Reporting energy savings from energy taxes and CO2 pricing for the Energy Efficiency Directive (EED) – *experiences, challenges and methodological aspects*

Workshop report

TOWARDS BETTER ENERGY EFFICIENCY POLICIES

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ENSMOV Project

ENSMOV is an EU-funded project aiming to support public authorities and key stakeholders in 13 Member States (MS) and the UK, represented by its consortium (Austria, Belgium, Bulgaria, Croatia, France, Germany, Greece, Hungary, Italy, Lithuania, Netherlands, Poland, Romania and the UK, addressing all 27 MS, the UK, and accession countries) to monitor, revise, improve and complement the design and implementation of their national energy efficiency policies by developing resources on practical and strategic issues arising from the Article 7 EED.

ENSMOV follows up on two other very influential projects that have helped to shape Member State policies to address Article 7 requirements of the EED – IEE ENSPOL (www.enspol.eu) and H2020 MULTEE (https://multee.eu/).

ENSMOV has the following strategic objectives that will deliver impacts beyond the duration of the project:

a) to ensure that energy efficiency policies do not only promise, but also realize a major, long-term contribution to the energy, environmental, economic and security goals of the EU and MS under the Energy Union; and

b) to sustain an active platform and community for knowledge exchange of best practices in policy development and implementation of Article 7 EED policies, strengthening cooperation and improving the dialogue between national policymakers and stakeholders across the EU.

Representatives of EU Member States and beyond are invited to participate in international workshops and can contact the project coordinator in order to arrange national workshops.

Introduction

This document offers overview of the ways Member States are implementing taxation measures to achieve Article 7 EED targets and how they calculate and report saving calculations to the European Commission.

1. Context

Article 7 of the EED is one of the most important instruments for achieving the ambitious European energy efficiency targets. EU Member States can meet the energy savings obligation set in the Article 7 with Energy Efficiency Obligation Schemes (EEOs) and/or alternative measures. Energy and carbon dioxide taxation as alternative measures are becoming increasingly popular among EU Member States as a means of complying with the EED energy savings obligation.

Results from the ENSMOV Stakeholder needs assessment indicate that one issue regarding taxation that has emerged from recent experience is reporting of energy savings on the basis of robust estimates of price elasticities of demand. The current approaches on how to calculate and report energy savings by energy taxation and CO_2 pricing vary between Member States.

To support EU Member States with this challenge, a thematic workshop was held, which focused on experience sharing between Member States and on highlighting best practices. More specifically, appropriate approaches/methodologies are presented for quantification and reporting of energy savings from energy taxes and CO2 pricing and specific challenges (such as additionality, materiality) were discussed. This should ensure the further applicability of energy taxation and CO2 pricing as a means of meeting energy saving obligations for Member States. This report summarizes the key aspects covered in the taxation workshop.

2. Introduction to the EU policy framework (DG ENER, EC)

Taxation measures were implemented in several Member States in the first period from 2014 to 2020 and will be used in the upcoming period from 2021 to 2030 (as already nine Member States mentioned taxation measures in their National Energy and Climate Plans (NECPs)). The main taxation measure in these Member States are excise duties on electricity, natural gas, and oil products, fuels for transport and space heating or on other specific energy products. From the experience from the first period (2014-2020) taxation measures can be considered effective in a sense that they can generate a high share of cumulative energy savings.

However, the implementation of taxation measures requires a high degree of knowledge on how to calculate the energy savings in an appropriate way, and also the impact on the overall energy efficiency target. From the MS perspective it was identified that taxation measures appear to be an effective tool to cover the energy savings gap (from poorer savings delivery from incumbent measures) within short time. Some Member States notified taxation measures in the middle of the obligation period 2014 to 2020, in addition to existing policy measures implemented trough Article 7 EED. In order to generate real and reliable energy savings though, taxation measures should be designed carefully and aim at structural effects and facilitate the market transformation. Taxation therefore can be used in parallel and complementary to other alternative measures, which can then increase the overall measures' effectiveness in each national policy package. As an example, the signal on price increase of energy sources can further stimulate the adoption and purchase of energy efficiency measures/products (hence leading to higher market penetration next to potential subsidy measures).

In order to demonstrate energy savings from taxation measures, it is equally important to not only carefully design, but also to assess the counterfactual energy consumption (in essence to estimate what the consumption would be in the absence of the taxation measure). In this regard, the Commission published a recommendation, and there is a specific appendix where calculation support is provided to Member States.

