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PART 2/3

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT REPORT

Accompanying the document

Proposal for a Council Directive

restructuring the Union framework for the taxation of energy products and electricity (recast)

{COM(2021) 563 final} - {SWD(2021) 640 final} - {SWD(2021) 642 final} - {SEC(2021) 663 final}

ANNEX 1: PROCEDURAL INFORMATION

1. Lead DG, DECIDE Planning/CWP references

The lead DG is the Directorate-General for Taxation and Customs Union. The Decide reference of this initiative is PLAN/2020/6493.

The Commission Work Programme for 2021 provides, under heading European Green Deal, the "Fit for 55 Package", which includes the initiative for a revised legislation on energy taxation (legislative proposal, including impact assessment, planned for Q2 2021).

2. Organisation and timing

The Inter-service Steering Group was set up by the Secretariat-General to assist in the preparation of the initiative. The representatives of the following Directorates General participated in the ISSG work: Legal Service, CLIMA, TRADE, JRC, COMP, GROW, ECFIN, ENER, MOVE, BUDG, ENV, AGRI, RTD, MARE, TAXUD.

A total of three Inter-Service Steering Group meetings took place, with the last being on 2 February 2021.

In addition to the Inter-Service Steering Group, DG TAXUD held numerous informal Interservice meetings and technical expert group meetings to gather information, views, policy orientation and technical input from competent DGs on the treatment of energy products and electricity and the way in which the ETD can complement other policies. Representatives from the following Directorates General have been involved: ENER, CLIMA, MOVE, RTD, ENV and JRC. The last meeting took place on 06 November 2020.

3. Consultation of the RSB

An informal upstream meeting with Regulatory Scrutiny Board took place on 15 September 2020. On 19 February 2021, DG TAXUD submitted the draft Impact Assessment to the Regulatory Scrutiny Board and the Board meeting took place on 17 March 2021. The opinion of the Board, as issued on 19 March 2021, was positive with reservations.

The Board's recommendations have been addressed as presented below.

(1) The report should better explain how the objectives of the ETD have evolved to include environmental and climate policy objectives. It should better explain the coherence of the ETD with other initiatives in the 'Fit for 55' package, and in particular the ETS. It should further develop how these instruments interplay and what the optimal combination of the instruments and their ambition levels should be. It should explain how the ETD will contribute to reaching the agreed targets in the most cost-efficient way. It should clarify to what extent the success of the other 'Fit for 55' initiatives will be dependent on this one, and vice-versa.

These recommendations have been addressed in Chapters 1 (both in the text and in the box) 2.1, 6 and 7.4.

In chapter 1, explanation on the role of ETD in the context of the "Fit 55" package and the coherence with the ETS system have been added. In particular it has been underlined the different role and the complementarity of the two instruments in contributing to the overall "Fit 55" objective. The review acknowledges that the main role in the decarbonisation of the

EU economy corresponds in any case to the ETS and to the Effort Sharing Decision. At the same time, it explains that without the contribution of the ETD, other initiatives would have to contribute more. This, for example, could result in a higher ETS price. The coordination of the two initiatives (ETD and ETS) can help to achieve the targets in 2030 and beyond in a more cost-efficient way.

Moreover, Chapter 1 and 2.1 now address the double role of ETD as a revenue raising instrument as well as an environmental instrument, underlining the relevance of the two roles and also that the proposed review overcomes a possible trade-off, by simultaneously adjusting rates and broadening the taxable basis, thus increasing the effective tax rates.

Chapter 6 explains the coherence of the quantitative analysis with the FIT 55 in terms of baseline (EU Reference Scenario) and the considerations on the inclusion of the extension of the ETS system to transport and buildings.

Chapter 7.4 explicitly refers to the coherence with the existence and possible extension of ETS.

(2) The report should nuance its finding that the current minimum tax rates no longer serve their purpose to prevent a race to the bottom. For several energy products, many countries are still at or close to the minimum rates. The report could better explain that avoiding a race to the bottom is not sufficient to harmonise rates, unless the minimum rates are set at a sufficiently high level, which is currently not the case.

Sections 2.1 and 2.2 have been revised in order to focus on the converging role of minimum rates in the internal market. These sections shows that, in the absence of an indexation mechanism, the real value of rates has eroded over time and they no longer have a converging effect on national rates as the vast majority of Member States tax most energy products and, in some cases electricity, considerably above the ETD minima. Highly divergent national rates are applied in combination with a wide range of tax exemptions and reductions in order to safeguard the competitiveness of EU industries as well as to pursue other national policies. The chapter on effective tax rates summarises the dispersion of these national situations.

(3) The report should clarify the Directive's role in generating energy tax revenues. It should consider introducing an objective on tax collection, as a basis for the analysis of tax revenues in the comparison of options.

Chapters 2 and 4 have been modified in order to clarify the role of the Directive in preserving revenues generation. The need of preserving the capacity to generate revenues for the budgets of the Member States is now defined as one of the general objectives of the review and is included in the intervention logic. The intervention logic has been modified and no more presents operational objectives, but just general objectives and specific objectives. Section 6 has been expanded to include more analysis on the impact on revenues.

(4) The report should better explain the rationale for some proposed minimum rates. It should clarify the evidence behind the concept of 'environmental performance' that determines the minimum rates. In this context, it should better justify the proposed rates for the primary sector, aviation and maritime transport. It should specify how it proposes to tax cargo-only flights within the EU and sustainable airline fuel. The report should better explain how the indexation of minimum rates to inflation would affect effective taxation. It should discuss whether there are plausible alternative combinations of key policy design measures (in terms of minimum rates, scope extension or removal of differentations, reductions and exemptions) under the preferred option(s) that might become politically relevant and, if so why such variants were not assessed.

Explanation on the rationale for minimum rate as well as clarifications of the concept of "environmental performance" have been introduced in Chapter 5.2 both for different categories of products and uses. In box 4 the rationale for the proposed rates for the aviation and maritime sectors as well as the exemption of cargo flights and the taxation of biofuels have been addressed. The rationale of the choice of the indexation criterion is also explained and the tables presenting the new minima illustrate how (expected) inflation affects the level of rates. In Chapter 5.3 it has been included an alternative consisting in a mix of option 1 (definition of the taxable basis) and 2 (definition of rates) and it is explained why this option has been discarded.

(5) The report should reinforce its analysis of impacts on employment, international competitiveness and air pollution. It should expand the economic impact analysis for energy intensive and transport sectors (in particular air transport), including on their international competitiveness. It should differentiate between the equity effects on households and Member States. The report should better explain regulatory costs and benefits. In particular, it should clarify the consequences of the initiative on administrative costs. The report should expand on the distribution across affected groups.

In Chapter 6, the section on the labour market impacts has been extended to include information both on the Member States impact on employment and on sectorial impact. In the same chapter under sections devoted to the aviation and maritime information on the impact of the proposed options on employment were also presented. A new section 6.8 analysing the impact of the proposed options on more energy intensive industries has been included. The section on distributional impact has been extended to provide more detailed analysis and differentiate between the equity effects on households and Member States. Supplementary detailed results and analysis of distributional impacts across households by Member States for the main options considered was also included in Annex 9. On administrative cost supplementary information was included in Annex 3.

(6) The report should strengthen its analysis on why the options that also tax air pollution perform worse than the preferred option(s). The comparison of options should better recognise the benefits of reduced air pollution, and balance them against negative distributional effects. The analysis could consider transition periods for the introduction of such a tax, take into account the local character of some emissions, and reflect the effects on technical innovation.

The analysis of the reasons why a pollution component should be discarded has been strengthened in section 8 by adding technical considerations on biomass emissions linked to the quality of burnt products and the biotechnologies developments. In the comparisons of the options the benefits of reduced air pollution is better recognised.

The Board notes the estimated costs and benefits of the preferred option(s) in this initiative, as summarised in the attached quantification tables.

The table has been checked

4. Evidence, sources and quality

The evidence for the impact assessment report was gathered through various activities and from different sources:

- TEDB (Taxes in Europe Database)
- TEMS -TAXUD Energy Metadata Survey (Effective Tax Rates)
- DG JRC: Quantification of the industrial energy consumption within the scope of article 2 of the Energy Taxation Directive) (Annex 10)
- DG JRC and DG ECFIN (macro and micro economic modelling for the Impact Assessment
- Validation by external validators (from academia and other international organizations) of JRC's study on out-of-scope provisions and of data collected via TEMS
- Study on aviation
- Replies from citizens, stakeholders and public authorities to the published Inception Impact Assessment and to the Open Public Consultation (OPC)
- Desk research
- Cost assessment of air pollution:
- EMEP/EEA air pollutant emission inventory guidebooks 2019
- EEA Air quality in Europe — 2019 report
- EEA European Union emission inventory report 1990-2017 under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP)

ANNEX 2: STAKEHOLDER CONSULTATION

1. Consultation activities carried out

Stakeholders were consulted via the Inception Impact Assessment feedback mechanism and via a Public Consultation.

2. Inception Impact Assessment Feedback

The large majority of the 182 replies comes from the business sector, in particular from the energy intensive industries, other business (producers and distributors of energy products and electricity), businesses associations and transport sector. Three Member States two municipalities (Lille and Stockholm), a few public bodies and NGOs and three citizens sent comments.

Member States all underline the need to respect the current rules of unanimity and generally stress the importance of EU competitiveness. One MS seems open to consider negative externalities for the taxation of energy products, whereas another strongly addresses the problem of connectivity in case of maritime taxation. The third MS encourages to tax energy based on energy content and CO2 and to withdraw the exemption for the aviation sector.

In general, the energy intensive sector, as well as the business associations and producers of traditional energy products, overall claim for maintaining the current legislative framework in the context of the internal market objectives, the role of ETS for climate objectives and the preservation of the EU international competitiveness. They also stress the need to extend and render mandatory the current exemption framework. Moreover, they ask to stop to apply the state aid rules in the context of the exemption.

The aviation and maritime businesses strongly plead in favour of maintaining the current exemption, because of their need to devote resources to investments for alternative fuels (and not taxation), the need to respect international agreements and the possibility to escape a tax by tankering abroad. They also stress the need of a favourable tax treatment of alternative source of energy.

The producers and distributors of electricity and alternative fuels broadly support the analysis presented in the Evaluation and the Inception Impact Assessment and the use of energy taxation as an environmental tool. There is an overall request to tax energy products on the basis of energy content, CO2 and other polluting emissions. Moreover, they underline the need to favourably treat electricity output, while taxing the polluting sources of electricity and to restructure the products' coverage of the Directive. Some organisations warn for unintended effects of decarbonisation on the security of supply and demand lower rate for natural gas as a transition energy product.

The NGOs present the usual arguments in favour of an environmental based approach and the use of ordinary legislative initiative.

3. Public Consultation - Stakeholder participation

3.1 Respondents

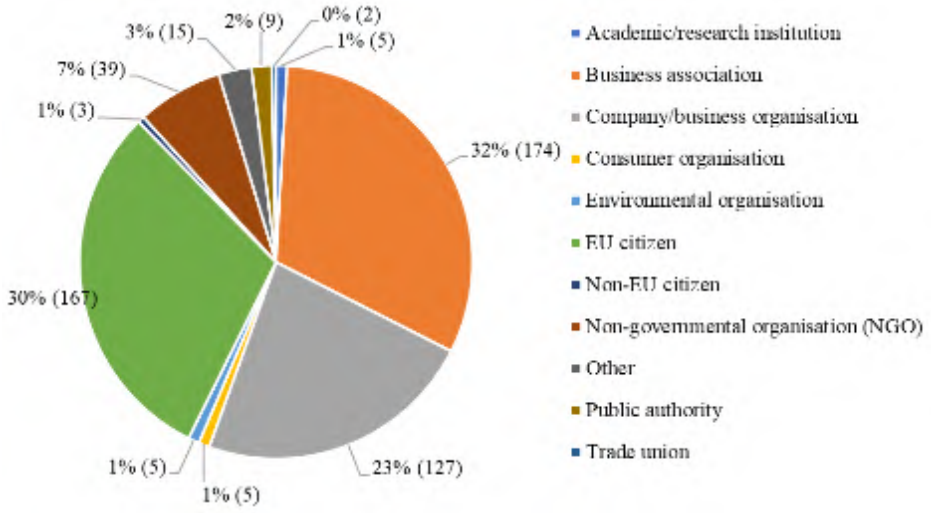
The public consultation was open for 12 weeks from 22 July 2020 to 14 October 2020.

In total, 563 responses were received, together with 129 position papers. During the data cleaning process, 12 blank submissions were found and removed from the dataset. Therefore,

551 responses from 25 Member States and 5 third countries were considered throughout the remainder of the analysis.

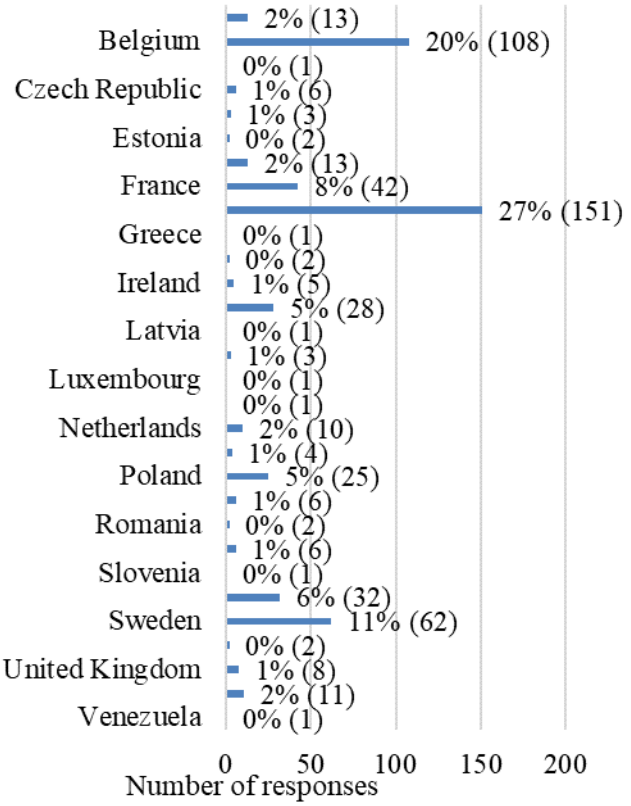
Figure 1 and Figure 2 summarise the respondent types and their geographical location.

Figure 1: Total number and percentage (%) of responses by stakeholder type (N = 551), values = % (n)



Source: Public consultation questionnaire responses

Figure 2: Public consultation survey – respondent geographical location



Source: Public consultation questionnaire responses

Stakeholders providing a response on behalf of the companies and business organisations were asked about the size of their organisation: 30% were from large companies, 16% were from medium, 23% from small, and 31% from micro-organisations. Of the nine public authorities that responded, three were local, four are regional, and two are national.

3.2 Context

As shown in the tables below, an overwhelming majority of respondents agree with the general EU objectives of fighting climate change and pollution and with the application of these objectives to the revision of the ETD. However the support to the revision of the ETD for better tackling environmental concerns, like air pollution, is lower from businesses (even though still majority) but is also present in position papers.

Table 1: Do you agree with the following statements about the EU Energy Taxation Directive (ETD)?

	EU's plans to increase climate ambition for 2030		***EU's economy and society becoming climate-neutral by 2050***		***EU's Green Deal zero-pollution ambition for a toxic-free environment***	
Stakeholder type	***agree***	***disagree***	***agree***	***disagree***	***agree***	***disagree***
Companies & business associations	86.6%	13.4%	96.8%	3.2%	90.7%	9.3%
EU & Non-EU citizens	95.9%	4.1%	95.8%	4.2%	98.8%	1.2%
Public authorities	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Civil society (all other stakeholders)	97.0%	3.0%	98.5%	1.5%	100.0%	0.0%

Source: Public consultation questionnaire responses

Table 2: Do you agree with the following statements about the EU Energy Taxation Directive (ETD)?

