SEC(2008) 52

[91] EC (2014): Commission Staff Working Document Impact Assessment Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A policy framework for climate and energy in the period from 2020 up to 2030 SWD/2014/015 final

[92] The Ministry of Employment and the Economy (2014): Information on the fee for the emission permit in Finland are found in the Decree 57/2014 of the Ministry of Employment and the Economy (Työ- ja elinkeinoministeriön asetus Energiaviraston maksullisista suoritteista 57/2014)

surrender of emission allowances constitute compliance obligations. The regulation governing the compliance obligations and the Union Registry are to a large extent harmonized in the EU ETS and complemented and implemented nationally. Some of the principles governing the MRV are included in the EU ETS Directive. In addition to the regulations on MRV, the two main regulations governing the MRV are the one on monitoring and reporting (the so-called MRR-regulation)[93] and one governing the accreditation of accredited entities and verifications[94]. The rules governing the functions of the Union Registry are also harmonized in the so-called Union Registry Regulation[95]. Article 24 of the EU ETS Directive states that the Commission can adopt new MRV-regulation if a member states opts-in new sectors, gases and activities.

In connection with the revision of the EU ETS for the third trading period the Commission assessed the capacity threshold for inclusion of combustion installations. The inclusion of smaller installations has so far been prevented by the high administrative costs for MRV, making the ETS a less cost-efficient tool than other policy tools for reducing emissions on an EU-level. MRV entails costs for the participants as well as the administrators and implementing agencies. The costs entailed by MRV are proportionate to the annual emissions for large emitters but not in relation to the annual emission of small and medium size emitters. The cost-benefit ratio for including small emitters appeared unbalanced and the administrative costs for higher compared to the benefits of their participation (costs for MRV).[96]

There are examples of other cap-and-trade schemes that has developed systems to include small-scale sources in the scheme without compromising cost-efficiency of MRV. For example California's cap-and-trade programme has included residential and commercial buildings and road transport by posing a compliance obligation of transport fuel and natural gas suppliers. The same approach has been raised by the Commission for inclusion of heating of buildings and road transport into the EU ETS.[97] The opportunities and challenges of this so-called up-stream approach are discussed in the following section.

### 3.3 Opportunities and challenges when moving the ETS compliance obligations upstream

The current EU ETS Directive is based on the principle of direct emissions, meaning that the point of regulation (the entity responsible for MRV of emissions and surrender of allowances) is the point of release of greenhouse gases to the atmosphere. This means that it is the installation or the aircraft operator that is regulated under the EU ETS and not e.g. the fuel distributors or refineries. This so-called downstream approach is not the only

[93] EC (2012): Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council Text with EEA relevance *OJ L 181, 12.7.2012*

[94] EC (2012): Commission Regulation (EU) No 600/2012 of 21 June 2012 on the verification of greenhouse gas emission reports and tonne-kilometre reports and the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council Text with EEA relevance, OJ L 181, 12.7.2012

[95] EC (2013): Commission Regulation EU No 389/2013 establishing a Union Registry pursuant to Directive 2003/87/EC of the European Parliament and of the Council, Decisions No 280/2004/EC and No 406/2009/EC of the European Parliament and of the Council and repealing Commission Regulations (EU) No 920/2010 and No 1193/2011, OJ L 122, 3.5.2013

[96] EC (2008):Commission of the European Communities, Commission Staff Working Document accompanying document to the Proposal for a Directive of the European Parliament and of the Council Amending Directive 2003/87/EC so as to improve and extend the EU greenhouse gas Emission allowance trading system: Impact Assessment, SEC(2008) 52

[97]EC (2014): Commission Staff Working Document Impact Assessment Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A policy framework for climate and energy in the period from 2020 up to 2030 SWD/2014/015 final

choice of point of regulation in an ETS. The point of regulation can also be upstream, in which case the emissions are regulated higher up in the supply chain, e.g. at supplier /distributor level.[98] The California cap-and-trade scheme is an example of a mixed upstream and downstream scheme, where large stationary sources are subject to compliance obligations but emissions from road transport and residential and commercial buildings are included through the inclusion of transport fuel and natural gas suppliers.[99]

As discussed above (in section 3.1.3.2) the benefit ratio of the EU ETS is increased when the point of regulation is entities that are accountable for a larger share of emissions. One potential option for including the entire heating sector is to move to a mixed upstream/downstream system. The upstream approach has been discussed by the Commission as an option for inclusion of both road transport[100] and end-users in the energy sector. An upstream approach has been considered to contain many advantages, such as being administratively less complex.[101] Under the Californian cap-and-trade scheme natural gas (covers around 60% of the fuels used for residential heating[102]), distillate fuel oil and liquefied petroleum gas (or blends that contain any of these fuels) suppliers are the point of regulation while also including large stationary sources.[103] Road transport fuel and natural gas suppliers providing an amount of fuel that if combusted would result in more than 10,000 tonnes of $CO_2$ equivalent annually are required to monitor and report their emissions and fuel suppliers who provide an amount of fuels that if combusted would result in more than 25,000 tonnes of $CO_2$ equivalent are in also obliged to have the emissions verified by an accredited entity and surrender an amount of allowances corresponding to the emissions.[104]