EED revision

The Commission is carrying out the revision of the EED as announced in the European Green Deal (the EC committed to review and revise if necessary, the Energy Efficiency Directive and also other directives like the Renewable Energy Directive by June 2021). The starting point for the assessment is the target of at least 55% of CO2 reduction by 2030 in the fit-for-55 package and the EU climate law. This will require increased efforts also in energy efficiency. In this process, there was no special intention to revise the energy savings application, also Article 7 EED, as it has already been subject to amendments within the framework of the Clean Energy Package in 2018. Taxation measures will still be considered as an effective policy to achieve the required amount of energy savings if such measures are implemented in line with the requirements. Member States should carefully assess and show how elasticities have been applied within the taxation measure.

3. Assessment of the impact of taxation measures on energy savings claimed under Article 7 EED

In the first Art 7 EED period (2014 to 2020), several Member states implemented taxation measures for different energy sources, while others had specific taxation for sectors, such as for instance transport fuels. In some Member States taxation contributed largely on the reported savings, more than 75% of the cumulative savings, others less, around 20% in most Member States.

Furthermore, taxation was reported early enough in most Member States with very clear objectives on the purpose and target of the taxation, as this was one of the requirements of the EC. Member States must demonstrate that the taxation measure has an energy-focused and specific target. In some countries that were asked to provide more information on the taxation, energy and CO2 taxes are introduced recently, in the last two years as an alternative measure and the reason for that was to close the gap in the energy savings. In general, there are a lot of interactions of taxation measures with other policies under the Article 7 EED. In most cases they are complementary rather than overlapping and the main interactions are with grants and subsidies in different sectors, especially in households. Since there are a lot of possible alternative measures, there is a logic in introducing taxation later on to fill the gaps.

Guidance note and methodologies

The most important element in estimating energy savings from taxation measures is to provide a clear indication on the price elasticity values used. There are two ways to calculate the elasticity:

- Direct estimation: Study for short (1-2 years) and long term (15-20 years) estimates/ modelling scenarios/ national verified databases/ inclusion of parameters (income, prices, other measures, seasonal effects, autonomous efficiency improvements, etc). It is clear that if the calculation is started now, with the COVID-19 period and the changes in the energy demand, the data that are available will not be relevant for the calculation of short – term elasticity.

- Indirect estimation: Regressions from academic literature results, particular sector in another (similar) country/ justifications are required in all cases.

When energy savings are calculated, the elasticity should count for the net effects of changing prices. It is also important to make use the counterfactual scenarios or decomposition analysis (the counterfactual scenarios meaning what would have happened without taxation).

For the Counterfactual scenarios, the following calculation options are provided:

a) Bottom-up: estimation of granular estimates of energy use or energy savings and on the multiplication of these granular estimates up to the total level of the affected population
b) Extrapolation of trends observed before the intervention: Past trend to evaluate the changes over time; and
c) Comparison with similar (regional or national) markets where the policy measure is not introduced.

Important: counterfactual should ensure that the energy savings that are estimated are directly attributable to the adopted taxation measure, taking into account energy savings from accompanying taxation policy instruments and beyond the EU minimum. An alternative to that is the decomposition analysis (disentangling of the effects of individual policies in sub sectors and end uses)

4. Sweden's tax model approach for implementation of Article 7 EED

To address market imperfections and energy efficiency targets, Sweden applies different *complementary* policy instruments. The foundation for Swedish energy efficiency policy is the tax on energy and CO_2 emissions and the EU-ETS as general economic instruments (setting thus price signals as the core policies). These policy instruments are complemented with energy performance regulation, informative instruments, R&D, including technology deployment and other (over 10) policies.

Sweden has a long history of taxation as it was introduced in 1950 and the carbon tax was introduced in 1992. Since 1991, in the energy and climate policy framework, taxation of energy use and CO_2 emissions are the central policy instruments. Carbon tax and energy taxes are adjusted yearly with the Consumer Price Index (CPI) also adjusted with the GDP growth.

How does the carbon tax look like?

The general level of the CO_2 tax has been increased several times and is currently at 1.14 SEK (0.11 €)/kg CO_2. In the transport sector, petrol and diesel increased to 10% and 13% respectively over the period 1998-2020, and also electricity taxes up to 16%. In 2018 there was a reduction due to an Obligation Scheme, as suppliers of the petrol and diesel are now obliged to mix biofuel in their petrol and diesel sales to reduce their CO_2 emissions.

