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Report of the working group on energy taxation reform: A proposal for implementing the intentions and goals of the Government Programme and for further development of energy taxation

Taxation

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Abstract

The Ministry of Finance appointed a working group on energy taxation reform for the period 18 November 2019– 1 September 2020. The working group's task was to conduct preparatory work for implementing the intentions of the Government Programme and to assess the development needs of the energy tax system.

In regard to the intentions set out in the Government Programme, the working group proposes that the increase in heating fuel taxation producing an additional EUR 100 million in tax revenues should take effect at the start of 2021. The increase would concern both the energy content and carbon dioxide components of the taxation, with the rise for peat being equivalent to that for other fossil fuels, and the 0.9 calculation rule for combined heat and power production would be removed. The energy tax expenditures for mining activities would also be removed from the start of 2021. The category II electricity tax for industry, data centers and greenhouse cultivation would be lowered to the EU minimum level and the energy tax rebate for energy-intensive industries would be discontinued. Both measures would be implemented gradually between 2021 and 2024. Regarding a transfer to category II electricity tax in the case of heat pumps and data centres generating heat for district heating networks, a separate examination of this is continuing and will be completed in the early part of 2021.

The working group also proposes the phased removal of tax expenditures on peat and energy tax rebate for agricultural fuels. The working group felt it important that the structure of energy taxation, including tax expenditures, should be regularly reviewed. The group also proposes that there should be regular adjustments to energy tax rates in order to retain environmental incentives and maintain tax revenues.

Keywords taxation, energy taxation, tax expenditure, emissions

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Kuvailulehti
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Energiaverotuksen uudistamista selvittävän työryhmän raportti ehdotukseksi hallitusohjelman kirjausten ja tavoitteiden toteuttamisesta sekä energiaverotuksen muusta kehittämisestä

Valtiovarainministeriön julkaisuja 2021:7		**Teema**	Verotus
Julkaisija	Valtiovarainministeriö		
Yhteisötekijä	Valtiovarainministeriö, maa- ja metsätalousministeriö, työ- ja elinkeinoministeriö, ympäristöministeriö ja Verohallinto		
Kieli	englanti	**Sivumäärä**	180

Tiivistelmä

Valtiovarainministeriö asetti työryhmän toimikaudelle 18.11.2019–1.9.2020 valmistelemaan hallitusohjelmakirjausten toimeenpanoa ja arvioimaan energiaverojärjestelmän kehitystarpeita.

Hallitusohjelmakirjauksista työryhmä ehdottaa, että lämmityspolttoaineiden 100 milj. euron veronkorotus toteutettaisiin vuoden 2021 alusta siten, että korotus kohdistuisi sekä energiasisältö- että hiilidioksidiveroon, turpeelle tehtäisiin vastaava korotus kuin muille fossiilisille polttoaineille ja yhteistuotannon 0,9-laskentasääntö poistettaisiin. Lisäksi kaivostoiminnan energiaverotuet poistettaisiin vuoden 2021 alusta. Teollisuuden, konesalien ja kasvihuoneiden sähköveroluokka II alennettaisiin EU:n vähimmäistasolle ja energiaintensiivisen teollisuuden energiaveronpalautuksesta luovuttaisiin. Molemmat toimet toteutettaisiin asteittain 2021–2024. Sähköveroluokkaan II siirrettävien, kaukolämpöverkkoon lämpöä tuottavien lämpöpumppujen ja konesalien osalta jatketaan erikseen selvitystä siten, että se saadaan valmiiksi alkuvuodesta 2021.

Lisäksi työryhmä ehdottaa turpeen ja maatalouden polttoaineiden verotukien asteittaista poistamista. Työryhmä pitää tärkeänä, että energiaverotuksen rakennetta ja siihen sisältyviä verotukia arvioidaan säännöllisesti. Työryhmä ehdottaa ympäristöohjauksen säilyttämiseksi ja verotulojen ylläpitämiseksi energiaverotasojen säännönmukaisia tarkistuksia.