	The ETD should be revised in order to support the transition towards climate neutrality		**The ETD has to be revised in order to better tackle environmental concerns, like air pollution**		**The ETD has to be revised in order to better ensure the smooth functioning of the internal market**		**The ETD has to be revised in order to take into account the changed energy mix with higher share of renewables and electricity**		**The ETD should better promote energy saving/efficiency**	
Stakeholder type	***agree***	***disagree***	***agree***	***disagree***	***agree***	***disagree***	***agree***	***disagree***	***agree***	***disagree***
Companies & business associations	90.0%	10.0%	65.9%	34.1%	85.3%	14.7%	89.4%	10.6%	86.7%	13.3%

	The ETD should be revised in order to support the transition towards climate neutrality		The ETD has to be revised in order to better tackle environmental concerns, like air pollution		The ETD has to be revised in order to better ensure the smooth functioning of the internal market		The ETD has to be revised in order to take into account the changed energy mix with higher share of renewables and electricity		The ETD should better promote energy saving/efficiency	
Stakeholder type	*agree*	*disagree*	*agree*	*disagree*	*agree*	*disagree*	*agree*	*disagree*	*agree*	*disagree*
EU & Non-EU citizens	96.4%	3.6%	95.7%	4.3%	89.9%	10.1%	94.9%	5.1%	97.0%	3.0%
Public authorities	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%	87.5%	12.5%
Civil society (all other stakeholders)	98.5%	1.5%	89.1%	10.9%	94.6%	5.4%	100.0%	0.0%	98.4%	1.6%

Source: Public consultation questionnaire responses

Respondents were asked about their **priorities for the ETD** and the responses are shown in table 12, which shows that the highest levels of agreement were for the ETD revision taking into account greenhouse gas emissions in the definition of rates, followed by introducing incentives for alternative energy sources such as clean hydrogen and sustainable biofuels. Overall, people disagreed with the following options: the ETD should not tax the energy use in sectors of activity which are at risk of carbon leakage, and the ETD revision should support the objective of minimising the use of whole trees and food and feed crops for energy production, whether produced in the EU or imported.

270 respondents gave details about other priorities that they considered important in the associated open text question. The two commonest priorities were to "take into account greenhouse gas emissions in the definition of rates" (31), and to "reduce the possibility of favouring fossil fuels via tax reductions" (21). A further 24 respondents wanted to avoid the possibility of double taxation. All these opinions were also expressed in position papers. The latter also mentioned that the ETD should contribute to a stable and attractive investment environment with long-term investments in low carbon technologies and products. Some papers insisted on the necessity to take into account individual Member State requirements (e.g., peripheral EU countries) and promoted to promote EU internal competition via differential tax systems across Member States. Others preferred a homogeneous energy taxation in Europe.

Table 3: Which of the following priorities are important for the EU Energy Taxation Directive (ETD)?

	The ETD should ensure adequate amounts of tax revenues		The ETD should not tax the energy use in sectors or companies which are at risk of carbon leakage		The ETD revision should reduce the possibility of favouring fossil fuels via tax reductions, exemptions and rebates		The tax system should ensure compensations for low income households when implementing energy taxation		The ETD revision should take into account energy content in the definition of rates	
Stakeholder type	*agree*	*disagree*	*agree*	*disagree*	*agree*	*disagree*	*agree*	*disagree*	*agree*	*disagree*
Companies & business associations	51.6%	48.4%	70.2%	29.8%	65.8%	34.2%	63.6%	36.4%	80.9%	19.1%
EU & Non-EU citizens	86.5%	13.5%	15.3%	84.7%	95.2%	4.8%	91.6%	8.4%	65.3%	34.7%
Public	66.7%	33.3%	33.3%	66.7%	88.9%	11.1%	42.9%	57.1%	87.5%	12.5%

	The ETD should ensure adequate amounts of tax revenues		The ETD should not tax the energy use in sectors or companies which are at risk of carbon leakage		The ETD revision should reduce the possibility of favouring fossil fuels via tax reductions, exemptions and rebates		The tax system should ensure compensations for low income households when implementing energy taxation		The ETD revision should take into account energy content in the definition of rates	
Stakeholder type	*agree*	*disagree*	*agree*	*disagree*	*agree*	*disagree*	*agree*	*disagree*	*agree*	*disagree*
authorities										
Civil society (all other stakeholders)	76.5%	23.5%	18.9%	81.1%	85.0%	15.0%	85.5%	14.5%	80.4%	19.6%

Source: Public consultation questionnaire responses

Respondents' views on the extent to which they agree with statements regarding **environmental and efficiency goals and functioning of the internal market** are presented below. By far the statement gaining the most agreement, was "the ETD can play a significant role in supporting production of energy from renewable sources". Option "the ETD should particularly support self-consumption and small producers of electricity coming from renewables" also has high agreement. However, respondents broadly disagreed with all other options.

Table 4: To what extent do you agree with the following statements taking into account environmental and efficiency goals and the functioning of the internal market?

	The relevant provisions of the Energy Taxation Directive (ETD) are sufficiently comprehensive also in relation to the new technologies (e.g. production of hydrogen, biofuels, synthetic fuels, e-fuels, etc.)		*The provisions related to the tax exemption for energy products used to produce energy products and the uses of energy products and electricity considered out of scope (e.g. industrial processes such as chemical reduction, electrolytic, metallurgic*		*The mandatory exemption for energy products for electricity production, which can be waived for reasons of environmental policy, is sufficiently clear and comprehensive*	
Stakeholder type	*Agree*	*Disagree*	*Agree*	*Disagree*	*Agree*	*Disagree*
Companies & business associations	17%	83%	48%	52%	41%	59%
EU & Non-EU citizens	11%	89%	12%	88%	9%	91%
Public authorities	0%	100%	40%	60%	60%	40%
Civil society (all other stakeholders)	6%	94%	18%	82%	15%	85%

	The ETD can play a significant role in supporting production of energy from renewable sources		*The ETD should particularly support self-consumption and small producers of electricity coming from renewables*		*The possibility of granting tax exemptions or reductions related to combined heat and power generation (CHP) should be restricted*	
Stakeholder type	*Agree*	*Disagree*	*Agree*	*Disagree*	*Agree*	*Disagree*
Companies & business associations	92%	8%	71%	29%	14%	86%
EU & Non-EU citizens	91%	9%	80%	20%	55%	45%
Public authorities	100%	0%	71%	29%	0%	100%

	The ETD can play a significant role in supporting production of energy from renewable sources		*The ETD should particularly support self-consumption and small producers of electricity coming from renewables*		*The possibility of granting tax exemptions or reductions related to combined heat and power generation (CHP) should be restricted*	
Stakeholder type	*Agree*	*Disagree*	*Agree*	*Disagree*	*Agree*	*Disagree*
Civil society (all other stakeholders)	97%	3%	88%	13%	41%	59%

Source: Public consultation questionnaire responses

3.3 Social impact

Respondents' views on the accompanying measures considered to be the **most relevant social policies** are summarised in table 14. The three most relevant options are the same for all stakeholders, except for public authorities, where a tax-free threshold for heating and electricity taxes is considered the most relevant (although the number of public authority respondents is low). The order of relevance differs slightly: citizens and civic society both considered lower taxation for public transport most relevant, with social welfare programmes for poor households second. Companies and business associations think that reduction of other taxes are most relevant and lower taxation for public transport is second.

A further 127 respondents gave details of other measures they believe relevant, and the argument made by the most (29) is that social measures should be linked to energy efficiency measures. The second most popular argument is "Carbon Fee & Dividend" (17). Among these respondents, a group of Swedish citizens (9) refers to the position of the Swedish Klimatsvaret, summarising it as "equal distribution of energy tax revenues to all citizens as a conversion allowance". Some position papers advocate to redirect fiscal instruments for a green recovery stimulus: public revenues generated could be used to fairly redistribute the economic burden across society and support the most vulnerable, while also providing an opportunity to reduce labour taxation.

Table 5: Which of the following accompanying measures do you consider as most relevant social policies?

	Reduction of other tax e.g. taxes on labour or social contributions		**Direct compensation to lower income groups via a lump sum**		**Direct compensation to all households via lump sum**		**Social welfare programs directed at poor households**[1]	
Stakeholder type	*agree*	*disagree*	*agree*	*disagree*	*agree*	*disagree*	*agree*	*disagree*
Companies & business associations	81.7%	18.3%	52.9%	47.1%	24.5%	75.5%	75.5%	24.5%
EU & Non-EU citizens	46.1%	53.9%	57.7%	42.3%	48.2%	51.8%	85.5%	14.5%
Public authorities	100.0%	0.0%	60.0%	40.0%	33.3%	66.7%	100.0%	0.0%
Civil society (all other stakeholders)	67.9%	32.1%	58.3%	41.7%	42.0%	58.0%	84.0%	16.0%

[1] reducing their energy costs for both home owners and rental dwellings

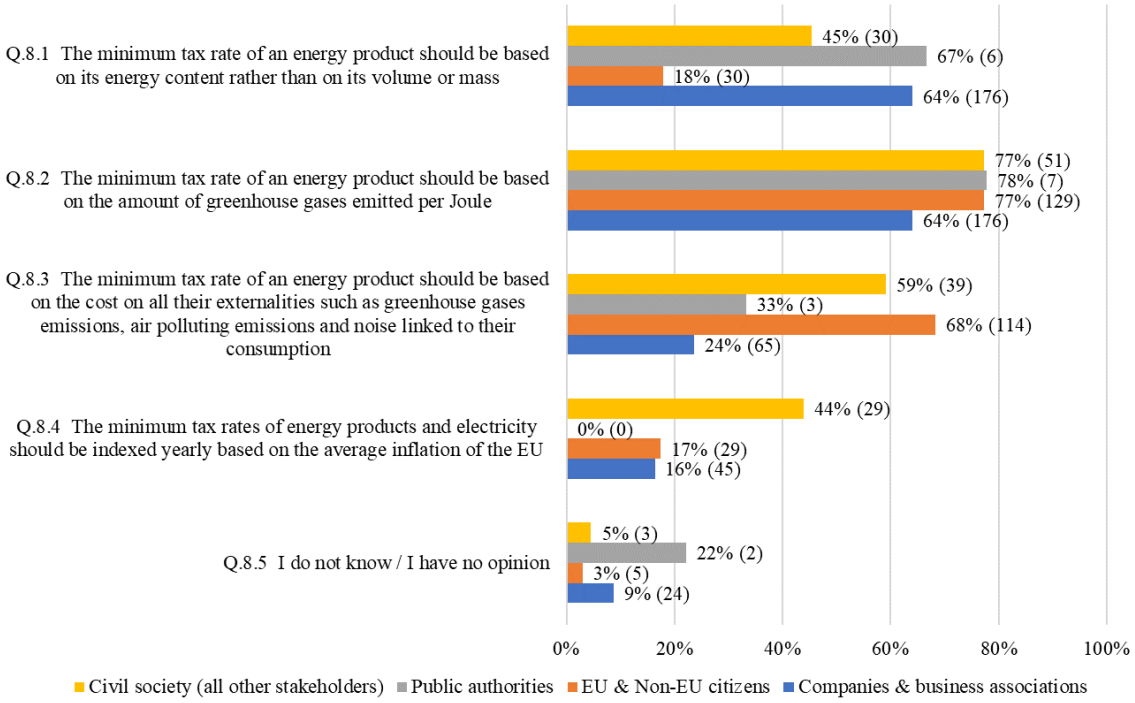
	Tax-free base/ threshold for heating and electricity taxes for basis energy consumption.		Q.7.6 The possibility for lower taxation for local public transport should be kept		Q.7.7 No accompanying social measures are needed	
Stakeholder type	*agree*	*disagree*	*agree*	*disagree*	*agree*	*disagree*
Companies & business associations	45.4%	54.6%	78.0%	22.0%	12.6%	87.4%
EU & Non-EU citizens	25.2%	74.8%	86.7%	13.3%	5.7%	94.3%
Public authorities	100.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Civil society (all other stakeholders)	39.1%	40.6%	83.6%	6.6%	17.2%	65.5%

Source: Public consultation questionnaire responses

3.4 Standard Rules for energy taxation

Respondents' views on the basis that should be used for setting **minimum tax rates** for energy products are summarised in Figure 37, and the majority (70%) believe they should be based upon the amount of greenhouse gases emitted per Joule. There are similar percentages for two other options: based upon their energy content rather than on their volume or mass (47%); and based upon the cost of all externalities such as greenhouse gases emissions, air polluting emissions, and noise linked to their consumption (43%). 14% of respondents indicated that they did not know or had no opinion. There are considerable differences between stakeholder type, with companies and business associations favouring the first and second options, whereas citizens prefer the second and third options, and civic society prefers the second and third options, although some civic society respondents also opt for the first and fourth options. Stronger support for "indexing minimum tax rates annually to the average inflation in the EU" can be seen in Belgium and Poland.

Figure 3: Which options do you consider as relevant for minimum tax rates. Multiple options are possible



Source: Public consultation questionnaire responses

3.5 Sector exceptions

3.5.1 Agriculture, Forestry and Fishery

Respondents were asked their opinions on specific exemptions and policies relating to several specific sectors of activity. When asked about energy tax treatment exceptions for **agriculture and forestry**, and for **fishery**, a vast majority of citizens and civil society respondents and a small minority of businesses and public authorities indicated that no exceptions should be granted[2]. For both questions, high numbers of respondents indicated that they did not know or had no opinion, with 36% and 43% respectively.

For fishery, position papers recommended that harmful incentives are abolished, and public funds are redirected to improved fisheries management and biodiversity protection. They also advocated support designed to target small-scale fisheries that operate in a way that minimises their impact on the environment.

3.5.2 Transport

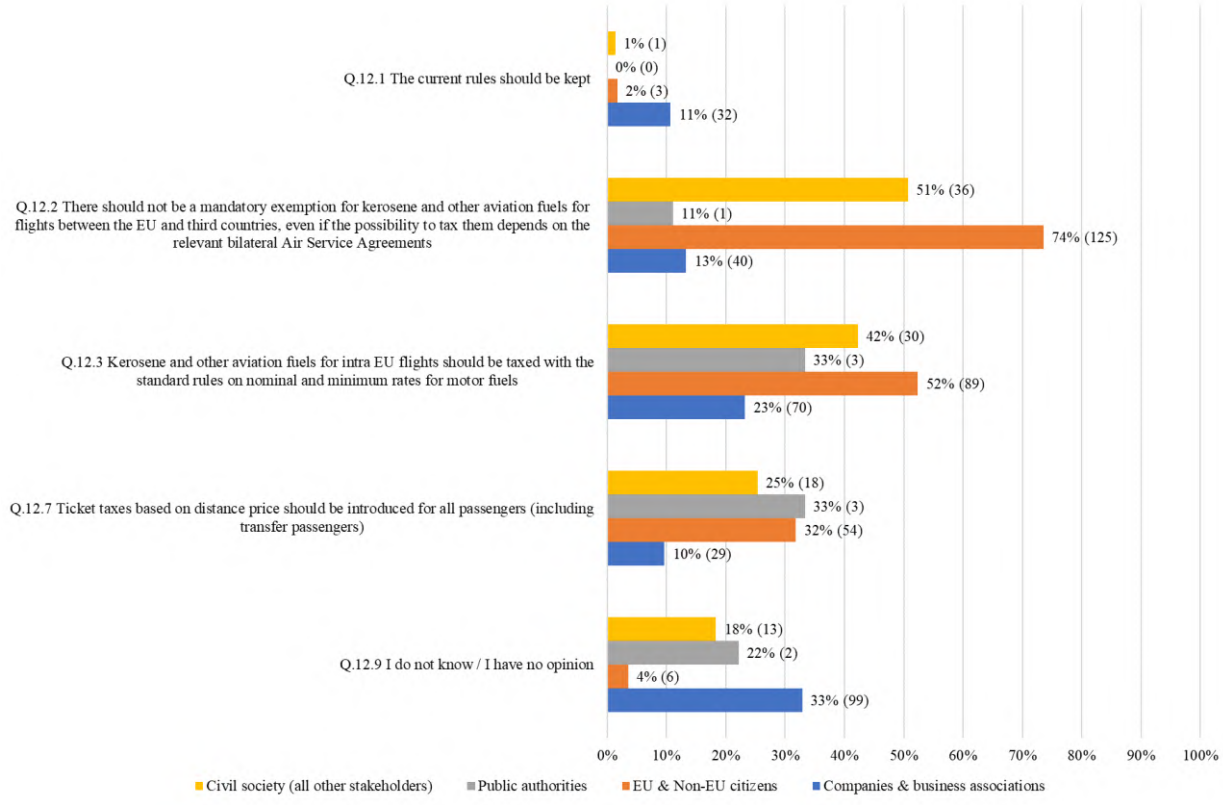
Overall, the public consultation revealed some support to equalising the taxes for different transport modes so that they can compete on a level playing field, the development of more energy efficient and low carbon transport modes as well as the incentivisation and deployment of transitional and lower carbon technologies and fuels particularly natural gas, LNG, CNG and fossil-based hydrogen. Moreover, position papers advocate to increase the use of biofuels

[2] Agriculture & Forestry: 63% of civil society, 82% of citizens, 25% of public authorities, 16% of businesses
Fishery: 67% of civil society, 87% of citizens, 13% of public authorities, 14% of businesses

and hydrogen in vehicles, incentivise the development of new technologies and alternative fuels, exempt buses and coaches from the scope of the revised ETD and envision rail as a main future land-based transport mode.