Industry as a whole is also under energy and carbon taxation, while most heavy industries are also covered by the EU ETS. Furthermore, there are also other instruments, but most industries make use of tax exemptions because of the international market competitiveness.

Article 7 EED approach

The approach for estimating energy savings for the Article 7 EED targets is top down. Sweden tries to capture the effect of carbon and energy taxes and other policy effects on prices and then calculates the price effect to avoid double counting. This allows to demonstrate the effects from taxes when estimating the effects from all policy instruments.

Swedish energy efficiency policies are based on price signals/increases through different instruments, as efficient price signals can lead to different measures for energy efficiency. This approach can minimise administraton costs. Eligible energy savings that can be counted against the target are the savings originating from price differences between Sweden and EU minimum tax levels including VAT. In a simplified form the calculation form used is:

*Energy saving = price elasticity * (Swedish tax level – EU min. tax level) * final energy consumption*

Elasticity

The elasticities indicate consumers' responsiveness to energy price (tax) changes. The Short term elasticities measures direct effects and tax differences for a period of two years. In the course of time the short run elasticities will converge into the long run elasticities. Usually, the effects increase over time so, the change will give new actions up until a new steady state is reached are price signals are maintained by upgrading CPI. The Long-term model (steady state model) effects are estimated for long time periods, usually using long term elasticities.

Some of the conclusions from the dynamic model for households are that a 10% increase in price will cause 5.2% decrease in energy consumption in the long run (elasticity of 0.52). In the transport sector, the long run elasticity for petrol is 1.15.

Although taxation measures are very effective in Sweden, there is a need for further work with simulations, collaboration with modelers and expertise required for data analysis software.

5. Energy saving from transport fuel taxation in Finland

Finland calculates the impact of taxes only in the transport sector for passenger cars. There are specific measures for the other means of transport beyond taxation. Transport is included in the calculation of both impacts of excise taxes and VAT, which are higher than the minimum EU requirements, as in

Sweden. The difference is that Finland does not take into account calculations of long-term impacts. As the taxation measure is applied only in the passenger cars, there is no risk of overlap or any possibility of double counting with other measures.

The structure of the fuel taxation is similar to the one in Sweden, with a CO_2 emission charge, which is applied on top of the energy tax, and then there is a minor stock fee, but that is really small compared to the taxes. There is no regular mechanism of increasing of taxes with which the increases are applied annually or periodically. Nevertheless, there have been biyearly increases in the tax rate. The VAT in Finland is stable at 24% for seven years now.

To calculate the input data for the next period, the baseline is important because there is a need-to-understand what improvements can be expected from the vehicle technologies. There is a very ambitious goal to improve the efficiency of cars by 30% in the coming period and at the same time there are expectations for the changes in mileage. The Finnish research institutes are running a model where they have calculated these impacts, so they had already taken them into account for future period savings. As a result of the new technologies and the policies, the fuel consumption is expected to be reduced.

Why is the Swedish model used?