Asiasanat	verotus, energiaverotus, verotuki, päästöt		
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Rapport från arbetsgruppen som utrett reformen av energibeskattningen med förslag till att uppfylla regeringsprogrammets föresatser och mål samt till annan utveckling av energibeskattningen

Finansministeriets publikationer 2021:7		**Tema**	Beskattning
Utgivare	Finansministeriet		
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Språk	engelska	**Sidantal**	180

Referat

Finansministeriet tillsatte en arbetsgrupp för mandatperioden 18.11.2019–1.9.2020 för att bereda genomförandet av regeringsprogrammets åtgärder och bedöma behovet att utveckla energiskattesystemet.

När det gäller regeringsprogrammets åtgärder föreslår arbetsgruppen att höjningen av skatten på uppvärmningsbränslen med 100 miljoner euro sker vid ingången av 2021 och att höjningen ska gälla såväl energiinnehållsskatten som koldioxidskatten. Skatten på torv höjs på motsvarande sätt som på andra fossila bränslen och 0,9-beräkningsregeln för samproduktion slopas. Ytterligare ska energiskattestöden för gruvdrift slopas vid ingången av 2021. Skatten enligt skatteklass II inom industrin, i datorhallar samt yrkesmässig växthusodling ska sänkas till det minimum EU tillåter och systemet för återbäring av energiskatt inom den energiintensiva industrin ska avvecklas. Båda åtgärderna ska genomföras stegvis 2021–2024. Utredningen fortsätter separat när det gäller värmepumpar och datorhallar som genererar värme till fjärrvärmenätet och som överförs till elskatteklass II. Utredningen är planerad att bli färdig i början av 2021.

Arbetsgruppen föreslår också att skattestöden för torv och jordbruksbränslen gradvis slopas. Enligt arbetsgruppen är det viktigt att energiskattens struktur och de skattestöd som ingår i den utvärderas regelbundet. Arbetsgruppen föreslår att energiskattenivåerna justeras regelbundet för att bevara miljöstyrningen och skatteinkomsterna.

Nyckelord	beskattning, energibeskattning, skattestöd, utsläpp		
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The Ministry of Finance appointed a working group to look into an energy taxation reform for the term 18 November 2019–1 September 2020. As part of the tax reform for sustainable development, the working group was to draft an energy taxation reform which would strengthen emission guidance and meet the Government Programme goals relevant to energy taxation. The group's tasks also included assessing any other needs to develop the current energy tax system. In addition to the carbon neutrality target, the working group was to factor in business competitiveness as well as social and regional policy aspects.

The working group has prepared proposals for implementing the changes to energy taxation set out in the Government Programme. The Government Programme does not take a stand on the timeline for implementing the proposed reform of energy taxation or the order in which the changes should be carried out. The working group has drawn up proposals with different schedules and implementation methods, taking into account the fact that the proposed changes to energy taxation are partly overlapping and, due to their various interlinkages, affect each other. The working group also sought to answer the question of how the energy tax system could support the Government in achieving its ambitious climate targets.

In addition to implementing the Government Programme intentions, the working group assessed any other needs to develop the current energy tax system. Apart from the perspective of developing energy taxation in general terms, the working group also assessed the need for changes from the viewpoint of attaining Finland's emissions reduction targets and securing sustainability in central government finances over the short and medium term. The longer-term change needs are to be assessed separately later.

The working group examined the taxation of energy production and consumption in different sectors. Transport taxation issues were partly excluded from this work, as they are dealt with by a separate working group, especially in the context of strengthening emissions guidance in transport. Nevertheless, the structure of transport fuel taxation is closely linked to the structures of other energy taxation, which is why it was also discussed by the working group on energy taxation.

The working group was chaired by Leo Parkkonen, Senior Ministerial Adviser at the Ministry of Finance. Its members were Ministerial Advisers Veli Auvinen and Krista Sinisalo from the Ministry of Finance, Senior Officer Veli-Pekka Reskola from the Ministry of Agriculture and Forestry, Senior Ministerial Adviser Petteri Kuuva and Senior Adviser Bettina Lemström from the Ministry of Economic Affairs and Employment, Senior Ministerial Adviser Outi Honkatukia from the Ministry of the Environment, and Tax Control Director Saija Taipale from the Finnish Tax Administration. Krista Sinisalo and Bettina Lemström served as the working group's secretaries.