Respondents were asked their opinion on the tax treatment of energy products and electricity for the **aviation** sector. There was reasonable support for two options. For the option gaining the most support, 44% indicated that "there should not be a mandatory exemption for kerosene and other aviation fuels for flights between the EU and third countries, even if the possibility to tax them depends on the relevant bilateral Air Service Agreements". The second most popular option, with 41% of responses being in favour, is that "kerosene and other aviation fuels for intra EU flights should be taxed with the standard rules on nominal and minimum tax rates for motor fuels". Only 22% of all stakeholders believe that "ticket taxes based on distance price should be introduced for all passengers (including transfer passengers)". Furthermore, 26% of all respondents indicate that they do not know or have no opinion. The remaining response options all receive minimal support with less than 10% of respondents choosing these. Position papers wish to incentivise a commercial alternative to kerosene and the development of sustainable aviation fuels.

Figure 4: What is your opinion on the energy tax treatment for the aviation sector? (Multiple options)



Source: Public consultation questionnaire responses

Regarding respondents' opinions on the energy tax treatment of energy products and electricity for **maritime** transport and **inland waterways**, 53% and 54%, respectively, indicated that fuels in these sectors should be taxed as motor fuel. In both questions, high numbers of respondents indicated that they did not know or had no opinion, 27% and 30% respectively.

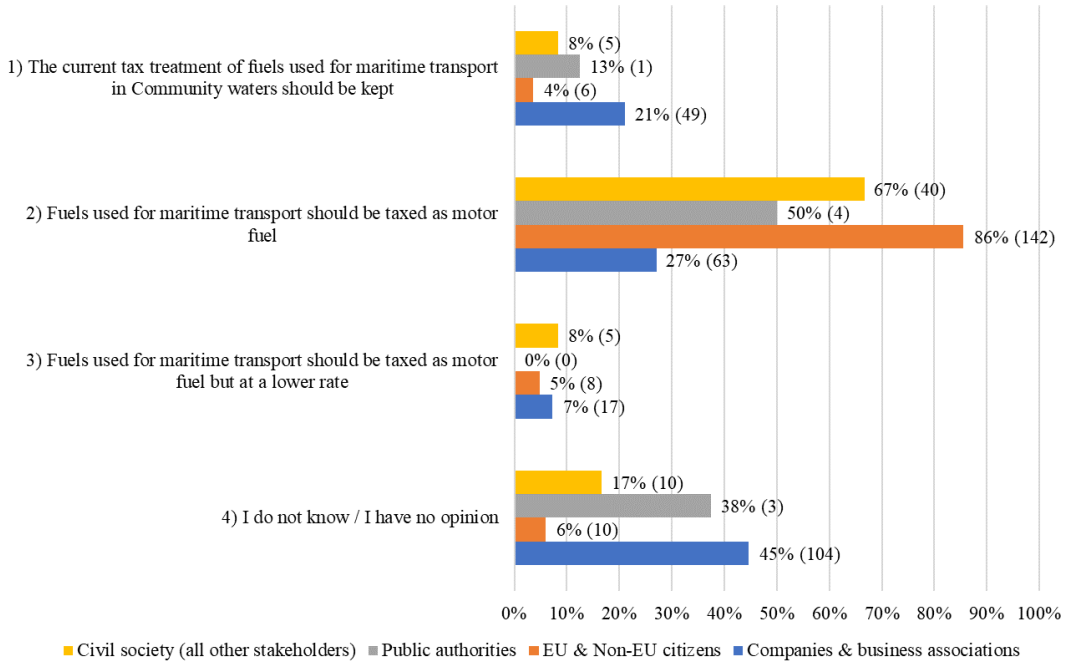
Respondents were also asked about their views regarding **shore side electricity** (SSE) and they favoured two options. The most selected option (61%) is that "SSE should be stimulated

by regulation, for instance by an obligation to use shore side electricity in harbours when available". The second most selected option (53%) is that "instead of giving a special tax treatment for SSE, the use of fossil fuels on board of ships in harbours should be subject to energy taxation".

Position papers for navigation highlighted the following main points

- Support alternative solutions in the maritime sector and European ports by facilitating and incentivising investments in a sustainable fuels infrastructure, including development, production, and use of renewable hydrogen and derived e-fuels.
- the EU ETS may be more effective in the maritime sector than an EU-wide fuel tax.
- Maintain the exemption for gasoil until the sector can fully transition to low carbon alternatives.

Figure 5: What is your opinion on the energy tax treatment for maritime transport? (Multiple options)



Source: Public consultation questionnaire responses

When asked about the tax treatment of **diesel or other motor fuels used as a propellant for commercial purposes**, a large majority of responses (70%)[3] supported the option that any motor fuel used in road transport should be taxed with the standard rules, whether used for commercial purposes or not. Position papers favour the incentivisation of zero-emission alternatives and no differentiation of tax treatment between commercial and non-commercial.

When asked about the **tax treatment of electricity used in electric vehicles in road transport**, 49% of responses[4] indicated that there is no need for a specific treatment of electricity used in electric vehicles (road transport). Only 19%[4] indicated that a specific lower tax rate should be introduced for the use of electricity for electric vehicles, but this option was the most frequent response to the open text accompanying question, with 28 people raising this issue. In the open text responses, 25 people would like electricity from renewable sources

[3] 75% of civil society, 94% of citizens, 71% of public authorities, 50% of businesses

[4] No specific treatment: 43% of civil society, 66% of citizens, 43% of public authorities, 39% of businesses
Lower tax: 26% of civil society, 17% of citizens, 14% of public authorities, 19% of businesses

to be subject to special conditions, and 24 people would like it to be based on CO_2 content. Position papers advocate for electromobility and the use of electricity over fossil fuels as well as the incentivisation of efficient energy use and storage.

3.5.3 Industry

Respondents were asked about their opinions on the **energy tax treatment of energy products in industry**, and although there was a mixed reaction overall, a clearly preferred treatment could be identified. The highest number of respondents (34%)[5] consider that "energy products and electricity in the industry sector should not be differentiated when used for heating (including Combined Heat & Power generation) and motor fuels and industrial processes". All three remaining choices have similar, relatively low levels of support.

39%[6] of respondents preferred the option "energy products and electricity consumption by industry should be taxed with the EU standard rules on nominal and minimum rates". However, 35% of respondents indicated that they do not know/have no opinion. The second most supported option (28%)[6] is 'energy products and electricity consumption by industry should be taxed with the EU rules only for the energy content and not for the carbon content because the latter is, for an important part, covered by the EU Emissions Trading System'.

In addition, position papers advocate to incentivise electricity over fossil fuels and energy efficiency as well as mandatory exemptions and low minimum tax rates to support international competitiveness of EU businesses, prevent carbon leakage, and keep the internal market balanced. Some recommend a modification of the current taxation on lubricants and harmonisation at European level.

3.6 Lower carbon energy products

When asked about differentiated tax treatments for **low-carbon fuels and applications**, and for **selected fuels (e.g. advanced biofuels and synthetic fuels)**, in both cases the majority said 'Yes', with 75% and 63% of respondents, respectively and position papers confirm this opinion. On the same wave length, some position papers advocated for an evaluation of bioenergy on the basis of utility from a holistic viewpoint, for a differentiated treatment for advanced biofuels to encourage emissions reductions with no preferential tax treatments for other types of biofuels.

About **hydrogen**, the highest level of support (51%)[7] is for option "only if it is green hydrogen, e.g. from electrolysis with renewable electricity, in any of the above". Some position papers are in favour of green or blue hydrogen (from natural gas).

When asked about their views on tax differentiation for Compressed Natural Gas (**CNG**) and Liquefied Natural Gas (**LNG**), the most frequent response (43%)[8] was tax differentiation on these products is not acceptable. The second most frequent response (23%)[9] was that preferential treatment is permissible but should be linked to the standard energy tax components (e.g. energy content and greenhouse gas emissions). Some position papers consider LNG/CNG is currently the only suitable alternative fuel for heavy road transport, public transport, aviation and maritime use and thus, should be incentivised as a transition fuel.

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[5] 43% of civil society, 67% of citizens, 13% of public authorities, 11% of businesses

[6] Standard rules: 40% of civil society, 58% of citizens, 25% of public authorities, 27% of businesses
Energy content (not CO2): 17% of civil society, 9% of citizens, 50% of public authorities, 43% of businesses

[7] 58% of civil society, 77% of citizens, 78% of public authorities, 33% of businesses

[8] 61% of civil society, 63% of citizens, 56% of public authorities, 26% of businesses

[9] 21% of civil society, 15% of citizens, 22% of public authorities, 28% of businesses

Inputs from the related open text question and from position papers favour taxation on fuels to be differentiated based on energy content and/or on GHG emissions. They consider that the ETD should favour biofuel as a replacement of fossil fuel-derived energy sources (or at least ensure a level playing field, as sustainable renewable fuels cannot compete with fossil fuels if minimum excise rates are based on volume). They also wish to incentivise the use of transitional "lower carbon" fuels (natural gas, LNG, CNG, fossil-based hydrogen) and technologies that make efficient use of these fuels, in particular for district heating and CHP. Other papers however prefer to remove all fossil fuel incentives and accelerate decarbonisation of the grid and allow only specific exemptions for 'energy communities', self-consumption and self-production. Several papers insist on a clear definition of clean energy, taking into account the lifecycle impact, which would contribute to a gradual change towards a low carbon economy.

3.7 Additional information

Respondents were allowed to leave comments about any aspect of the survey and 300 provided comments covering 547 different issues, with three issues mentioned over 50 times:

- Taxation should be set according to the GHG emissions (well-to-wheel) of all fuels (89);
- The ETD must not result in double taxation (77);
- Incentives for investment in innovative and clean technologies and fuels are required (59).

4. Consultation results summary

The majority (70%) of respondents believe that the **minimum tax rates** of an energy product should be based upon the amount of greenhouse gases emitted per Joule. There is also support for two other options: basing it upon energy content rather than on its volume or mass (47%); or upon the cost of all externalities such as greenhouse gas emissions, air polluting emissions, and noise linked to their consumption (43%). This trend is confirmed in position papers. Overall businesses tend to prefer taking the energy content into account, whereas citizens and civil society prefer the idea of basing the cost on all the externalities.

This was studied in policy options 1 to 3 (energy content), 2c and 3c (air pollution) and 3 (greenhouse gas).

Regarding **nominal tax rates,** the strongest support (61%) is for national nominal tax rates to follow the same structure as those introduced for minimum tax rates. There is considerable unanimity between all the stakeholder groups except public authorities which would prefer no restrictions on national nominal tax rates.

This was studied in policy options 2 and 2 in terms of tax rate ranking between energy products.

Regarding the different **sectors of activity**, approximately half of respondents do not want to see tax exemptions in aviation (44%) and would prefer fuel to be taxed as motor fuel for maritime and inland waterways (50%). Similarly, approximately half the respondents do not want to see special treatment for electric vehicles (49%). Regarding commercial road transport, over two thirds of respondents would like to see fuel taxed as normal (70%). Citizens and civil society tend to favour an abolition of tax exemptions and reductions while businesse would prefer to keep part or all of their sector's preferential tax treatments. Overall, there is strong agreement that the ETD can play a significant role in supporting the production of energy from renewable sources.

A great simplification of the different sectors' and uses' exemptions and reductions was studied in policy options 2 and 3. The removal of the EU-wide mandatory exemption for aviation and maritime and the removal of the optional exemption for inland shipping is also part of policy options 1, 2 and 3.

There is strong support for differentiated tax treatments for **low-carbon fuels and applications**, and for **selected fuels (e.g. advanced biofuels and synthetic fuels)**; in both cases, over two thirds of respondents agreed with this. Regarding policy options addressing the uses of hydrogen, about half support the option of "only if it is green hydrogen, e.g. from electrolysis with renewable electricity, in any of the above". There was a positive but less enthusiastic response to the idea of tax differentiation for Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) (43%).

The differentiated tax treatment for low carbon and selected fuels was studied in policy options 2 and 3. In these options, LPG and CNG are considered transitory fuel for decarbonation of transport and have a lower minimum tax rate than traditional fuels for a transitional period.

ANNEX 3: WHO IS AFFECTED AND HOW?

1. Practical implications of the initiative

The revision of ETD aims at introducing improvements and simplification in the tax rates and taxable base, as well as clarifications of the legal text. The envisaged changes however should not fundamentally alter the actual levy and administration of excise taxation on energy products and electricity. Energy suppliers or big energy consumers remain the main taxpayers or operators registered for excise purposes. They are responsible for the payment and collection of the tax proceeds, as well as the management of possible reductions and exemptions. The number of taxpayers therefore remains limited (energy suppliers or big energy consumers) and as a result, the administration costs are practically quite limited.

Notwithstanding the above some additional regulatory costs may arise as a result of the new energy products proposed to be introduced in the ETD's scope (e.g. hydrogen and solid biomass). Such costs, albeit limited may arise for the traders in the new energy products and for administrations as these new products will be subject to some provisions of the excise general arrangements. In order to provide an illustrative overview of the key processes and obligations related to the production and trade in energy products and electricity, see the following table, referring to the current Energy Taxation Directive[10]:

[10] See the Commission report: evaluation of the Energy Taxation Directive, SWD(2019) 329 final, and the final report on Technical and legal aspects of Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity.