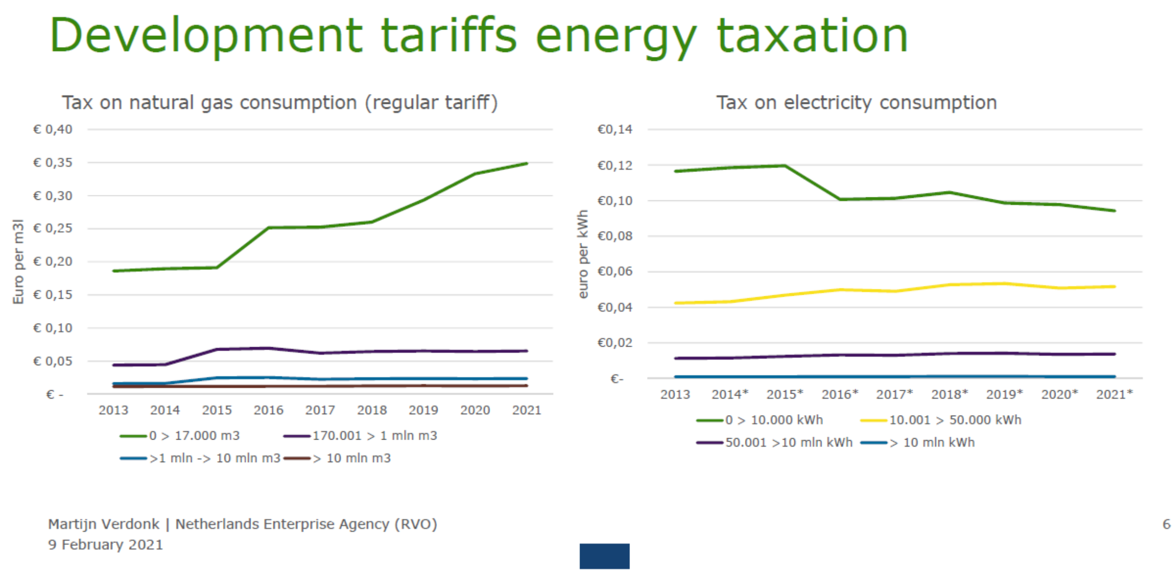
The taxes in Finland are almost double the minimum tax level in the EU and the short-term elasticities are calculated as in Sweden. The selection of elasticities from Sweden is based on the following similarities of the two countries: economy, geography, and similar alternative transport services. For instance, individual consumption in Finland is 12% higher and in Sweden 8% higher than the average. The price level index in Finland and Sweden is quite close to each other according to Eurostat, while the GDP per capita is lower in Finland, but the GDP is not a crucial indicator for households. The fuel taxes increased the prices in both countries and are now quite close to each other. Both countries are very large in size and have large rural areas with insufficient public transport network, where the car can be the only possible transport option. At the same time in all major cities and towns the public transport is very good, so this reflects the possibilities for modal shift.

The new savings are getting lower year by year due to baselines being already efficient. The expected savings for 7 years in the next period are 17.8 TWh.

6. CO2 & energy taxation in the Netherlands

In the Netherlands, the targets set for the 2021-2030 period are crystallized in the major framework set by the Climate agreement, with them aim to reduce emissions by 49%, without specific targets for renewable energy or energy efficiency. This means that all policies must contribute to these emission reductions and all sectors are allocated their own target for emission reductions. In the previous period, the taxation policies included the minimum CO_2 price for electricity and CO_2 surcharge for electricity.

The energy savings for the new period (2021-2030) under the Article 7 EED amount to 924PJ and the Netherlands intends to achieve those savings entirely using alternative measures. About 40 measures are notified including taxation measures, such as energy taxation and the surcharge for energy producers. There are different taxes, such as for instance a flat rate for coal, but the most significant ones are those for electricity and gas. Taxation for natural gas is differentiated at various consumption levels, roughly corresponding to the average household, SMEs or no- SMEs, and is thus specified in the number of kilowatt hours or cubic meters natural gas. There are some exceptions, like for the electricity that is produced by households from the PVs or from local energy cooperatives, due to renewable energy production stimulation. There is also lower tax for EVs and tax refunds for households. Besides the energy taxation, there is also a surcharge calculated. On the energy bill, this surcharge is meant to finance the subsidy scheme for renewable energy and emission reduction. In addition to these taxes, the VAT imposed is 21%. The two graphs below show the development of the tariffs for gas and electricity over the past years.



The surcharge for sustainable energy subsidy is increasing, especially in recent years. Larger energy consumers are paying higher tariffs relatively to households due to Climate agreement, based on which they are taking higher burden.

Industry and power producers

A minimum CO2-price for power producers is also part of the Climate Agreement, while discussions are ongoing. The minimum CO_2 price is subtracted from the European Allowances (EUA) price. When the EUA price is lower than the minimum CO_2-price, the difference is charged, but when the EUA price is higher there is no effect.

The surcharge for industry is enforced in 2021 and it applies to the ETS sectors excluding power and heat installations. It is thus complementary to EU ETS scheme and is calculated as:

Surcharge (per tonne CO_2-eq in year t) = tariff(in year t) - EUA price (future December t+1),

Given the higher EUA prices expected, the surcharge will increase rapidly from 2021 to 2030.

Calculations of Article 7 savings

The principle for calculation energy savings is bottom-up (taking into account market developments, number of insulation materials sold, number of EVs being brought into the market, subsidies, fiscal benefits, and the investments that have triggered those), compared to a baseline based on an EU energy use and CO2 emissions and norms. Though this approach, the Netherlands calculates the efficiency differences on sectoral bases preventing thus double counting between individual measures.