The working group met 23 times during its term of office, in addition to which it held e-mail meetings. In the course of its work, the working group consulted several researchers, organisations and key stakeholders.

On behalf of the working group, Leo Parkkonen

1 Background and preparative work

1.1 Background

The Government Programme of Prime Minister Marin states that taxation must reinforce sustainable development and work to mitigate climate change both nationally and internationally in ways that are socially just and secure the tax base. However, we should also bear in mind that taxation is not always the most effective solution to social challenges. We also need systematic regulation and other guidance instruments.

A sustainable taxation roadmap will be drawn up to serve the Government's climate goal. The first stage of this roadmap will be completed in time for the 2020 government discussion on spending limits. The preparations will seek solutions that promote the Government's climate objectives in the most economically effective way, accelerating the shift away from fossil fuels while meeting the requirements of social justice. The Government Programme contains several entries concerning the efficiency of emissions guidance by energy taxation as well as increases in energy taxes or reductions in tax expenditures.

Finland's current energy taxation is based on the average energy content of each fuel, life-cycle greenhouse gas emissions and local emissions. The tax levels in Finland are additionally high by international comparison. Consequently, energy taxation already provides quite significant economic incentives for reducing emissions and saving energy. Despite this, energy taxation includes individual tax structures that both promote the attainment of the carbon neutrality target and work against it. The Energy Taxation Directive contains provisions on key structures of excise duties on energy and, among other things, tax exemptions and reductions. Individual exemptions from the basic tax structure and the general tax levels of energy products allowed by the Directive are also in use in Finland, where they have been nationally defined as tax expenditures. Justifications for these exceptions have included improving energy efficiency, supporting renewable fuels, ensuring security of supply, reducing the costs of the transport sector and supporting the export sector or agriculture.

The tax reform for sustainable development referred to in the Government Programme includes a reform of energy taxation which, together with emissions trading, will support the transition towards a carbon-neutral circular economy.

The Government Programme notes that emissions guidance in energy production will be increased by abolishing the industrial energy tax rebate system and reducing category II electricity tax towards the minimum rate allowed by the European Union. The overhaul will be carried out with cost neutrality over a transition period. Reduced tax expenditures for combined heat and power production, later referred to as *CHP*, and higher heating fuel taxation will increase tax revenues by a total of EUR 100 million over the electoral term. Mines will be transferred to category I electricity tax and removed from the scope of the industrial energy tax rebate system. According to the Government Programme, heat pumps and data centres generating heat for district heating networks will be transferred to category II electricity tax. The Government's climate conference held in Vuosaari, Helsinki, on 3 February 2020 added detail to these policies for the part of energy taxation: the industrial electricity tax will be reduced to the EU minimum in a cost neutral manner, and the increase in tax revenue of EUR 100 million from heating fuels will take effect from the beginning of 2021. In addition, an effort will be made to carry out the transfer of data centres and heat pumps to electricity tax category II from the beginning of 2021.

The Government Programme notes that, as part of the overhaul of energy taxation, we will assess the necessary changes to the taxation of peat so that we can achieve our 2030 peat targets. We must ensure that timber material does not end up incinerated. The minutes of the Government budget negotiations on 17 September 2019 additionally state that the required changes to the taxation of peat will be assessed as part of the energy taxation reform in order to achieve the 2030 target.

The Ministry of Economic Affairs and Employment has appointed a working group to determine how peat use can be channelled in a controlled manner towards innovative products with a higher degree of processing instead of incineration, as the use of peat for energy will be decreased by at least half by 2030 in line with the Government Programme. The group will also examine how the change in the use of peat can be carried out in a way that is regionally and socially just. The working group’s term continues until 31 March 2021.

The measures set out in the Government Programme concerning the promotion of demand flexibility incentives through dynamic electricity taxation and the removal of double taxation on electricity storage for pumped storage facilities and smaller batteries have already been investigated and solved separately. The Ministry of Economic Affairs and Employment’s Smart Grid Working Group did not support the introduction of a dynamic electricity tax (a tax relative to the market price of electricity). Changes concerning the double taxation of electricity storage have already been implemented in energy tax legislation.