Heating is as stated in previous sections partially already included in the EU ETS. Possible upstream point of regulations for the small scale emission sources in the EU ETS could be natural gas and other fuel suppliers (distributors, importers and refineries), tax warehouse keepers or excise duty points.[105] Moving the compliance obligation to upstream also requires adoption of new MRV regulation, requirements and guidelines as the MRV of emissions at the source differ from MRV performed upstream e.g. by the fuel suppliers. The Californian cap-and-trade is an example of a functioning mixed upstream and downstream system, with a MRV framework in place also for upstream points of regulation. The boxes below demonstrate the main characteristics of the MRV-requirements for the fuel suppliers in California.

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[98] Kerr, S. and Duscha, V. (2014): "Going to the Source: Using an Upstream Point of Regulation for Energy in a National Chinese Emissions Trading System". Motu Working Paper 14-09. Online:

[99] Title 17 of California Code of Regulations (CCR), Section § 95811

[100] Road transport also faces the challenge of constituting a sector with a large amount of small emissions sources (separate vehicles) and thus downstream MRV accruing high administrative and transaction costs.

[101] EC (2014): Commission Staff Working Document, Impact Assessment, Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A policy framework for climate and energy in the period from 2020 up to 2030 SWD/2014/015 final.

[102] U.S Energy Information Administration (2009): Household energy use in California

[103] Title 17 of California Code of Regulations (CCR), Section § 95811 - § 95812. The threshold for large stationary sources in Califoria is linked to the annual emission (whereas in the EU ETS it is linked to the capacity of the installation). Stationary sources emitting more than 25,000 tons of CO2eq. annually are subject to all compliance obligations under the Californian cap-and-trade.

[104] Title 17 California Code of Regulations (CCR), sections 95100-95158

[105] EC (2014): SWD/2014/015 final

## Box 2. Reporting of transport fuels in the Californian scheme[106]

Reporting threshold:

In California, transportation fuel suppliers, importers and refineries shall report fuel volumes and associated GHG emissions if they supply fuel amount corresponding (If completely combusted, oxidised or used in other process) more than 10 000 tCO2e per year. If the supplied fuel corresponds more than 25 000 tCO2e per year, the emission report must be verified and is subject to the Cap and Trade Scheme.

Tracking delivered fuels and avoiding double counting:

- Fuel suppliers report fuel delivered across terminal racks (pump mechanism that delivers fuel from the terminal storage tanks into e.g. trucks or trains for distribution)

  (Fuel transfers that take place upstream of terminal track in the terminal system are not reported. Nor are the transfers across subsequent racks, as the fuel was already once reported. The downstream fuel supplier must have adequate documentation that the fuel was purchased from an upstream rack)

- Fuel importers report imports to California that do not go via terminal system (and subsequently across the terminal rack).

  (The fuel imports to the terminal system shall not be reported as they will be ultimately transferred across a terminal rack if delivered to California and reported then)

- Refineries report fuels that they deliver across terminal racks and fuel delivered via pipeline to other parties than licensed fuel suppliers

  (Licensed fuel suppliers will ultimately deliver fuel purchased from refineries across the terminal rack and report them then)

Separating fuels delivered out of the scheme:

Fuel that's final destination is outside California or that is used exclusively in marine or aviation is not included to the emission trading and is not counted to the threshold nor reporting obligation. Exclusion of fuels on these bases shall be proofed by adequate documentation:

- Primarily by Bills of Lading (BOL) confirming specific delivery destination
- For fuels not saleable in California, primary documentation is proof that fuel does not meet California regulations (also BOL may be required in verification)

Tracking biomass blended diesel:

The party who adds biomass component to fuel assumes that all the blended biomass was derived across the fuel rack of their company and displaces equivalent volume of petroleum diesel delivered across their rack. All the fuel sold by the blender to other suppliers in the bulk system (upstream of the blendrs rack) would be reported as 100% petroleum fuel by the downstream suppliers once ultimately delivered across their racks.