ADMINISTRATIVE BURDEN	For economic operators	For Member States	Source
Declaration and payment of excises			
Excise declaration	* Register for the use of the electronic declaration system * Prepare data for the declaration * File the declaration (electronically)	* Set up and maintain IT system * Control the correctness of declarations * Ensure all consumptions have been duly declared --> perform physical and document-based audits	National legislation Horizontal Directive Commission Regulation EMCS
Payment of duties	* Establish a payment method * Ensure continuous operability (E.g. provide for sufficient amount on bank account)	* Set up payment system * Control payment is made	National legislation
Respect of minimum rates	/	* Ensure compliance with EU minimum levels of taxation	**Energy Taxation Directive (art. 4)** National legislation
Excise classification	* Ensure that categorization of products is up to date * Inform on the categorization of taxable products not explicitly listed in the legislation	* Update the IT system with Combined Nomenclature changes	**Energy Taxation Directive (art. 2)** National legislation
Exemptions and reductions			
Provide direct tax exemption/reduction (in practice, based on licensing schemes)	* Prepare and submit request for licenses/authorizations	* Assess and issue licenses/authorizations	**Energy Taxation Directive (Art. 6)** National legislation
Request for a refund	* Prepare and submit request for refund	* Assess and grant refunds	**Energy Taxation Directive (Art. 6)** National legislation
Record keeping and reporting requirements (fiscal control)	* Ensure compliant record keeping	* Perform physical and document-based audits	**Energy Taxation Directive (Art. 5, 14-18, 21)** National legislation
State aid	/	* Verify that State aid rules are not breached	State aid rules (EU and national)
Movement			
Under suspension - Operate EMCS	* Register to the EMCS system	* Set up and maintain EMCS system	Horizontal Directive Commission Regulation EMCS
Under suspension - Placing and release from goods in EMCS	* Prepare the data and use EMCS to place and subsequently release the movement under suspension of goods	* Ensure the movement under suspension of goods is compliant --> perform physical and document-based audits	Horizontal Directive Commission Regulation EMCS National legislation
Under suspension and duty-paid - Guarantee	* Foresee a guarantee	* Calculate the amount of guarantee	Horizontal Directive National legislation
Duty-paid - Request for a refund	* Prepare and submit request for refund in case of MS movements of duty-paid goods	* Assess and grant refunds	Horizontal Directive National legislation
Storage and production			
Request for a license	* Prepare and submit request for licenses/authorizations	* Assess and issue licenses/authorizations	Horizontal Directive National legislation
Guarantee	* Foresee a guarantee	* Calculate the amount of guarantee * Ensure guarantee is in place	Horizontal Directive National legislation
Record keeping and reporting requirements	* Ensure compliant record keeping	* Perform physical and document-based audits	Horizontal Directive National legislation
Member States derogations			
Monitor MS derogations	/	* Introduce request for further exemptions or reductions for specific policy considerations	**Energy Taxation Directive (art. 19)** National legislation
Statistical reporting			
Report to the EU Commission	/	* Inform the EU Commission about the levels of taxation applied and about the exemptions, reductions, differentiations and tax refunds adopted	**Energy Taxation Directive (art. 25-26)** National legislation

Source: Study on "Technical and legal aspects of Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity"

2. Summary of costs and benefits

I. Overview of Benefits (total for all provisions) – Preferred Option 2a		
Description	***Amount***	***Comments***
	Direct benefits	
Contributing to the EU 2030 targets and climate neutrality by 2050 in the context of the European Green Deal	Change in EU 27 emissions in 2035 compared to the baseline: • • GHG: -1,6% • • NOx: -1,7% • • PM2.5: -2,5% • SO2: -1,6% (see the relevant section on impacts of the policy options, results on option 2a)	By reducing emissions, the ETD will enable the EU to achieve its increased targets for 2030 and become carbon neutral by 2050
Preserving the EU internal market and ensure fair competition	The introduction of the new minima and the broadening of the tax base will contribute to greater convergence of effective tax rates across Member States (see the relevant section on impacts of the policy options, results on option 2a)	The envisaged provisions on product coverage, tax rates and taxable base aims at fostering more harmonised rules to the benefit of the internal market (and national administrations, economic operators, citizens)
Budgetary impacts	Revenues in Member States are expected to increase. The evolution in EU27 of total tax revenues is expected as follows: • • +22% in 2035 corresponding to c. 24 billion EURThis additional revenue compensates for around 70% of the loss in revenue projected under the baseline (see the relevant section on impacts of the policy options, results on option 2a)	Due to the widened product coverage, increased minimum rates and enlargement of taxable base, revenues generated from energy taxation are expected to increase significantly.
Equity	Equity has been taken in due consideration in the policy design for the revision of the current legal system • The relative contribution towards GHG reduction differs noticeably among Member States. • The same holds for the increase in revenues. • In general, lower income Member States, which have lower national rate, will be the most affected. • The effect on income distribution is of small magnitude and seems just slightly larger in the first half of the income distribution. (see the relevant section on impacts of the policy options, results on option 2a)	As expected due to the very different national situations the proposed option will have distributional impact. This is one of the reasons why some changes are proposed following a transitional period of implementation.
Coherence with other initiatives of 'Fit for 55' Package and other relevant EU policies	The preferred option is fully coherent with other initiatives of 'Fit for 55' Package and relevant EU policies. (see the relevant section on impacts of the policy options, results on option 2a)	This option does not overlap with but in fact usefully complements other policy actions under the 'Fit for 55' Package.

For the **costs** of the Directive's functioning, the specific implementation of the ETD is dependent upon several other factors. These include aspects such as specific national or other EU policies being applied in the same domain, national priorities and industrial legacy, prevailing economic and trading conditions or business models of individual sectors or companies.

According to the (already published) evaluation of the current ETD11, due to the wide ranging flexibility left by the current ETD to Member States to apply exemptions, reductions and refunds it was vastly complicated to even calculate effective rates in a harmonised way

[11] See the Commission report: evaluation of the Energy Taxation Directive, SWD(2019) 329 final

across the EU. Particularly that at the time of the evaluation no official data collection existed that was equipped to capture effective tax rates. Altogether means that it was difficult to single out and quantify some effects of the Directive's working.

However, in the current exercise, some economic costs have been identified in the relevant section on impacts of the policy options.

Moreover some regulatory costs (mostly managing authorisations, declarations and IT systems update) will arise for the traders in energy products newly introduced in the ETD's scope and for administrations as these products will be subject to some provisions of the excise general arrangements[12]; however these costs should be limited for hydrogen and solid biomass traders as these products will be allowed the same movement control simplifications as natural gas and coal respectively. The termination of excise duty exemptions for some fuels or sectors of activity (e.g. aviation and maritime) does not change the regulatory costs related to general arrangements as exempted fuels were anyway subject to holding and movement controls.

The collection of a fuel tax in the aviation sector is not expected to be problematic from an administrative perspective. Member States already have experience in collecting fuel taxes in other transport modes (mainly road transport). It is expected that an aviation fuel tax would be collected in a similar manner, with the fuel suppliers collecting the tax when they supply kerosene at airports, then transferring those funds to the relevant tax authorities.

In terms of efficiency, the costs of collecting the current motor fuel taxes can be used as a proxy for how much it would cost to collect an aviation fuel tax. A 2012 study carried out for DG MOVE[13] found that administrative costs for public authorities represented between 0.65% and 0.85% of the revenue of fuel tax. It is estimated that the collection of a kerosene fuel tax would be somewhat simpler, as the supply of kerosene is concentrated at airports, of which there are only a few in each Member State. Given this, the lowest figure of 0.65% of revenue is considered as representing the administrative costs of collecting a fuel tax.

Those costs can be summarised as follows.

II. Overview of costs – Preferred option 2a							
		Citizens/Consumers		Businesses		Administrations	
		One-off	Recurrent	One-off	Recurrent	One-off	Recurrent
Increase in effective taxation in the economy and broaden of the scope of the Directive	Direct costs	- Loss of employment by 0.2% at EU 27 level	- Increase in household heating and transport prices	As consumers: - Cost increase due to reduced exemptions including for new	As consumers: - Increase in fossil fuel prices As	limited regulatory costs for authorisations of new traders and new products	limited regulatory costs for declarations management and authorisations follow

[12] Council Directive 2008/118/EC of 16 December 2008 concerning the general arrangements for excise duty and repealing Directive 92/12/EEC

[13] CE Delft et al. (2012). An inventory of measures for internalising external costs in transport. Brussels: European Commission.

				taxed sectors (e.g. aviation and maritime) As suppliers: - Limited regulatory costs for traders that store or move cross-border new energy products	suppliers: - declarations management and authorisations follow up		up Cost of collecting tax revenues.
	Indirect costs						
Action	Direct costs	None as stated in the evaluation report					
	Indirect costs	None as stated in the evaluation report					

ANNEX 4: ANALYTICAL METHODS

1. Introduction

In order to assess the environmental, macro-economic, and distributional impacts of the proposed revisions to the ETD, the analysis used three modeling tools: (1) JRC-GEM-E3, a computable general equilibrium model; (2) EUROMOD, a static microsimulation model; and (3) DG ECFIN's E-QUEST, a New-Keynesian dynamic stochastic general equilibrium model that has recently been enriched with a representation of the energy system.

*2. **The JRC-GEM-E3***

2.1 Overview

The JRC-GEM-E3[14] (General Equilibrium Model for Economy-Energy-Environment) is a recursive dynamic Computable General Equilibrium model. It is a global model, covering the European Union, alongside 13 other major countries or world regions. With a detailed sectoral disaggregation of energy activities (from extraction to production to distribution sectors) as well as endogenous mechanisms to meet carbon emission constraints, the JRC-GEM-E3 has been extensively used for the economic analysis of climate and energy policy impacts.

Divided into 31 sectors of activity, firms are cost-minimizing with CES production functions. Sectors are interlinked by providing goods and services as intermediate production inputs to other sectors. Households are the owner of the factors of production (labour, skilled or unskilled, and capital) and thereby receive income, used to maximize utility through consumption. Government is considered exogenous, while bilateral trade-flows are allowed between countries and regions.

In 5-year steps, an equilibrium is achieved at goods and services markets, and for factors of production through adjustments in prices.

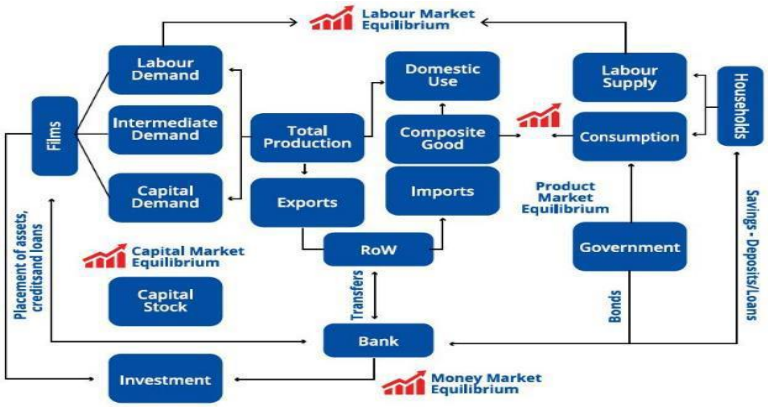
The model also integrates (in particular for the baseline building) inputs from energy system models (generally PRIMES for EU Member States and POLES-JRC for the rest of the world) on a number of variables of interest, such as a detailed use of energy products by consumers, global fuel prices, etc. More information on the integration of energy system model inputs in macroeconomic modelling in JRC-GEM-E3, can be found in the Impact Assessment of the Climate Target Plan (CTP) - Annex 9.3 [15]

The JRC-GEM-E3 model is normally used to compare policy options against a baseline scenario, representing the evolution of the global economy under current energy and climate policies. This is the case in this analysis: a baseline is defined, which represents the European Union's current ETD.

[14] https://ec.europa.eu/jrc/en/gem-e3/model

[15] Impact Assessment SWD(2020) 176 final part 2.https://eur-lex.europa.eu/resource.html?uri=cellar:749e04bb-f8c5-11ea-991b-01aa75ed71a1.0001.02/DOC_2&format=PDF

Figure 6: A schematic representation of the GEM-E3 model.



Source: JRC-GEM-E3

The model has been used to provide the macro-economic, sectoral and trade economic assumptions as input for this Impact Assessment. JRC-GEM-E3 produces consistent sectorial value added and trade projections matching GDP and population projections by country taken from other sources such as the ECFIN t+10 projections for economic activity and the Ageing Report. The model can also be used to assess the impacts of the energy and climate targets on macroeconomic aggregates such as GDP and employment.

The most important results, provided by GEM-E3 are: Full Input-Output tables for each country/region identified in the model, dynamic projections in constant values and deflators of national accounts by country, employment by economic activity and by skill and unemployment rates, capital, interest rates and investment by country and sector, private and public consumption, bilateral trade flows, consumption matrices by product and investment matrix by ownership branch, GHG emissions by country, sector and fuel and detailed energy system projections (energy demand by sector and fuel, power generation mix, deployment of transport technologies, energy efficiency improvements).

2.2. Adjustments and data extensions to the GEM-E3 model

2.2.1 Taxing energy use – model enhancements to introduce excise taxes

In the model, both firms and households consume energy. For firms, energy products are used as inputs to the production. For households, energy products are used to render two types of utility-deriving services, namely fuels for heating and appliances and fuels for private transportation. Energy products are supplied through five different sectors of activity: coal products, oil products, natural gas, electricity and agriculture (for biofuels).

For the purpose of analyzing the impacts of changes to the ETD, two new model parameters we introduced, for firms and households respectively, which represent a unit excise tax per volume of energy consumption (ton of oil equivalent in the model). The new model parameters are created in four dimensions: per country, per year, per energy consumer (also distinguishing between heating and motor fuels for households) and per energy product.

In the baseline, these new model parameters must reflect as close as possible the existing energy taxation levels in the EU under the current ETD. The most up-to-date information on tax rates and tax bases were used to derive effective tax rates (net of rebates/exemptions) in the required format for the JRC-GEM-E3 modelling exercise.

2.2.2 Deriving effective tax rates for the JRC-GEM-E3

Context

The calculation of effective tax rates, in its simplest form can be summarized as follows:

$$Effective\ tax\ rate\ (in\ €\ per\ toe) = \frac{Nominal\ tax\ rate\ (€\ per\ toe) \times Taxable\ volume(toe)}{Total\ Consumption\ Volume\ (toe)}$$

Identifying total consumption volumes per sector requires inputs from a highly detailed energy consumption database covering all Member States. The 2020 Eurostat Energy balances[16], which also enables us to ensure compatibility with the JRC-GEM-E3 baseline building process[17].

The calculation of effective tax rates is implemented in four steps:

1) Using the 2020 Eurostat Energy balances, the total consumption of fuels by consumers (production sectors and households) was employed at the level of detailed energy products reported in the balances (63 products);

2) Building on additional Commission analysis, the in-scope versus out-of-scope consumption volumes for each user was identified at the detailed energy product level;

3) Tax rates were mapped to the 33 consumers in the model, and 63 products in the energy balances (in consistent 2018€ per energy unit).

4) For each consumer, effective tax rates were derived by applying tax rates and tax bases, aggregating the detailed energy products to the level of the five energy-supplying sectors in the model.

The Eurostat energy balances present the supply and consumption of energy commodities throughout the economy in consistent units (tons of oil equivalent). The latest edition (2020) of the Eurostat energy balances was used for the most-recent available year, i.e. 2018, to derive the total use of energy products by JRC-GEM-E3 consumers.

Total consumption of energy products (*fu*) for each country(*ct*) and for each of the 33 consumers (*co*, 31 sectors and two households uses) was defined as the sum of inputs for transformation processes (e.g. for heat generation) and final consumption, as below:

$$TotCons_{fu,co,ct} = Trans\_inp_{fu,co,ct} + Fin\_cons_{fu,co,ct}$$

In-scope energy consumption

While the total consumption for JRC-GEM-E3 sectors and households represents how much energy products are actually consumed overall, this consumption is not fully subject to excise taxes. In the absence of full-fledged dataset on the actual volumes of energy subject to taxation across the Member States, further analysis was undertaken to identify the amount of energy consumption that is completely exempt from taxation according to article 2 of the ETD for energy intensive industries.

Using the same matching methodology as above to calculate total consumption, the in-scope energy consumption was identified at the level of JRC-GEM-E3 sectors as the difference between total consumption, and the identified out-of-scope volumes inputs for transformation processes and final consumption:

[16] https://ec.europa.eu/eurostat/web/energy/data/energy-balances

[17] The JRC-GEM-E3 model relies on input from energy system models to represent the present and future evolution of energy consumption for firms and households in the baseline. For EU MS, the projections of the PRIMES model are used, for which the Eurostat energy balances are the starting point.

$$InScopeCons_{fu,co,ct} = TotCons_{fu,co,ct} - OutScopeTransinp_{fu,co,ct} - OutScopeFC_{fu,co,ct}$$

Furthermore, a number of Member States apply special rates to industry on certain out-of-scope processes, as well as for products used for heat generation in CHP.

Therefore, the calculation of effective tax rates also requires the identification of volumes for the various out-of-scope processes at the disaggregated product level. Therefore an out-scope volume with a process dimension[18] ($OutScopeCons_{fu,co,pro,ct}$) was computed for each of the out-of-scope processes, namely: *Chemical reduction, Electrolysis, Metallurgical processes, Mineralogical processes, Dual use* and *Uses other than motor or heating fuel*[19].