Based on a Government Programme entry, the taxation of transport fuels was increased by EUR 250 million. This increase entered into force on 1 August 2020[1].

In connection with the budget and spending limits negotiations in September 2019, the Government decided to eliminate the tax expenditure for paraffinic diesel as part of reducing business expenditures. Once the reduction has been removed, this change would increase the annual tax revenues from transport fuels by EUR 115 million.

The tax reform for sustainable development set out in the Government Programme also includes a reform of transport taxation. According to the Government Programme, the targets for reducing emissions from transport must be in line with Finland's carbon neutrality targets. By 2030, Finland will reduce transport emissions by at least 50 per cent compared to the 2005 level. Whereas taxation is an important part of economic guidance aiming for reducing emissions, a wide range of other methods will also be required to attain the targets. The current transport tax system is already mainly based on taxing CO_2 emissions. The Ministry of Finance appointed a working group to examine the need to reform transport taxation from the perspective of climate objectives and central government finances. The group started its work on 1 September 2019, and its term of office will end on 1 March 2021.

The Vuosaari climate conference additionally decided that the needs to develop energy taxation over a period of 10 to 15 years will be assessed by drawing up a roadmap which, together with emissions trading, will support the achievement of the carbon neutrality target by 2035. This assessment will take into account impacts on business competitiveness as well as social and regional aspects. The objective of the road map is to secure the tax base over a period spanning several government terms against the backdrop of emissions reductions and technological changes. A body will be appointed to prepare the roadmap in autumn 2020, once the working group on energy taxation has completed its work.

The use of fossil oil in heating will be phased out by the early 2030s. Oil heating in state-owned and municipal buildings will be discontinued by 2024. A separate action plan will be prepared to encourage buildings heated with oil to switch to other forms of heating in the 2020s. The action plan for phasing out oil is being prepared by a working group consisting of public officials, which is scheduled to finalise its proposals for measures in autumn 2020.

[1] Government proposal to Parliament on Acts amending the Annex to the Act on Excise Duty on Liquid Fuels and section 5 of the Excise Duty Act https://www.finlex.fi/fi/esitykset/he/2019/20190066

1.2 Preparation

The Ministry of Finance appointed a working group to look into an energy taxation reform for the term 18 November 2019–1 September 2020. The members of the working group represented the Ministry of Finance, the Ministry of Economic Affairs and Employment, the Ministry of the Environment, the Ministry of Agriculture and Forestry and the Finnish Tax Administration. The working group was to draft a reform of energy taxation which would implement the Government Programme goals discussed above. The group's tasks also included assessing any other needs to develop the current energy tax system. The preparation process sought solutions that promote the Government's climate objectives in the most economically effective way, accelerating the shift away from fossil fuels while meeting the requirements of social justice. In addition to the carbon neutrality target, the working group was to factor in business competitiveness as well as social and regional policy aspects. The working group also took into account the revenues from energy taxes, the cost-effectiveness of measures, and the need to ensure that tax revenues will not decrease and tax expenditures for fossil fuels increase when the impacts of the tax measures are assessed as a whole.

The working group drew on earlier reports on energy taxation. In the course of its work, the working group consulted researchers, organisations and key stakeholders. Four consultations were organised, in which 15 parties were heard. Eight parties took part in a written consultation organised between 25 May and 8 June 2020. In addition, the working group commissioned a survey on the otakantaa.fi web service between 10 February and 10 March 2020, in which 27 responses were received.

The invitations to consultations and the statements received are available on the public web service of the Ministry of Finance[2].

[2] Ministry of Finance, projects and legislation: https://vm.fi/hankkeet, under VM148:00/2019.

2 Current status review

2.1 National legislation

2.1.1 General information on energy taxation

Energy taxes are levied on liquid fuels, electricity and certain other fuels, such as peat, natural gas and coal. Energy taxes, as well as other excise duties, increase the central government's tax revenue and have environmental, energy and industrial policy objectives. In 2019, the total accrual of energy taxes was around EUR 4.6 billion.