Selected facts on MRV:

- The scheme covers emissions of CO2, CH4 and N2O – standard emission factors used
- Fuel suppliers report their internal monitoring procedures in GHG Monitoring Plan
- Actual reporting is done yearly - Fuel data is entered to a provided reporting tool that does all the calculations automatically
- There are many acceptable methods to collect the fuel volume data
  - Primarily measured by meters measuring fuel coming in and going out of the terminal via terminal rack
- Tank inventory measurements, meters measuring fuel exiting from refineries to terminals, invoices from upstream fuel suppliers

[106] Californian Environmental Protection Agency (2015): ARB, Guidance for California's Mandatory Greenhouse Gas Emission Reporting: Greenhouse Gas Reporting Guidance for Suppliers of Transportation Fuels and Natural Gas Fuels.

**Box 3. Selected facts of the natural gas reporting in the Californian scheme[107]**

The operator of the distribution pipeline that physically delivers the gas to the end-user must report the emissions associated with the delivered natural gas.

Reporting threshold:

The same as in the transport fuels:

- Reporting threshold is fuel amount resulting to more 10 000 tCO2 per year when combusted and the threshold for verification and cap-and-trade regulation is 25 000 tCO2 per year

Emissions covered by the emissions trading, of a natural gas supplier, are the total emissions from fuel delivered to end users that are not under the emissions trading by themselves (the covered emissions don't include transfers to other natural gas suppliers and deliveries to other covered facilities). Covered emissions depend on the data beyond the boundaries of natural gas suppliers and thus they are not calculated by themselves.

In a mixed scheme with both upstream and downstream emitters the double counting of emissions should be prevented. Emissions should be reported only once, either by the entity supplying fuels or the entity combusting the same fuels. In California, the fuel suppliers might export fuels out from California and only emissions from combustion of fuels within California are under the scope of the Californian cap-and-trade scheme. The same applies for fuels distributed to aviation or maritime applications also falling outside the scope of the Californian cap-and-trade scheme. Consequently the fuel suppliers are not required to monitor, report and verify emissions from fuels distributed either outside California or sectors outside the scope of the ETS subject to the provision of sufficient evidence that the fuels have indeed been exported out from California or supplied to non-ETS sectors. A similar approach could be envisaged for provision of fuels to large stationary sources with compliance obligations themselves. Fuel suppliers would be exempt from monitoring, reporting and verifying the emissions from fuels distributed to large stationary installations having compliance obligations under the EU ETS subject to the fuels suppliers providing sufficient evidence of the fuel being provided to another entity with compliance obligations. The issue of double counting is of central relevance to the environmental integrity of the EU ETS and thus an assessment of the most suitable and reliable approach would need further examination.

## 3.4 Concluding remarks

The part of the heating sector that has not been included in the scope of the EU ETS constitutes a significant source of emissions, approximately 600 million tonnes of $CO_2$eq annually from the heating of buildings (IPCC 1A4a and 1A4b). The presumption is that the economic and environmental efficiency of the EU ETS increases when the scope of the EU ETS is extended. The impacts of the extension of the scope are however also dependent on addressing market barriers and imperfections, such as e.g. low price elasticity.[108]

The technical feasibility of MRV is an absolute requirement when new activities are considered for inclusion in the scheme as the MRV of emissions guarantees the environmental integrity of the ETS and thus the credibility of the scheme. MRV for heating

[107] Californian Environmental Protection Agency (2015): ARB, Guidance for California's Mandatory Greenhouse Gas Emission Reporting: Greenhouse Gas Reporting Guidance for Suppliers of Transportation Fuels and Natural Gas Fuels

[108] Commission Staff Working Document Impact Assessment Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A policy framework for climate and energy in the period from 2020 up to 2030 SWD/2014/015 final

is technically feasible for individual installations and boilers, but the cost efficiency of the MRV is a challenge for sectors consisting of a large amount of small emission sources. The challenge of cost efficient MRV in relation to the size and amount of emission sources has also been relevant when discussing inclusion of the road transport, which as an entire sector constitutes a significant emission source but consist of a large number of small separate emission sources (separate vehicles).[109] The benefits of extending the scope to sectors with a large amount of small emission sources is disproportionate to the costs accrued for MRV to individual installation owners and to regulators and administrators of the EU ETS. Both the complexity and the costs for administration of the EU ETS increase when a large number of emissions sources are included.

The solution to this barrier also raised by the Commission is to place the compliance obligation upstream.[110] No concrete proposal as to which actors in the supply chain would be the most appropriate has been presented, but different options have been mentioned e.g. fuel suppliers. A notable difference between road transport and the heating sector is that road transport is currently in its entirety outside the scope of the EU ETS whereas large combustion installations over the capacity threshold of the EU ETS Directive (including installations in the heating sector) are included in the scheme. For heating, this would mean that either the compliance obligation for the entire sector is moved to upstream entities or that the point of obligation are the upstream entities for small scale sources and the direct source of emissions (i.e. the installation) for large scale sources. In the Californian cap-and-trade scheme transport fuels and natural gas suppliers have been included as the point of regulation, in addition to large stationary sources. As demonstrated in the text box above MRV is technically feasible for fuels suppliers.