The volume of products used to generate heat in CHP processes ($CHPScopeCons_{fu,co,ct}$) was also computed. In the absence of data on the volume of fuels used for heat or for power in CHP, we use the heat/power output split in each sector and country provided in comments to JRC.C7 by the International Energy Agency[20].

Finally, full exemptions to a set of activities were assigned namely: energy products for electricity generation, fuels used for aviation and navigation. For these sectors, in-scope volumes are zero.

Mapping tax rates to consumers and products

First tax rates per sector and product groups -currently in volume (1000L), weight (1000kg) or energy units (GJ, MWh)- were converted into consistent units across fuels, namely per ton of oil equivalent (€/toe). For this exercise conversion rates based on Eurostat's 2019 calorific values from the Energy Balances Guide were employed Table 6.

Detailed tax rates were assigned to the JRC-GEM-E3 consumers, namely the 31 sectors of activity and two households uses as described in Table 7

Table 6: Conversion factors for original tax rate units to EUR per toe

Units provided by TAXUD →	EUR/ 1000 litres	EUR/ 1000 kg	EUR/ GJ	EUR/ MWh
Petrol	1.25			
Gasoil	1.15			
LPG		0.89		
Heavy Fuel		1.04		
Coal and Coke			41.87	
Natural gas			41.87	
Kerosene	1.19			
Electricity				11.63

Source: JRC

Table 7: Mapping tax rates to JRC-GEM-E3 consumers

JRC-GEM-E3 energy consumers		Tax database
1	Crops	Agriculture
2	Coal	Industry

[18] For instance, the consumption of natural gas for metallurgical processes in the Iron and Steel sector.

[19] Note that in Article 2, another exemption exists: Electricity accounting for more than 50% of the cost of a product. However, due to lack of data on production costs, we were unable to identify the corresponding volumes.

[20] For 22 out of 27 Member States, which are also members of the OECD; the five remaining MS are assigned EU average values.

3	Crude Oil	Industry
4	Oil Products	Industry
5	Gas	Industry
6	Electricity supply	Industry
7	Ferrous metals	Industry (ETS)
8	Non-ferrous metals	Industry (ETS)
9	Chemical Products	Industry (ETS)
10	Paper Products	Industry (ETS)
11	Non-metallic minerals	Industry (ETS)
12	Electric Goods	Industry
13	Transport equipment	Industry
14	Other Equipment Goods	Industry
15	Consumer Goods Industries	Industry
16	Construction	Industry
17	Transport (Air)	None - exempted
18	Transport (Land)	Commercial Haulage- Public transport
19	Transport (Water)	None - exempted
20	Market Services	Services
21	Non Market Services	Services
22-29	Power technologies	None - exempted
30	Livestock	Agriculture
31	Forestry	Agriculture
n/a	Household heating	Household heating
n/a	Household private transport	Households motor

Source: JRC

Effective tax rates

Finally, using consumption volumes and tax rates for each of the 33 consumers by detailed energy product, effective tax rates at the JRC-GEM-E3 dimensions, were derived aggregating energy products into five energy-supplying sectors (su).

$$efftax_{su,co,ct} = \frac{\sum_{fu} \begin{bmatrix} InScopeCons_{fu,co,ct} \times Inscope\ rate_{fu,co,ct} \\ + OutScopeCons_{fu,co,pro,ct} \times Outscope\ rate_{fu,co,pro,ct} \\ + CHPScopeCons_{fu,co,ct} \times CHP\ rate_{fu,co,ct} \end{bmatrix}}{\sum_{fu} TotCons_{fu,co,ct}}$$

In addition to reflect out-of-scope volumes, this method allows us to differentiate tax rates between sectors (particular industrial sectors) based on their underlying energy mix. For instance, while the gasoil nominal tax rates for the Iron and Steel and non-ferrous metal sectors might be the same, the effective tax rate on oil products (supply sector 04) will vary based on (i) the ratio of in-scope over total consumption for each sector and (ii) the composition of their consumption of oil products (e.g. I&S might consume higher or lower volumes of LPG or gasoil than NFM).

2.2.3 Introduction of air pollutant emissions in the JRC-GEM-E3

To study the impact of the various proposal on air pollutant emissions, the JRC-GEM-E3 model was further developed to cover emissions of NOx, PM2.5 and SO2 for all sectors, energy carriers and countries in the EU. Air pollutant emissions were provided by the GAINS

model (IIASA, https://iiasa.ac.at/web/home/research/researchPrograms/air/GAINS.html), and corresponding emission control policies are in line with the baseline of the Second Clean Air Outlook (COM/2021/3 final) for the year 2030.

After mapping the sectors of both models, these emissions were converted into emission factors by dividing with the corresponding drivers: energy use or economic activity. Emissions that could not be clearly linked to either energy use or sectoral activity were kept fixed across scenarios. Emission factors for 2030 were then applied to the years 2025 and 2035, which could lead to slight underestimation (overestimation) of emission reductions in 2025 (2035) if emission factors are decreasing faster in regions were the ETD scenarios are particularly impactful.

While the JRC-GEM-E3 model combines economy-wide coverage with sector- and fuel-specific detail, a few caveats should be considered when interpreting the results on air pollutant emissions. First, emissions related to the use of solid biomass for energy in industry are not accounted for. Second, the model does not capture the split between diesel and petrol, hence may underestimate the benefits of the air pollution component in the minimum rates in terms NOx emission reductions.

3. EUROMOD

EUROMOD (EM) is the European Union tax-benefit microsimulation model[21]. The EM model combines country-specific coded policy rules with representative household microdata (mainly from the European Union Statistics on Income and Living Conditions database, EU-SILC). The model employs information on countries' tax codes and on household characteristics and economic circumstances to simulate tax liabilities and cash benefit entitlements. Taxes and transfers that are not possible to simulate because of lack of relevant information are used as recorded in the original surveys. The model simulations take into account the role played by each tax-benefit instrument, their possible interactions, and generate the disposable (i.e. income after taxes and cash benefits) household[22] income. Therefore, the model results are particularly suitable for the analysis of the distributional, inequality and poverty impact of tax reforms, by household or by individual groups according to socio-economic variables of interest. Cross-country comparability is enabled by coding the policy systems of the EU Member States according to a common framework. EM simulations also provide estimations of the budgetary effects and indicators which are commonly used to measure work incentive effects of the policy reform scenarios.

It should be kept in mind that EUROMOD simulations do not incorporate any behavioural effects that may also affect the fiscal as well as the distributional outcome of a reform. Thus, the model is static and delivers the first-round effects (`the overnight effect').

The analysis of the energy taxation reform scenarios is based on the recently developed Indirect Tax Tool version 3 (ITTv3) extension of the Euromod model.[23] The ITT allows the simulation of indirect taxes (such as VAT and excises) and their impact on household disposable income and government budgets. In a first step, the ITT augments the micro–data

[21] https://euromod-web.jrc.ec.europa.eu/about/what-is-euromod

[22] The main income inequality and poverty indicators which are used to evaluate the impact of reforms are generally based on *equivalised* household disposable income, considering economies of scale in consumption within the household: *equivalised* income refers to the fact that household members are made equivalent by weighting them according to their age, using the so-called modified OECD equivalence scale.

[23] https://euromod-web.jrc.ec.europa.eu/about/what-is-euromod#inline-nav-3

underlying Euromod with information on household expenditures. This is accomplished by imputing private household expenditure information for more than 200 commodity categories from the harmonised Eurostat Household Budget Surveys (EU HBS henceforth) into the microdata underlying EUROMOD. In a second step, the tool applies the indirect taxation rules in place in each country (including VAT, specific and ad-valorem excises) to compute households' indirect tax liabilities based on their imputed consumption basket. Currently, the ITT rests on the assumption of full tax compliance and of full pass-through, and it is available for 18 countries (BE, CY, CZ, DK, FI, FR, DE, EL, ES, HU, IE, IT, LT, PL, PT, RO, SI and SK).

The simulations used in this analysis are based on EUROMOD version I2.0. The tax-benefit systems simulated in the baseline refer to those in place in each country as of June 2019, while the underlying input data mainly come from the 2010 EU-SILC[24] and the 2010 HBS. Incomes reported in the EU-SILC of 2010 refer to 2009-2010. Uprating factors are used to update income and prices from the date of the input data to the year of interest, in this case 2019.

The impact of the energy tax reforms on household budgets is analysed by estimating the changes in household post-fiscal income (post-fiscal income = household disposable income[25] – indirect taxes) across the income distribution. Distributional, inequality and poverty risk indicators are calculated on household post-fiscal income for the total population or for specific groups. Their variations in the environmental tax reform scenario under consideration[26] are compared against the baseline. EM simulations are also performed for a scenario in which the energy tax reforms are accompanied by a budget-neutral compensatory measure that redistributes the additional revenue through lump-sum transfers among households.

For the simulations of these energy taxation reforms, EM has been linked to the GEM-E3 macroeconomic model to account for the economy wide impact of the reforms. Two main steps are followed to link the two models. In the first step, the baseline scenarios of the two models are aligned.[27] For this end, the consumption of each household in the ITT is adjusted proportionally in order to ensure that the aggregate share of consumption expenditure by each group of goods and services (e.g "Education", "Food" etc) matches the one in the GEM-E3 model. In the second step, EM is fed with the impact of the simulated tax reform over prices and incomes, as simulated by the GEM-E3. In more detail, the consumption expenditure of each household is adjusted to account for the changes in prices (while keeping constant quantities). Such consumer price changes reflect both the tax change as well as the impact that the reform has on producer prices. Furthermore, household income is also adjusted to account for the changes in labour and capital income triggered by the reform, as simulated by the GEM-E3.

It should be noted that for the scenario with a compensatory measure, the tax revenues to be redistributed among household are estimated within the EM framework. Revenues estimated

[24] While there are more up to date EU-SILC data, the 2010 version was chosen to match latest EU-HBS dataset available for the imputation of consumption data.

[25] Household market income net of direct taxes and cash benefits.

[26] For impact assessment EUROMOD was used for the analysis options 1/2.

[27] There are a number of reasons for the baselines of Euromod and GEM-E3 not to be necessarily aligned in a given year. One of them is that EM and GEM-E3 variables are constructed in accordance to different sets of statistics: for example, while in GEM-E3 household consumption is aligned with National Account data, consumption is recorded from survey data in EM.

from the macro model are larger, because they account for the increase in taxation in other sectors of the economy as well (e.g. the corporate sector).

This procedure rests on two key assumptions affecting the estimation of the change in the indirect tax burden for households. First, in the reform scenario, households are assumed to continue consuming the same quantities of all goods as before the tax hike. This can be interpreted as demand being inelastic or the "morning-after effect" (households do not adapt their consumption basket after the change in price). That effectively rules out any offsetting effects via reduced demand.[28] Second, changes in indirect taxation are measured by the variations in consumer prices resulting from the tax reforms. That amounts to assume constant producer prices and a full pass-through of the tax burden to consumers. This is a restrictive assumption since depending inter alia on market conditions, the pass-through could be imperfect and producer prices could vary to offset or to reinforce the impact of tax changes over consumer prices. Accordingly, the estimates from this approach might result in either an over-estimation (driven by the inelastic demand assumption) or an under-estimation (driven by eventual shifts of producer prices) of the additional tax burden borne by consumers. We nonetheless expect any estimation error to affect the different percentiles of the income distribution in a proportional manner, therefore preserving our qualitative conclusions.

4. QUEST

QUEST[29] is the global macroeconomic model that the Directorate General for Economic and Financial Affairs (DG ECFIN) uses for macroeconomic policy analysis and research. It is a structural macro-model in the New-Keynesian tradition with rigorous microeconomic foundations derived from utility and profit optimisation and including frictions in goods, labour and financial markets.

There are different versions of the QUEST model, estimated and calibrated, each used for specific purposes. In this impact assessment we used the E-QUEST model, which builds on the structure of dynamic stochastic general equilibrium (DSGE) models[30]. For this project, the model is set-up for two-regions, the European Union (EU) and the rest of the world (R). In each region, the economy consists of households, firms, a monetary and a fiscal authority. Following the standard DSGE literature, households can be liquidity or non-liquidity constrained depending on their access to financial markets. Households offer differentiated labour services to firms in three skill levels, low-, medium-, and high-skilled. In each region, firms produce differentiated goods and services for domestic and foreign markets. Production requires labour, general (non-energy) capital, a composite of intermediate goods and a composite of fuel and electricity-intensive capital-energy bundle. In the fossil fuel-intensive capital-energy bundle, capital is combined with fossil fuel energy while in the electricity-intensive bundle electricity is required to use the corresponding capital. The main innovation

[28] It is generally the case that when the price of a good raises (e.g. because an increase in taxation) its demanded quantity decreases. Empirically, price elasticity of demand are typically found to be in the range of (-1, 0).

[29] https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/economic-research/macroeconomic-models_en

[30] The model is an extension of the European Commission's QUEST III model (Ratto et al. 2009, Burgert et al. 2020). Ratto, M., Roeger, W., and in 't Veld, J. (2009). QUEST III: An Estimated Open-Economy DSGE Model of the Euro Area with Fiscal and Monetary Policy. Economic Modelling 26: 222-233. Burgert, M., Roeger, W., Varga, J., in 't Veld, J. and Vogel, L. (2020). A Global Economy Version of QUEST. Simulation properties. European Economy Discussion Papers 126. Directorate General Economic and Financial Affairs, European Commission.

in the E-QUEST model compared to the standard DSGE models is the inclusion of energy-input substitution allowing for a more detailed description of substitution possibilities in different energy sources for the economic agents. Firms have imperfect substitution possibilities between fossil fuel and electricity-intensive capital-energy bundles.

The model also differs from standard DSGE models by introducing sectoral disaggregation in order to address climate policy related measures targeting fuel and electricity-intensive sectors. There are seven sectors in the model: a fossil fuel and a fossil fuel-intensive capital producing sector, an electricity and an electricity-intensive capital producing sector, a sector manufacturing general, non-energy related capital goods, an emission-intensive sector and an aggregate of the remaining economic sectors.

The model features fully forward looking intertemporal optimization and it is calibrated and solved at annual frequencies. There is endogenous labour supply, demand and wage setting, imperfect (monopolistic) competition with real and nominal frictions in all sectors of the economy. The fiscal authority receives its revenue from taxes on domestic and imported goods and taxes on factor incomes. On the expenditure side, we assume that government consumption, government transfers and government investment are proportional to GDP and unemployment benefits are indexed to wages. The monetary authority follows a standard Taylor-rule reacting to the deviation from an inflation target.

ANNEX 5: EFFECTIVE TAX RATES

1. Introduction

This paper delivers a systematic overview of tax reliefs in the EU27 and Norway. Much of the EU's energy consumption is not taxed at the nominal levels listed in national legislation. A wide range of energy consumers benefit from various tax reliefs, in the form of rebates, refunds, differentiation and exemptions. This Impact Assessment quantifies tax reliefs in the transport, agriculture, households, services and industry sectors. In addition the criteria attached to tax reliefs are inventoried.

Effective tax rates are best suited to serve as the basis for policymaking. Effective tax rates are synthetic indicators, which present nominal rates adjusted by tax reliefs. The difference between nominal and effective rates show that the tax burden eventually born by consumers- can vary significantly from the nominal rate. Therefore, it is important to use duly computed effective tax rates to measure the impact of proposed policy changes. Effective tax rates – unlike their nominal counterparts- also allow for cross country and cross sector comparison.

Effective tax rates are also the best indicators to summarise the shortcomings of the current ETD and consequently the drivers for its revision. While nominal rates themselves provide no clear indication for the environment or internal market related problems of the EU's current energy taxation design, effective rates can serve the purpose. They illustrate the ETD's shortfalls in terms of preserving the EU's internal market as well as contributing to the 2030 targets and climate neutrality by 2050 in the context of the European Green Deal. Effective rates demonstrate harmful fossil fuel incentives in the form of sector and use specific tax reliefs and show the real differences in energy taxes paid by consumers across Member States.