7. Energy savings from energy and CO2 taxes in Germany

Germany implements mineral oil taxes for more than 80 years, which are considered as Energy Tax from 2006, and there is also an electricity tax from 1999. The Greenhouse Emissions Trading Act was introduced in 2004, which includes the legal basis for these taxes.

There are three approaches examined in more detail in preparation for the German National Energy and Climate Plan related to taxation. The simple approach looks only at the short-term behavioral changes induced by the price instrument. The middle approach also looks at investment behavior using a top-down method with long-run elasticities and the most sophisticated approach can also map technical and supply side restrictions using modeling. The complexity increases the effort required but also the accuracy in the estimations.

Elasticities

For the simple approach that only maps behavioral changes, four pieces of information are needed: energy prices, tax rate, taxable consumption, and elasticities. From the price and tax rate, the relative price increase can be determined. From the other data, the counterfactual energy consumption can be estimated (consumption in the absence of the tax). The difference hence between observed and counterfactual energy consumption demonstrates savings attributed to the tax.

There are different tax rates, elasticities, and energy prices. The different elasticities are applied to different technologies within the same sector, such as private motorized transport and fright transport for instance. The tax rates and energy prices differ for the individual energy sources and thus 27 different segments are used with different elasticities and prices. The estimate for the elasticity in some cases is evaluated based on macroeconomic analysis.

The second approach extends the first approach by also considering long term investment behavior. This requires cross-price elasticities between prices and sources. This indicates for instance how household demand for heat pumps increases as energy price rises by 1%. An adjustment with other measures that promote long-term investments is necessary and just in this case.

The third approach consists of the energy systems models that can represent much more than price stimuli. For instance, models can estimate not only fuel consumptions but also transport demand. Transport avoidance measures such as the promotion of telework can be represented. In addition, numerous other conditions can be taken into account. In Germany, energy system models are applied to estimate the development of set overall system. The first approach is only valid for small price changes and the other challenge is double counting.

8. Excise and tax measure for fuel - Lithuanian case

Lithuania has a VAT of 21% as a key taxation measure when compared to the minimum 15% in the EU. Lithuania looked at the prerequisites form Annex 5 and calculates only the savings from taxes difference between LT and the EU. This means that some excise duties are not calculated, but the VAT is calculated in total difference.

The calculations are similar to some extent to all: Germany, Finland, and Sweden. Firstly, the calculation estimates the fuel price difference that would be applied with only the minimum EU taxes. Secondly, fuel consumption that would be the result of these lower taxes is estimated. Finally, the difference between these consumption with or without Lithuanian taxes shows the effects of taxation.

$$E_{savings} = E_{Cons\ no\ Tax} - E_{ActualCons}$$

$$\Delta p = \frac{E_{TaxP} - E_{EUminTaxP}}{E_{EUminTaxP}}$$

$$E_{Cons\ no\ Tax} = \frac{1}{1 + \Delta p * el_{Accepted}} * E_{ActualCons}$$

Lithuania has calculated elasticities with coefficients for major fuels (gasoline, diesel, and LPG) in the transport sector. The same study is also addressing the energy prices for electricity and natural gas and heat provided from central heating systems.

In comparison to the studies used from other countries, in Lithuania the gasoline has 2 times higher elasticity, while diesel and LPG are the same. This measure amounts up to 31% of total energy savings by 2020. However, the final fuel consumption is steadily increasing, and modeling shows it will happen until 2025, when it will start gradually declining.

These three types of fuels amount to more 95% of all fuel types, and from these 90 to 95%, so about 80% is diesel, about 12% is gasoline and the rest is LPG.

9. Overview of situation in Greece and Cyprus

Greece

Taxation was introduced in 2017 as a measure under the Article 7 EED and the delivered savings from an increase in the taxation is allocated to four different products: LPG, gasoline, diesel, and heating oil. The Short-term elasticity was estimated by a study conducted by Institute for Industrial Studies, considering data from the previous 7-8 years. To avoid double counting, purchased quantities of fuels due to the provided heating oil allowance and other measures are subtracted. This is only for the period until 2020. For 2021-2030, there will be no more use of taxation measures, but other alternative measures and EEOs.

Cyprus

Cyprus introduced taxation also in 2017 and will continue having it as a measure from 2021-2030. There are many similarities to Lithuanian case, the application of calculation of difference between consumption in different taxation. For this, Cyprus uses energy forecast model for energy demand, also used for NECP. Elasticities are a mixture of literature and econometric estimations using national data.