In Finland, provisions on the taxation of energy products are contained in the *Act on Excise Duty on Liquid Fuels* (1472/1994)[3] and the Act on Excise Duty on Electricity and Certain Fuels (1260/1996)[4], later referred to as the *Electricity Tax Act*. The Excise Duty Act (182/2010), which contains provisions on the general taxation procedure of excise duties, additionally applies to the taxation of products subject to energy tax[5]. Excise duties are levied by the Finnish Tax Administration.

EU excise duties have to a great extent been harmonised under directives. Among other things, this means that the directives define the essential structure of excise duties, including excisable products, minimum tax levels and tax exemptions. Council Directive 2003/96/EC on restructuring the Community framework for the taxation of energy products and electricity[6], later referred to as the *Energy Taxation Directive*, entered into force at the beginning of 2004. Energy products referred to in the Energy Taxation Directive include petrol, gas oil for propellant use, biofuels, gas oil for heating and light and heavy fuel oil, natural gas, LPG, coal and electricity. Under the so-called equivalence rule of the Energy Taxation Directive, all products used as motor fuel shall be taxed at the level for the equivalent motor fuel, and all

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[3] Act on Excise Duty on Liquid Fuels (1472/1994).
https://www.finlex.fi/fi/laki/ajantasa/1994/19941472
[4] Act on Excise Duty on Electricity and Certain Fuels (1260/1996).
https://www.finlex.fi/fi/laki/alkup/1996/19961260
[5] Excise Duty Act (182/2010). https://www.finlex.fi/fi/laki/ajantasa/2010/20100182
[6] Council Directive 2003/96/EC on restructuring the Community framework for the taxation of energy products and electricity. https://eur-lex.europa.eu/legal-content/FI/TXT/?uri=celex%3A32003L0096

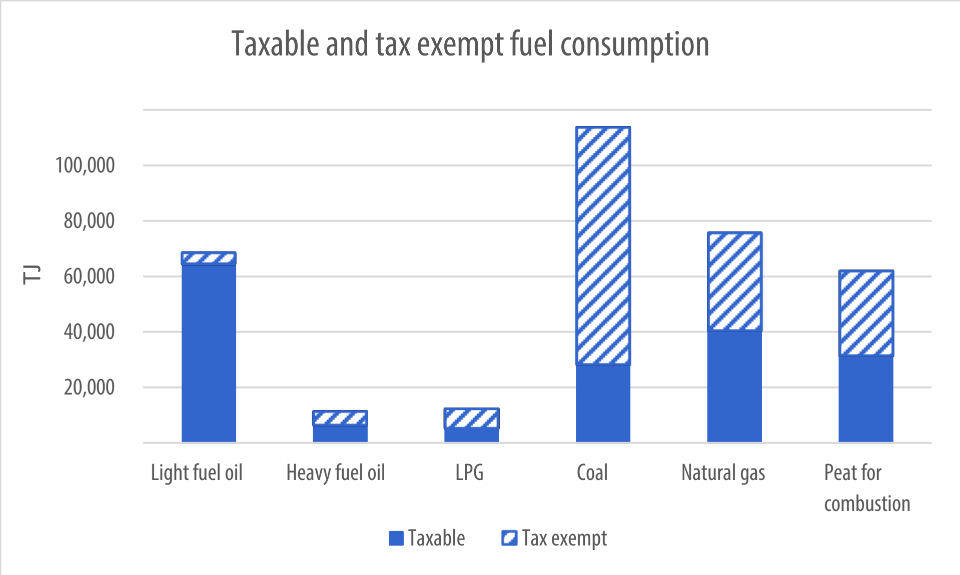
hydrocarbons used as a heating fuel shall be taxed at the level applied to the equivalent heating fuel. For example, the equivalence principle means that biogas is a taxable product under the Energy Taxation Directive both as a heating fuel and a motor fuel. This applies to both imported and domestically produced biogas. In addition to taxable products, the Energy Taxation Directive contains provisions on the structures and minimum rates of taxation. The tax levels applied in Finland generally clearly exceed the minimum tax rates set out in the Energy Taxation Directive.