The tax code can be changed in two ways. Firstly, by altering nominal tax rates. In other words, increasing or decreasing the rates applied to energy products and different uses. Secondly, by altering the taxable base. This can be achieved by changing the list of beneficiaries or eligibility criteria attached to tax reliefs. Such measures impact volumes of energy that benefit from various tax reliefs. Where applicable, this report builds sector- wide weighted averages, combining volumes of energy that are taxed at nominal rates - and therefore do not benefiting from any tax relief- with volumes of energy that are subject to zero or reduced rates.

Findings of the report are based on a survey completed by 28 Finance Ministries. In early 2020, DG TAXUD conducted a survey that was completed by all 27 EU Member States and Norway (further EEA28). TEMS- Taxud Energy Metadata Survey allowed for the collection of systematic information on tax reliefs and the national criteria attached to their application. TEMS also covered the taxation of various environmentally friendly technologies that are important drivers of the blocks energy transition. Amongst them, hydrogen, energy storage and renewables. In order to keep the reporting burden low for Member States, the survey was designed to be complemented by external data sources. Most notably, Taxes in Europe Data Base and Eurostat energy balances.

The table below illustrates the source and methodology of effective rates that fed into the modelling of economic impacts by sector. It also shows that the analysis, based on effective rates, covers a large proportion of fuels and uses. The figures represent the share of fuel consumption, based on 2018 energy balances for all Member States.

Table 8: Sector coverage of effective tax rates (2018 energy balance)

		Petrol	Gasoil	HFO	Kerosene	LPG	Natural Gas	Coal	Electricity	Biofuels
Households	Motor									
	Heating	0.5%	8.9%	0.2%	13.0%	34.7%	37.9%	35.8%	28.2%	63.7%
Agriculture		0.2%	6.6%	2.9%	0.1%	4.6%	1.6%	4.2%	2.1%	8.7%
Transport	Road	98.5%	76.1%	0.0%	0.0%	34.5%	0.8%	0.0%	0.1%	87.6%
	Air	0.1%	0.0%	0.0%	76.7%	0.0%	0.0%	0.0%	0.0%	0.0%
	Rail	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	0.1%
Services		0.4%	4.1%	3.4%	8.8%	10.1%	19.2%	4.3%	29.5%	4.3%
Industry		0.4%	3.8%	93.5%	1.3%	16.2%	40.5%	55.7%	38.2%	35.5%
Total		100%	100%	100%	100%	100%	100%	100%	100%	100%

Effective Rates (Source: TEMS)
Effective Rates (Source: JRC- Petten, TEMS)
Effective Rates (Source: TEDB**)
Nominal Rates (Source: TEDB)
No rate defined for the modelling*** or no rate defined by the current ETD ***

* DG JRC: Quantification of the industrial energy consumption within the scope of article 2 of the Energy Taxation Directive (JRC124019)

** no significant tax reliefs apply or mandatory exemption applies

** due to relatively insignificant share in the energy mix

**** rate of the fuel of equivalent use and optional tax reliefs apply

Source: European Commission

Well designed tax reliefs are not always harmful. A country that sets its nominal tax rates relatively high, thereby using taxation as an instrument of environmental policy, might decide to grant tax reliefs to certain consumers or uses. These tax reliefs might allow this country to maintain this relatively high nominal rate, thus increasing energy conservation and energy efficiency across its economy, while safeguarding selected users. Such measures are used in order to pursue certain national policy goals (particularly for industries exposed to international competition or to protect vulnerable consumers).

Exemptions and reductions for any use of fossil fuels remain fossil fuel incentives. Tax reliefs for the consumption of fossil fuels increase their price advantage over less polluting alternatives and lock- in the use of fossil fuels.

2. *Transport*

This chapter presents effective rates in the transport sector, the sector that accounts for 30% of the EEA28's energy consumption. Aviation, maritime and inland shipping are covered by tax exemptions. Therefore, effective rates are automatically zero for these modes of transport. Most transport on inland water- ways is also untaxed.

Road transport accounts for 95% of all energy consumed in transport. Road transport is dominated by fossil fuels, as they provide 94% of all energy consumed on the EEA28's roads. Among fossil fuels, gas oil is the most prevalent. It accounts for over two- thirds of all energy used in road transport (67%), followed by motor petrol as a distinct second (24%). Renewables and biofuels account for the remaining 6%[31]. In road transport, commercial gas oil is the most notable beneficiary of tax reliefs. In line with the ETD, commercial gas oil may be used exclusively for the transport of goods and passengers. 14% of all gas oil used in transport benefits from commercial gas oil tax reliefs.

Table 9: Energy Mix of Road Transport.

Gas Oil	Gasoline	Blended biofuels	Pure Biofuels	LPG	Natural gas	Electricity
67.1%	24.2%	5.5%	0.3%	2.2%	0.6%	0.1%

Source: Eurostat FC_TRA_ROAD_E 2018

Tax reliefs to gas oil in road transport result in EUR 3.85 billion tax expenditure. This amount incentivizes the use of a fossil fuel. Consequently, it also constitutes part of fossil fuel incentives the EU aims to decrease in the context of its G20 commitment and the Paris Agreement. In line with these international commitments, the Clean Energy for All Europeans communication states: "the remaining but still significant public support for oil (…) continues to distort the energy market, creates economic inefficiency and inhibits investment in the clean energy transition and innovation." [32]

Ten countries provide some type of tax relief for the commercial use of gas oil. Eight of them implement refund schemes. In Germany, the scheme covers only public transport and not the transport of goods. Two apply a rebate, in the form of providing gas oil with fiscal marking at a differentiated price or refueling from special tanks. This means, that 17 MS and Norway apply the standard propellant rate to the commercial use of gas oil in road transport. In addition, Malta defines various rates for the use of gas oil in water borne transport. These include the conveyance of passengers between Malta, Comino and Gozo as well as certain maritime commercial activities[33].

[31] Source: Eurostat. Complete Energy Balances nrg_bal_c

[32] COM(2016) 860 final, p.12.

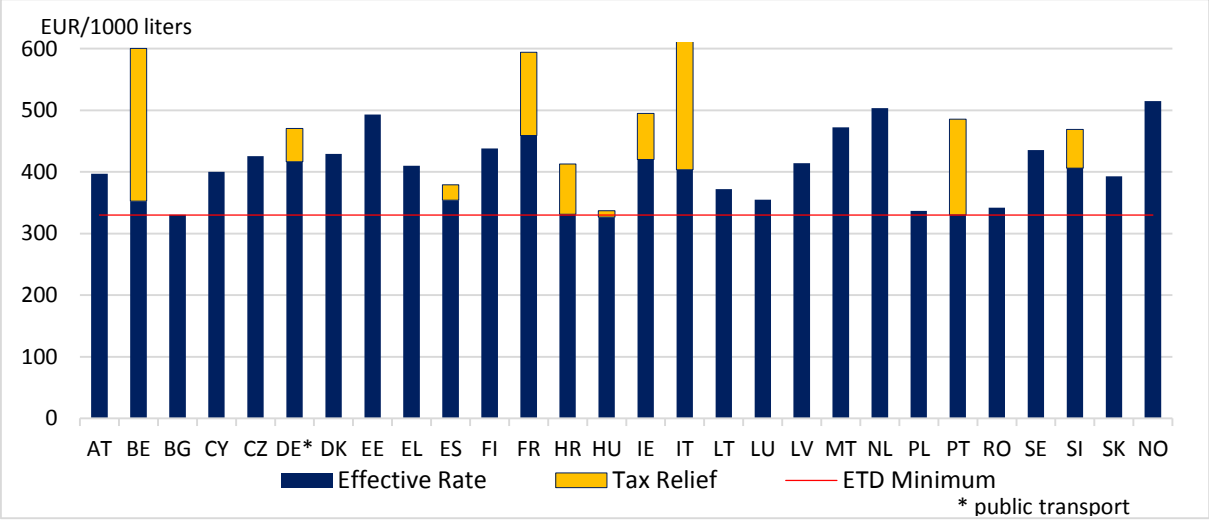
[33] Also conveyance of passengers and goods between shore and ocean- going vessels or Separate rates for inland navigation between Malta and Gozo for vessels below and above 3500 tonnes weight.

Table 10 **Share of Commercial Gas Oil Benefiting from a Tax Relief in Total Gas Oil Consumption in Road Use 2018/19. Source: TEMS and Eurostat FC_TRA_ROAD_E**
Source: TEMS and Eurostat FC_TRA_ROAD_E

AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU
0%	37%	0%	0%	0%	4%	0%	0%	0%	17%	0%	32%	13%	30%
IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK	NO
7%	29%	0%	0%	0%	0%	0%	0%	7%	0%	0%	40%	0%	0%

Effective rates range from 330 to 530 EUR/1000 litre. This report presents effective rates in a harmonized way, therefore the type of tax relief applied by each MS does not make a difference when displaying them. Yet, all effective rates must respect the following provisions laid down by the ETD: countries may differentiate between commercial and non-commercial gas oil, provided that Community minimum levels are observed. In other words, the effective rate may be lower than the national standard propellant rate, but may not fall below the ETD minimum. In the case of some other uses of gas oil, the effective rate may go below the minimum, even to zero. The ETD also defines a weight criteria: the gross laden weight of vehicles fueled by commercial gas oil must be at least 7.5 tonnes.

Figure 7: Effective Rates for Commercial Gas Oil in Road Transport, 2018/19.



Source: TEMS

The ETD allows for the tax exemption of certain public transport and freight modes. The directive states that MS may apply, under fiscal control exemptions or reductions in the level of taxation to energy products and electricity used for the carriage of goods and passengers by rail, metro, tram and trolley bus. This provision allows MS to set tax rates that go below the minima, including zero rate. The list however excludes some environmentally friendly modes of public transport, such as electricity and hydrogen- fueled buses. The environmental performance of these low carbon transport modes could mandate their inclusion in the list of modes eligible for a full exemption.

The energy mix of rail transport[34] is dominated by electricity. Electricity accounts for 68% of all energy used by railways to transport goods and passengers. Taking into account

[34] Local and high speed railways (excluding metro)

the share of renewable electricity in each EEA28 country's power generation mix and adding blended biodiesel consumption, we find that 39% of energy used by the EEA28's railways is of renewable origin. Consequently, rail transport is one of the most environmentally friendly modes of transport available today. Railway transport makes up only half a percent of the EE28's final energy consumption and 2% of all energy used by the block's transport sector.[35]

Table 11: Electricity Mix of the EU's rail transport sector.[36]

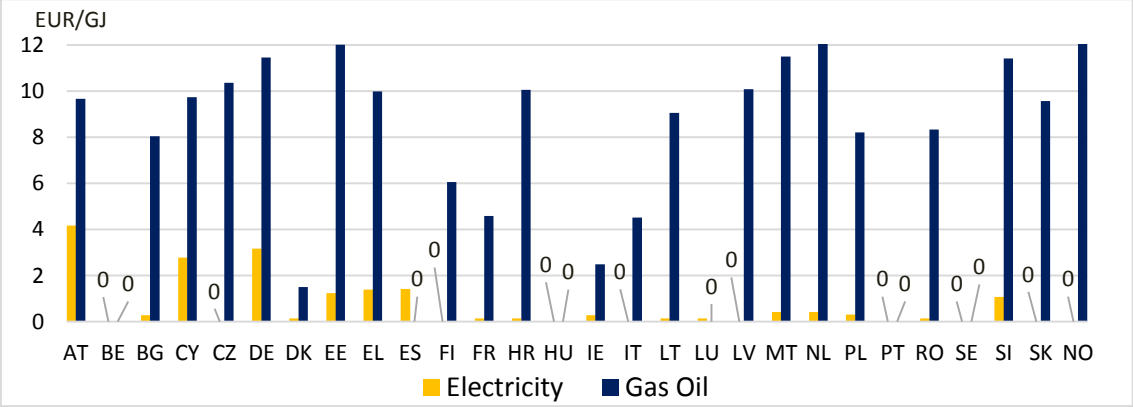
Renewable elec.	Fossil elec.	Gas Oil	Coal	Biodiesel	Other
38%	30%	27%	2%	0.4%	3%

Source: Eurostat FC_TRA_RAIL_E, SHARES nrg_ind_ren

EEA28 tax expenditure on electricity in rail transport is 8 times less than on commercial gas oil. Tax expenditure on electricity in rail transport amounts to approximately EUR 445 million . This amount comprises of exemptions in ten countries and refunds in three others. Belgium, Czechia, Finland, Hungary, Italy, Latvia, Portugal, Sweden, Slovak Republic[37] and Norway[38] do not tax electricity used in rail transport. Therefore, the effective rate is zero. The cumulative rail transport electricity consumption of these countries, accounts for 27% of all electricity consumed by the EEA28's railways. Germany, France and Denmark provide refunds, resulting in effective rates of EUR 11.42 (DE), 0.5358 (DK) and 0.5 (FR) per MWh.

Ten countries apply tax reliefs to gas oil consumption in rail transport. Less than 1% of all gas oil used in the EU's transport sector is consumed by railways. Therefore, the economic and environmental impact of these tax reliefs is limited compared to other tax reliefs for the consumption of oil products, be it in road transport, households or industry. Seven Member States, Belgium, Spain, Luxembourg, Hungary, Portugal and Sweden exempt gas oil in rail transport. Denmark, Finland, France, Italy, Ireland apply reductions resulting in effective rates ranging from 62 to 249 EUR/1000 litres.

Figure *8*: Effective Tax Rates in Rail Transport - Electricity and Gas Oil.



Source: TEDB, Eurostat FC_TRA_RAIL_E

Other modes of public transport and services may also benefit from tax reliefs. Provided, that they respect the minimum levels of taxation prescribed by the ETD, differentiated rates of

[35] Source: Eurostat Complete Energy Balance nrg_bal_c

[36] Assuming that the share of renewable electricity is the same in rail transport as in each country's energy mix.

[37] Source for EU MS: TEDB Taxes in Europe Data Base.

[38] Norwegian Tax Administration https://www.skatteetaten.no/en/business-and-organisation/vat-and-duties/excise-duties/about-the-excise-duties/electrical-power-tax/

taxation may be applied by MS in the following cases: local public passenger transport (including taxis), waste collection, armed forces and public administration, disabled people, ambulances. Under this provision, MS may apply rates that go below the national standard rates but do not go below the ETD minima. Table 12 provides a list of these tax reliefs, which are socially justified by the countries, without quantifying volumes of energy subject to them, as their economic and environmental impacts are limited.

There are no significant tax reliefs for petrol used in transport. Unlike for gas oil, there are no wide spread refund schemes for the propellant use of petrol. Only two Member States Germany and France, grant tax reliefs for the use of petrol, by local public transport and taxis respectively. Taxis running on gas oil also benefit from tax reliefs in Belgium, Spain, and Italy. In France the effective rate for the gas oil use by taxis is 359 EUR/1000 litres, resulting in 190 EUR tax expenditure per 1000 litres. In Italy and Spain tax reliefs bring down the effective rate of gas oil to 330 EUR/liter, which corresponds to the ETD minimum. Tax expenditures per 1000 litres of gas oil used in taxis equal 270 EUR and 49 EUR, in Italy and Spain respectively. In Belgium, tax expenditure on gas oil used in taxis equals 248 EUR per 1000 litres. These tax reliefs incentivize the use of a fossil fuel.