A shift from the current downstream approach and principle of direct emissions requires an amendment of the wording of the Directive and introduction of monitoring, verification and reporting requirements for upstream entities. An amendment of the Directive requires implementation through national law in every member state. The current Directive is based on the principle of direct emissions, i.e. including the direct source of emissions as the point of regulation carrying the compliance obligation. The different practices in the member states of the EU ETS pose a challenge for the short term implementation of an upstream approach.[111] Questions of double counting of emissions would also require to be addressed appropriately. Inclusion of upstream emitters is an amendment of essential elements of the EU ETS and would require the adoption of a MRV-framework for upstream point of obligations.

The scope of the EU ETS can be extended in all EU ETS member states through an amendment of the Directive or by individual member states through the opt-in provisions. The questions of the benefit-ratio between increased costs due inclusion of new sectors and activities (costs for both compliance entities and administrators) and the benefits (environmental and economic) of a scheme with a larger scope and more participants has been central in the assessment of possible extension of the scheme. The difference between the benefits and costs for extending the scope in all ETS member states and an extension by individual member states through opt-in would require further analysis. There is likely not only differences in the costs for MRV between member states, but also the amount of emissions outside the scope of the EU ETS and amount of entities accountable for the emissions (boilers and fuel suppliers) vary. However, an inclusion of upstream emitters through opt-in limit the benefits of the inclusion as the amount of emissions and entities covered limited compared to an EU ETS wide inclusion.

[109] Impact assessment, include emission data on road transport.

[110] EC (2014): SWD/2014/015 final

[111] EC (2014): SWD/2014/015 final

# 4. Conclusions

The EU ETS started in 2005 aiming to reduce greenhouse gases in a cost efficient way. The objective of the EU ETS has been to open the system for gradual sectoral, geographical and gas coverage extension and consequently the scope of the scheme has been extended already several times. The Commission has already discussed the possibility of including the fuel consumption of the current non-ETS sectors to the EU ETS sector.

Currently a minority of the heating sector emissions are included in the EU ETS through the inclusion of large combustion installations. In addition, some member states have opted-in certain small installations. However, relatively significant emissions from single heating boilers and heating of individual buildings fall outside the scope of the ETS. These emissions are also high in relation to the current EU ETS cap and this speaks for the consideration of inclusion of the entire sector in the scheme.

The argument for expanding the EU ETS is to improve the cost efficiency of reducing emissions. Current tax rates for the heating fuels in the member states are mostly above the EUA price and thus already provide more incentives to reduce emissions. However, given the large differences and some cases of low levels in excise taxes on heating fuels across member states and fuel types, there is likely room for improving cost efficiency.

However, there are a number of obstacles in the inclusion. Firstly, the EU ETS would overlap with existing policy instruments regulating the non-ETS heating emissions. The existing policy instruments are a complex combination of taxes and command-and-control regulations, like energy efficiency measures. The most likely candidates for adjustment up on inclusion of the sector into the EU ETS are fuel taxes (excise duties).

Secondly, removing or lowering excise duties may threaten government revenue. This applies especially for the member states with current high excise duties. It is nonetheless possible to compensate part of the tax revenue with increased revenues from emission allowance auctions. There are multiple alternatives for member states to achieve reasonable fiscal neutrality.

Thirdly, the challenge of including the non-ETS heating sector consisting of a large amount of small emission sources is the high costs for monitoring, reporting and verification (MRV) of the emissions as well as the increase of the administrative burden of regulators. A cost-efficient solution could be to place compliance obligations for small emissions sources upstream by including entities higher up in the supply chain, e.g. fuel suppliers and distributors. This approach has been raised by the Commission in 2014 and is utilized under the Californian cap-and-trade scheme. Moving the compliance obligation to upstream entities would require adoption of new MRV regulation, requirements and guidelines for upstream entities and the questions of double counting of emissions would have to be appropriately addressed. In addition, the wording of the Directive would require an amendment to include also upstream emission sources.

A defining feature of the demand for heating fuels is that the demand is very inelastic in the short term. Hence, the inclusion of the heating sector in the EU ETS would have a little effect on emissions in the short term regardless of whether current excise taxes are adjusted or not. However, in the long-term inclusion in the EU ETS may unlock some of the previously unrealized abatement potential in the non-ETS heating sector. This applies especially to the member states, where current excise duties on heating fuels are close to zero.