Council Directive 2008/118/EC[7] concerning the general arrangements for excise duty and repealing Directive 92/12/EC, later referred to as the *Excise Duty Directive*, also applies to energy products. The Directive contains provisions on harmonised criteria, procedures and a monitoring system for excise duty covering the production, storage and movements of products between Member States.

The tax base of energy taxation does not equal energy consumption. As we can see in Figure 1, which illustrates the energy consumption related to certain fuels in 2018, a significant proportion of fuel consumption is currently tax exempt and thus out of reach for incentives provided by energy taxation. The most significant exemptions here apply to fuels used in electricity production and certain industrial processes. While electricity is taxed as a final product, energy taxation does not differentiate between the methods in which the electricity is generated. In the transport sector, significant tax exemptions apply to aviation and maritime fuels for other than pleasure purposes. When using taxation as an energy or climate policy instrument, it is important to keep in mind the proportion of taxable consumption in the consumption of different energy products.

[7] Neuvoston direktiivi 2008/118/EY valmisteveroja koskevasta yleisestä järjestelmästä ja direktiivin 92/12/ETY kumoamisesta. https://eur-lex.europa.eu/legal-content/fi/TXT/?uri=CE-LEX%3A32008L0118

Figure 1. Taxable and tax exempt consumption of certain fuels in 2018. The figure for coal includes coal and coke. Source: Statistics Finland, Ministry of Finance.



Background and principles of the 2011 energy tax reform

In 2011, an overhaul of energy taxation was carried out in Finland based on environmental criteria and with the aim of developing the taxation of energy products from the perspective of not only central government finances but also several other objectives. The most important objective was motivated by the need to develop and improve the incentive provided by energy taxation as an environmental and energy policy instrument. This also contributed to increasing the acceptability of the high energy taxation in Finland, as it supports not only central government finances but also other societal objectives. The reform followed on the first phase of the environmentally-related transport tax reform began in 2008, in which carbon dioxide emissions were introduced as the basis of car taxes. The second phase of the environmentally-related transport tax reform was carried out in 2011, in which year carbon dioxide emissions were also introduced as the basis of the basic tax share of the annual vehicle tax.

Predictability, which is one of the characteristics of a good tax system, was also selected as the basic principle of developing the energy tax system. Predictability is also closely related to applying the same criteria to the tax treatment of different fuels and technologies, and their treatment should be as objective and technologically neutral as possible.

In the unit-based tax model used prior to the energy tax reform, biofuels were subjected to higher tax levels than fossil fuels, as the tax system did not account for the energy content of biofuels, which is typically lower than that of fossil fuels, or the reduction in carbon dioxide emissions achieved with biofuels. Examined per litre, the application of the same tax level led to higher taxes on biofuels than on fossil fuels per unit of energy. The energy tax reform aimed for fair and neutral taxation of biofuels in relation to both fossil fuels and other biofuels.

As energy taxation has been harmonised at the EU level, the provisions of the Energy Taxation Directive and the Excise Duty Directive, and the proposal for a new energy tax directive which the European Commission was drafting at the time, had to be taken into account when developing the tax model. Other EU legislation also had to be taken into consideration. While regulation on tax discrimination and State aid were in key role, such other pieces of legislation as the Directive on the promotion of the use of energy from renewable sources (the RES Directive)[8] and the Fuel Quality Directive affected the available solutions. For example, the State aid rules prevent the simultaneous use of the obligation to distribute biofuels, which has been in force in Finland since 2008, and tax reductions to promote biofuels.

As the energy tax solutions were developed, efforts were made to reconcile industrial competitiveness and tax incentives for cutting emissions while reducing overlaps between different policy instruments, including energy taxation and emissions trading.

Relying on an extensive background study, a tax model was adopted aiming to take into account these somewhat conflicting objectives. Two main components were selected for the energy tax model: an energy content tax and a carbon dioxide tax. The purpose of the energy content tax component is to provide an incentive for energy savings, energy efficiency and reduced use of natural resources and to ensure the fair treatment of different energy products. The carbon dioxide tax component, which is proportionate to the energy content, takes into account emissions from combustion and life-cycle emissions, thus ranking the fuels based on the reduction in life-cycle emissions achieved through their use. In addition, a refund is granted for reducing local emissions: lower taxes determined on objective criteria are imposed on fuels with lower local emissions.