Table 12: Tax Reliefs Applied to Public Transport, Motor Fuels for Public Services and Taxis, as of July 2020

MS	Product	Beneficiary and unit	Rate
BE	Gas oil	Taxis and use by disabled persons. Per 1000 litreslitres.	352.54
DE	Petrol	Local public passenger transport (sulfur content not exceeding 10 mg/kg). Per 1000 litreslitres. Unleaded.	600.48
	Petrol	Local public passenger transport (sulfur content exceeding 10 mg/kg). Per 1000 litres. Unleaded.	615.78
	Gas Oil	Local public passenger transport (sulfur content not exceeding 10 mg/kg). Per 1000 litres. Unleaded.	416.38
	Gas Oil	Local public passenger transport (sulfur content exceeding 10 mg/kg). Per 1000 litres. Unleaded.	431.68
	LPG	Local public passenger transport. Per 1000 litres	251.62
	Natural gas	Natural gas and hydrocarbon gases, used for local public passenger transport. MWh.	12.90
	Electricity	Local public passenger transport. MWh.	11.42
ES	Gas Oil	A partial refund for the transport of goods or passengers and taxis. The refund equals 49 EUR /1000 litres of gas oil purchased. The amount of gas oil refunded shall not exceed 50,000 litres (per vehicle and year). A different limit applies for taxies: 5,000 litres (per taxi and year).	330.00
FR	Petrol	Taxis benefit from a refund of 331.0€/1000 litres. Unleaded.	384.60
	Gas Oil	Taxis benefit from a refund of 305.3€/1000 litres	289.00
	Gas Oil	Public passenger transport and haulage operators benefit from a refund of 175.4€/1000 litres	418.60
	Petrol	Taxis, ambulances, armed forces. Per 1000 litres. Unleaded.	359.00

IT	Gas Oil	Local public passenger transport. Per 1000 litres.	403.22
	Gas oil	Taxis, ambulances motor fuel for armed forces. Per 1000 litres	330.00

Source: TEDB.

3. Households

This chapter presents two types of tax rates paid by households for various energy products. Firstly, the rate paid by the average household. Secondly, a sector- wide effective tax rate. The latter, in the form of a weighted average that is built taking into account exemptions, reductions and differentiated rates. The ETD itself does not define tax rates for households, instead it sets minimum rates for business and non- business use. Households fall under the second category. However, the ETD allows countries the apply exemptions and reductions. Therefore, the combination of non- business rates and tax reliefs yield the effective rates.

Households account for 22% of the EU's total energy consumption. Electricity, natural gas and renewable thermal energy are the sources households use most commonly. On average across the EU, the energy mix of households consists of 32% natural gas, 24% of electricity and 20% renewable energy, most of which (16%) consists of primary solid biofuels, such as firewood and wood pellets[39]. These wood products as well as heat output, accounting for 9% of household energy consumption are not taxed by the ETD. Oil products make up further 11% and solid fossil fuels, including coal 3%. This average however, conceals highly different national energy mixes.

The following sections analyze the taxation of electricity, natural gas and coal consumed by households. Electricity is used by households for lighting and heating purposes, including the provision of hot water, space heating and cooking as well as to power appliances. The prevalence of electric heating differs significantly across countries. Coal and natural gas are used for heating purposes in many countries. Due to social considerations, heating fuels are typically taxed at lower rates than transport fuels. This includes tax differentiation for the same fuel: when used for heating, rates are commonly lower for the same product used for other purposes. For example the ETD minimum rate for natural gas used as propellant is 2.6 EUR/GJ compared to 0.15 and 0.30 EUR/GJ for business and non- business heating respectively.

Table 13: Energy Mix of Households in the EEA28.

Natural gas	Electricity	Wood products	Oil products	Heat	Thermal RES	Coal
32%	25%	16%	11%	9%	4%	3%

Source: Eurostat

Eight countries exempt all electricity consumption of households. These countries do not condition the exemption on any criteria. All households are exempted, irrespective of their income or geographical location. The cumulative electricity consumption of households in these countries make up 6.8% of all electricity consumed by households in the EE28. In all but 2 of these Member States[40] the per capita GDP does not reach 60% of the EU 2013 average (as defined by the Modernization Fund).

Eight countries exempt all natural gas consumption of households. Together, their consumption accounts for 11.5% of all natural gas consumed by households in the EE28. The list of the countries exempting natural gas is not identical with the list of countries exempting

[39] Excluding peat, which is also untaxed by the current ETD. Peat exceeds 1% of the household energy mixes of IE (7%) and LV (1%).

[40] CY, IE.

electricity. In 5 Member States[41] both products are exempted. In Czechia, Romania and Poland natural gas is exempted, while electricity is taxed. In Ireland and Latvia the opposite holds. In Cyprus electricity is exempted. Natural gas is not used on the islands of Cyprus and Malta.

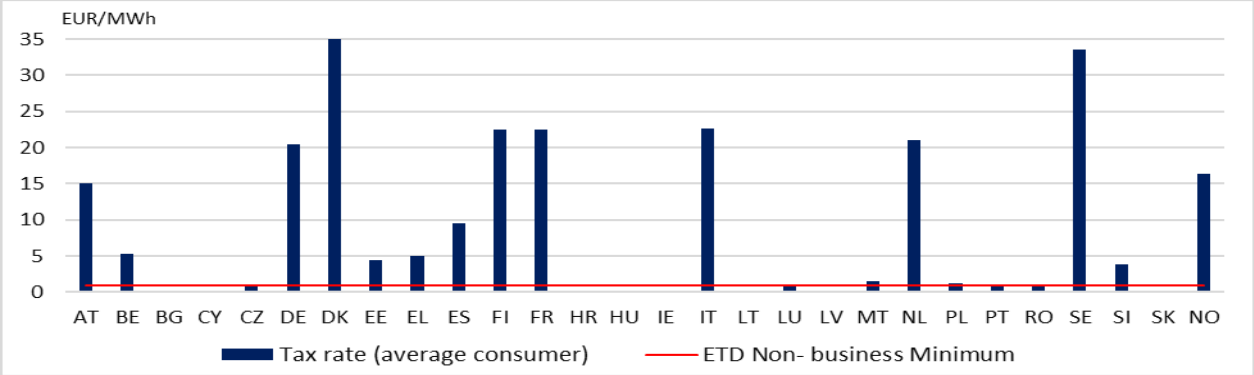
Table 14: Tax exemption of household gas and electricity consumption. X= exemption applies.

	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU
Elec			X	X									X	X
Gas			X		X								X	X
	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK	NO
Elec	X		X		X								X	
Gas			X					X		X			X	

Source: TEMS

Other countries grant partial exemptions based on social and regional grounds. These exemptions typically apply only to a small share of total consumption and apply to defined groups, mostly vulnerable consumers. In Belgium 3.3% of household electricity and 11% of gas consumption is exempted, being delivered to "residential protected clients with a low income or in a vulnerable position". [42] In Portugal 12% of household electricity and 1.4% of gas consumption is delivered to economically vulnerable households[43]. In Norway, the household electricity consumption of the two northernmost municipalities, Troms and Finnmark is exempted. Their consumption accounts for 2.6% of all household electricity consumption.

Figure 9: Taxation of Household Electricity Use – Tax Rate paid by the average consumer



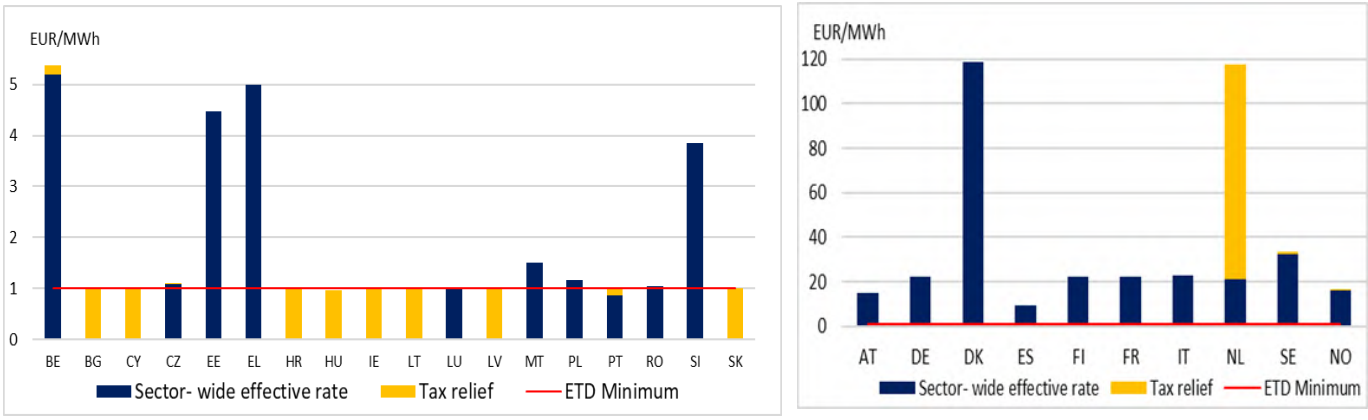
Source: TEDB

[41] BG, HR, HU, LT, SK.

[42] As defined by Article 20, § 2 of the law of the 29th of April 1999 concerning the organisation of the electricity market.

[43] These households are characterized by receiving a social benefit or having an annual income of € 5808 or less. The beneficiary must be the electricity supply contract holder and the installation must be low voltage, with a contracted power less or equal to 6,9 KVA.

Figure 10: Sector- wide effective rates of household electricity consumption[44]



Source: TEMS

Two countries differentiate energy taxes according to regions.

In France, the national electricity tax rate of 22.5 €/MWh applies to all households. In addition to the national rate, a local rate is applied. This local tax for households is the result of a uniform rate of 0.75 €/MWh multiplied by a coefficient according to departments (2, 4, 4.25) or town councils (0, 2, 4, 6, 8, 8.5). Hence, the local tax on electricity consumption can vary between 1.50€ /MWh and 9.56 €/MWh. As a result, total households electricity taxes range from 24€/MWh to 32.06 €/MWh. In Sweden, a lower tax rate is applied in the northern parts of the country. The lower rate is set at 257 SEK/MWh, compared to the general level of 353 SEK/MWh.

Yet other countries differentiate household rates based on consumption volume. In these countries the consumption bands and corresponding rates constitute of tiers. These systems are explained in detail under the section **Tiered Systems.**

In the Netherlands, a tiered system with regressive rates is applied to all consumers. In other words, households and businesses are all assigned to one of four consumption bands. In this degressive system, the higher the consumption band, the lower the per unit tax rate. Almost all households fall in the first tier. The Netherlands also grants a lump sum per connection annually, which is automatically deducted from consumer's combined electricity and natural gas bill. This report presents an effective rate for Dutch households taking into account this lump sum.

In Malta, also a consumption volume based, tiered system applies. The tariff structure is composed of consumption bands and similarly to the Netherlands, it applies to both business and non- business consumers.[45] The rates however, are degressive. In other words, the per unit tax rate increases as consumption increases. Beyond consumption volume, 2 other factors

[44] The ETD minimum rate applies as the benchmark

[45] The tariffs are based on a cumulative consumption per annum and are applied pro rata on basis of the number of days covered by the bill. The kWh tariff structure applicable for the consumption of electricity differentiates between registered primary residence premises (household, primary residence), domestic premises (household, not primary residency) and non-residential premises (non household).

vary along a specific tariff structure. Connection capacity[46] and eligibility for an "Eco-Reduction"[47] also contribute to determining the final price.

In Denmark, consumption indirectly differentiates the effective rates paid by households. There are two different rates applied to the household consumption of electricity. A lower rate applies to electricity used for heat production. Households that are electrically heated, typically by heat pumps, pay a reduced rate for monthly consumption over 4000 kWh. This limit is based on the average household´s consumption of electricity for purposes other than heating. In other words, a lower rate applies to heating, while a higher rate applies to uses other than heating. The effective rate for each individual household results from the amount of power they use above 4000 kWh. Differentiating the taxation of electricity according to its specific uses is a challenge in all Member States. The Danish system, with a specific tax rate applied to a lump sum of consumption assigned to heating, does not require households to measure and separate their electricity consumption by end use.

Several countries exempt the auto- production of electricity. Slightly different definitions apply across countries, but auto- production basically means that the producer and consumer of electricity are the same legal entity and the consumption takes place at the site of generation. Solar panels installed on the rooftop of a family house are a common example. Additionally, some countries set upper or lower limits to the name plate capacity of installations that can benefit from an exemption. Therefore, households are unlikely to benefit from the exemption. On the other hand, Spain sets an upper limit. Tax exemption is granted when the installed capacity of cogeneration, renewable and waste electricity auto- producers does not exceed 50 MW.

Unlike for all other exemptions, the impact of auto- production could not be quantified. Volumes subject to the above listed tax reliefs could be quantified, included in the TEMS data base and taken into account for the calculation of effective rates. The same couldn't be done for auto- production. The reason for this is that most national authorities do not distinguish between auto- production by households and auto- production by other consumers. As an exemption, Czechia reported that 25 GWh renewable auto- production, equalling 0.25% of the countries household electricity consumption is exempted.

79% of household coal consumption is untaxed. Only seven countries tax exempt the household consumption of coal. However, the cumulative coal consumption of Belgium, Spain, Hungary, Luxembourg, Poland, Romania and the Slovak Republic accounts for 79% of

[46] Beyond the kWh tiered tariff structure as described briefly in the box above, a fixed annual service charge that differentiates between a single-phase service and a three-phase service and a maximum demand tariff €/kW is payable in the case of household consumers with a service connection capacity rating exceeding 60Amps/phase.

[47] The rebate, referred to as 'eco-reduction' is not on the electricity excise tax, but on the applicable tariff rates according to consumption, whereby a lower applicable tariff rate in the form of an automatic rebate applies when the level of electricity consumption is below a certain applicable threshold. Registered primary residence premises (households' primary residence) only, shall be eligible for an eco- reduction of the amount due for consumption of electricity for the billing period in question, which shall be calculated in accordance with set rates and thresholds, on a pro rata basis of the relative annual cumulative consumption. The reduction will not be applicable if the indicated thresholds are exceeded. Household consumers may receive a percentage reduction of electricity rates, an 'eco reduction', on their electricity consumption bill on one registered primary residence as follows: Households composed of two or more persons may benefit from a two tier eco reduction mechanism provided that the consumption per person does not exceed 1750kWh per annum. A reduction of 25% in the consumption bill is possible if the consumption does not exceed 1000kWh per person for the first tier. The
second tier consists of a reduction of 15% in the bill on the next 750 kWh per person/household, Single person households receive a reduction of 25%.

all coal consumed by households in the EEA28. The prevalence of coal differs significantly across national household energy mixes. It is virtually zero in half of the EEA28 countries and is typically higher in the countries that grant an exemption.

Table 15: Share of Coal in Households Energy Mix.

AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU
0.3%	0.9%	5.1%	0.0%	11.2%	0.9%	0.0%	0.1%	0.1%	0.5%	0.0%	0.1%	0.1%	1.6%
IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK	NO
4.7%	0.0%	2.8%	0.0%	0.5%	0.0%	0.0%	31.9%	0.0%	0.4%	0.0%	0.0%	1.5%	0.0%

Source: Eurostat

4. *Services and Data Centers*

This chapter presents tax rates paid by services, accounting for 14% of the EE28's energy consumption. This includes both commercial and public service providers. Electricity (47%) and natural gas (30%) make up most of the sector's energy consumption, with a wide range of other products accounting for smaller shares. Therefore, the taxation of these two products is further examined below.

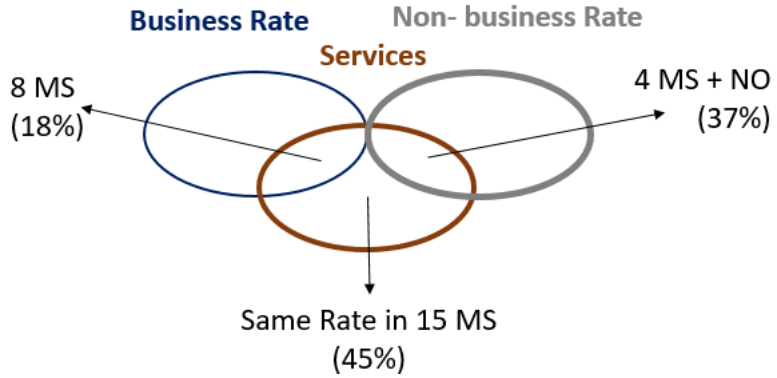
Table 16: Share of Services in Final Energy Consumption.

AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU
10%	14%	13%	17%	13%	14%	14%	17%	14%	14%	12%	17%	12%	12%
IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK	NO
13%	17%	12%	13%	15%	24%	15%	11%	15%	8%	13%	9%	13%	17%

Source: Eurostat FC_OTH_CP_E and FC_E

Neither the ETD, nor Member States set specific rates for services. Moreover, the ETD doesn't define minimum rates neither for industry nor for households. Instead, minimum rates are set for business and non –business uses of electricity, natural gas and coal[48]. In the case of gas oil, commercial use is distinguished. Non- business rates are higher in the ETD minima as well as in the national implementation of each country. Given the business versus non-business distinction, it would be natural to assume that the energy use of services is taxed at the business rate. This is however far from the actual situation.

Figure 11: Taxation of the electricity consumed by services[49]



Source: TEMS and Eurostat FC_OTH_CP_E

5 countries tax services at the higher, non- business rate. In Germany, Finland, Spain, Sweden and Norway the definition of business is narrower, as the ETD allows Member States to limit the scope of business. Together these countries account for 37% of all electricity consumed by the EEA28's services. In Germany the non- business rate applies to all consumers not classified as companies in the manufacturing, agriculture or forestry sectors. In Finland business rate is restricted to industry, mining, data centers and agriculture. In Norway, the non- business rate applies to all consumption outside of industrial manufacturing and

[48] The ETD also defines separate minimum rates for the business and non- business use of heavy fuel ol, gas oil and kerosene. However these minimum rates are identical for business and non- business respectively.

[49] The graph assumes that the distribution of electricity consumption between private and public services does not vary highly across countries.

mining as well as CHP.[50] Additionally, Denmark taxes non- VAT registered services at the non- business rate, alongside its households.

15 countries do not distinguish between business and non- business. They apply one rate. The cumulative electricity consumption of services in these countries accounts for 45% of all electricity consumed by EEA28 services. Among them, Croatia, Lithuania, Luxembourg and Romania apply the ETD minima[51]. As 5 countries tax services at the higher "non- business rate" and 15 countries do not differentiate, 8 countries tax services at the lower, "business" rate. This means that only 18% of electricity consumed by services is taxed at a dedicated business rate, be it the minimum rate or higher. The Netherlands applies the same tiered system to all electricity consumption, be it by households or industry. However, business and non- business are distinguished in the largest consumption band, covering annual consumption of 10 GWh and above.

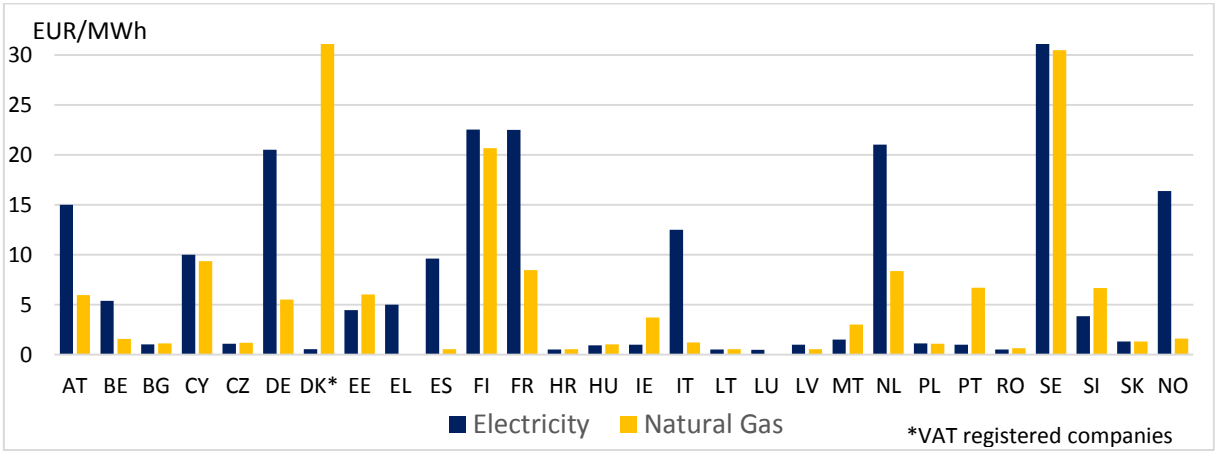
Table 17: Electricity rate applicable to commercial services. B= Business. NB= Non-business. SR= Same Rate.

AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU
SR	SR	B	B	SR	NB	B	SR	SR	NB	NB	SR	B	SR
IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK	NO
SR	B	B	B	SR	SR	SR	SR	SR	B	NB	SR	SR	NB

Source: TEMS and TEDB

Even less countries differentiate the business and non- business use of gas. In Finland and France, the business versus non- business distinction, that is applied to electricity, does not exist for gas. Neither does the Netherlands apply a differentiation for the highest bracket of gas consumption, that is applied for electricity. In Italy, all gas is taxed at the non- business rate when used for other than industrial purposes. In Spain, the non- business rate applies to uses other than fuel, as well as to natural gas intended for use as fuel in stationary engines.

Figure 12: Nominal Tax Rates applicable to Services.



Source: TEDB

Public services are usually taxed at non- business rates. Local and national administrations, educational institutions, hospitals, welfare institutions, lightning of public roads and squares were commonly listed by countries as public services in the TEMS survey. In Cyprus, all uses defined as non- business, including public services, can benefit from an

[50] The lower, business rate applies also to all commercial activity in Finnmark and certain municipalities in Nord-Troms, to data centres with an output in excess of 0.5 MW and to commercial vessels.
[51] 0.5 EUR/MWh for business and 1 EUR/MWh for non- business.

exemption. In the northernmost parts of Sweden, similarly to households and service sector companies, public services may benefit from a lower rate. In the countries where all households are exempted, its only pubic services that fall under the non- business category. For example, households pay no tax on natural gas, while public services pay the non-business rate.

Data centers benefit from special provisions in some countries. Data centers are energy intensive services**.** In Finland, data centers can benefit from the lower, business rate, alongside industry, mining and agriculture. In France, data centers can benefit from a reduced tax rate of 12 €/MWh for the fraction of their annual consumption that exceeds 1 GWh, if their total consumption of electricity equals or exceeds 1 kWh/€ of added value. Norway also attaches a criteria: data centers with an output in excess of 0.5 MW can benefit from the business rate. In Sweden, the lower tax rate of SEK 5/MWh for business use applies to electricity used in data centers, alongside manufacturing and shore- side electricity.

Services can benefit from tax reliefs as long as resulting effective rates respect the ETD minima. The ETD allows national administrations to grant tax exemptions and reductions to businesses based on a range of criteria, including energy intensity, trade intensity and energy efficiency. Services typically do not fulfill these criteria, with the exemption of tax reliefs conditioned on annual consumption volume. Services can consume large volumes of energy and therefore qualify for this type of tax relief. Services also pay differentiated rates in countries that apply tiered systems. Where such tax regimes are applied, services like all other consumers, might pay different rates based on the volume of their energy consumption.

Tiered Systems

Article 5 of the ETD allows countries to differentiate tax rates according to consumption volumes. Several countries make use of this provision for various areas of use of electricity and natural gas. Several countries make use of this provision for various products and uses. In these countries the bands of consumption volumes and corresponding rates built tiered tax systems. These systems are typically degressive: the higher the consumption band the lower the per unit tax rate. These tiered systems are used in multiple sectors of the economy, including industry, households and services. They are typically not applied in the transport and agriculture sectors where the use of liquid fuels is dominant. Where applied, such tiered systems pose particularly difficult challenges to the establishment of effective tax rates. While households are generally taxed at the rate of the first bracket (lowest consumption band and highest rate), individual companies in industries and services sectors can fall in multiple brackets. Therefore, the taxation of users in these sectors can be highly differentiated. The following table provides and overview of tiered systems applied by countries based on the TEMS Survey and Taxes in Europe Data Base.

Table 18: Overview of tiered systems applied by countries based on the TEMS Survey and Taxes in Europe Data Base

BE	Elec	Business	I	-0%	annual	0-20,000 MWh; reduction in federal contribution. Base rate: 3.4439 EUR/MWh
			II	-15%	annual	20,000-50,000; reduction in federal contribution. Base rate: 3.4439 EUR/MWh
			III	-20%	annual	50,000-250,000; reduction in federal contribution. Base rate: 3.4439 EUR/MWh
			IV	-25%	annual	250,000-1000,000, reduction in federal contribution. Base rate: 3.4439 EUR/MWh
			V	-45%	annual	>1000,001 (starting with 1000,001), reduction in federal contribution. Base rate: 3.4439 EUR/MWh
			VI	cap	annual	Federal contribution is capped at 250.000 EUR
BE	Gas	Business	I	-0%	annual	0-20,000 MWh; reduction in federal contribution. Base rate: 3.4439 EUR/MWh
			II	-0.15	annual	20,000-50,000; reduction in federal contribution. Base rate: 3.4439 EUR/MWh
			III	-0.2	annual	50,000-250,000; reduction in federal contribution. Base rate: 3.4439 EUR/MWh
			IV	-0.25	annual	250,000-1000,000, reduction in federal contribution. Base rate: 3.4439 EUR/MWh
			V	-0.45	annual	>1000,001 (starting with 1000,001), reduction in federal contribution. Base rate: 3.4439 EUR/MWh
			VI	cap	annual	Federal contribution is capped at 750.000 EUR
EL	Gas	Business	I	1.5	annual	0-36,000 GJ
			II	0.45	annual	36,000-360,000 GJ
			III	0.4	annual	360,001-1,800,000 GJ
			IV	0.35	annual	1,800,001-3,600,000 GJ
			V	0.3	annual	> 3,600,000 GJ
IT	Elec	Business	I	12.5	monthly	0-200 MWh
			II	7.5	monthly	For the share of monthly consumption in excess of 200 MWh but below 1200 MWh.
			III	cap	monthly	If the monthly consumption exceeds 1200 MWh a flat rate of 4,820 EUR applies for the share in excess of 200 MWh.
LU	Gas	Non- bus.	I	1.08	annual	Cat. A
		Business	II	0.54	annual	Cat. B
			III	0.30	annual	Cat. C2
			IV	0.05	annual	Cat. C1
NL	Elec	Both	I	125	annual	0-10
			II	88.33	annual	10-50 MWh
			III	34.04	annual	50-10,000
			IV	0.95	annual	>10,000
NL	Gas	Both	I	9.82	annual	0 – 5,978.9 GJ (National rate 0 – 170,000 Nm3; conversion rate 0.03517GJ/Nm3)
			II	2.32	annual	5,978.9 – 35,170 GJ (National rate 170,000 – 1,000,000 Nm3)
			III	0.85	annual	35,170 – 351,700 GJ (National rate 1,000,000 – 10,000,000 Nm3)
			IV	0.45	annual	> 351,700 GJ (National rate > 10,000,000 Nm3)
SI	Elec	Both	I	3.05	annual	0-20
			II	3.05	annual	20-160
			III	3.05	annual	160-10,000
			IV	1.08	annual	>10,000

5. Agriculture

Agriculture accounts for 3% of the EEA28's total energy consumption. Gas oil is the dominant fuel in the sector: half of all energy consumed is covered by gas oil. Gas oil in agriculture is used both as propellant (for example driving tractors) and for heating (for example heating green houses). As a distant second, electricity accounts for 16% of the sectors energy mix, followed by natural gas (12%), biofuels (4%) and other renewables (6%), including solar- and geothermal. Coal use is negligible in all countries but Poland, where it accounts for 22%. The following sections analyze the taxation of the three products with the highest shares in the sector's energy mix, namely gas oil, natural gas and electricity.

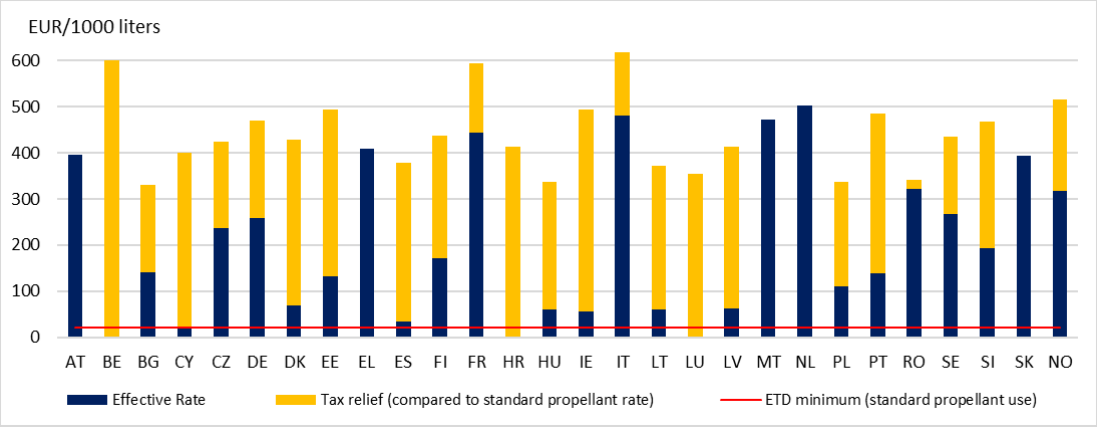
Table 19: Energy Mix of the EEA28's agriculture sector.

Gas oil	Electricity	Natural Gas	Biofuels	Other RES	Other FF
52%	16%	12%	4.0%	6%	10%

Source: Eurostat

Twenty- one countries provide some form of tax relief to tax gas oil used in agriculture. Three of them apply a full exemption. The aggregate consumption of Belgium, Croatia and Luxembourg equals to 18265 TJ or 3% of the total EU27 gas oil consumption in the agriculture sector. 18 other countries provide other forms of tax relief**.** Eleven grant a refund and 7 apply differentiated rates. Most of these countries use fiscal marking to fight abuse of rebated fuel. A colorant is added to the fuel allowing for on-spot visual as well as for laboratory testing. Irrespective of the type of tax relief, the ETD allows for agriculture rates that go below the ETD minimum of standard propellant use.

Figure 13: Effective Rates for Gas Oil Use in Agriculture.



Source: TEMS

Total EEA28 tax expenditure on gas oil in agriculture amounted to EUR 3.2 billion Euros in 2019. This amount was incentivizing the use of a fossil fuel. Furthermore, it constitutes an implicit loss of revenues. It is to be remembered that per liter and total tax expenditures cannot be compared across countries. A country that applies the minimum rate to both standard propellant and agricultural use, would show zero per liter incentive. Another country that applies a high standard propellant rate, thus fostering energy conservation, and at the same time grants a large refund to agricultural use only, would show a large per liter incentive.

The tax code of 6 countries distinguishes different agricultural uses of gas oil. Germany, Denmark, Ireland and Sweden distinguish between propellant and other uses of gas oil, which mostly consist of heating. Czechia applies different rates to plant- and

livestock production. Romania lists gas oil used for agriculture and aquaculture separately, albeit the same rate applies to both. For these countries, a weighted average that takes into account respective rates and consumption volumes, is presented in this report.

Table 20: Differentiated Taxation of Gas Oil in Agriculture

Country	CZ	DE	RO	SE
Category 1	Plant production, forestry, fishpond	Propellant	Agriculture (all)	Propellant
Category 2	Livestock	Heating	Aquaculture	Heating
Rate 1	0.255	0.215	0.211	0.257
Rate 2	0.055	0.015	0.211	0.342
% Vol. 1	26%	99%	99.8%	89%
% Vol. 2	74%	1%	0.20%	11%

Source: TEMS

The role of natural gas shows high divergence on the national level. While natural gas makes up less than 1% of the agriculture sector's energy consumption in 11 Member States, it reaches 57% in the Netherlands, 35% in Belgium and 20% in Romania. In these countries, natural gas is typically used to heat green houses. Biofuels and thermal renewable energy (geothermal and solar thermal) also provide a sizeable share of the sectors energy consumption in Sweden (37%), Austria (35%) and Finland (29%).

Three countries apply total or partial exemptions to electricity used in agriculture. Belgium and Greece exempt all power use in agriculture. The consumption of these two countries accounts for 7% of all electricity used in the EEA28's agriculture sector. Norway exempts electricity supplied to commercial green houses. Sweden also provides a tax relief for electricity in agriculture: the same lower tax rate applies to electricity used in agricultural, forestry and aquacultural works as the one applied to data centers, shore side electricity and industrial manufacturing processes.