It was believed that it was not possible to base fuel taxation fully on the environmentally-related energy tax model for all vehicle technologies. Consequently,

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[8] Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. https://eur-lex.europa.eu/legal-content/FI/TXT/?uri=CELEX%3A32009L0028

the tax on driving power included in the annual vehicle tax was adjusted to promote the achievement of the technological neutrality and environmental objectives of fuel taxation to meet, among other things, the requirement of tax neutrality under EU law. In other words, the tax on driving power evens out the difference in operating costs paid by drivers due to the different tax treatment of fuels.

The taxation of CHP was reduced by halving its carbon dioxide tax. The purpose of this tax reduction was to improve the competitiveness of an energy-efficient production method compared to separate heat production and to reduce overlapping guidance with emissions trading. It also alleviated the tax burden on industries faced with international competition and contributed to maintaining and increasing the otherwise high level of energy taxation to preserve the level of environmental incentives. For similar reasons, it was also considered necessary to maintain the reduced energy taxation for industry. This was carried out by reducing the industrial electricity tax and offering a refund of energy taxes for energy-intensive companies.

Levying higher taxes on transport fuels than on heating fuels was justified by the fact that the overall tax level for heating fuels was clearly lower than that for transport fuels, and the same pricing criteria could thus not be used. In terms of tax levels, the reform did not start from zero; the initial tax levels for different sectors (transport, heating, machinery) affected the possibility of converging their tax levels, even if the structural changes to energy taxation were similar in different sectors.

Different areas of EU law set different requirements for the introduction of the new energy tax model, whose compliance had been ensured in a process with the Commission's Directorate-Generals responsible for taxation and competition issues which lasted several years.

The tax model does not enable increases in the tax levels for individual fuels but, with the exception of peat and tall oil, the tax levels for all taxable fuels are based on the same criteria determined by pricing the energy content and carbon dioxide emissions. This contributes to the predictability of taxation and neutral and objective taxation of fuels.

2.1.2 Transport fuels

In connection with the energy taxation reform, the Act on the Excise Duty on Liquid Fuels was amended by Act 1399/2010[9]. Under this amendment, which entered into force at the beginning of 2011, the volume-based excise duty on transport fuels was replaced by an energy content tax that depends on the calorific value of the fuel, and a carbon dioxide tax based on the fuel's average life-cycle CO_2 emissions. In the table annexed to the Act, the excise duty levels for different fuels or their components have been converted into taxes per litre.

Energy content tax

In principle, all fossil and bio-based transport fuels should be subject to the same energy content tax tied to the tax level for petrol. However, the tax on fossil and bio-based diesel, which is mainly used in commercial transport, is not as high as the tax on petrol and the corresponding biofuels mainly used in passenger cars. By imposing a lower tax on diesel, an effort has been made to reduce the costs of HGV transport and, consequently, the export industry, as well as bus and coach transport. This has been achieved by reducing the calculated energy content tax on diesel by a fixed amount of 25.95 cents per litre, which means a tax reduction of approximately EUR 0.0072 per megajoule for diesel and the fuels substituting it compared to the level required by the tax basis. With the exception of petrol and diesel and the corresponding biofuels, no separate tax levels have been laid down for other fuels when used as transport fuels. Consequently, the use of such fuels as natural gas and LPG for transport is taxed at the much lower level of heating fuels than other transport fuels. This also applies to electricity used in transport. As the energy content tax on diesel is lower than what the environmental criteria of the tax would require and there are no other environmental or other grounds for favouring diesel cars, diesel powered cars are subject to the tax on driving power as part of the annual vehicle tax. It complements fuel taxation, harmonises the cost differences for motorists arising from the different tax treatment of petrol and diesel based on the average annual transport performance, and ensures that the requirement of neutral energy taxation under State aid regulation is met. It is also used to implement in practice the tax refund for diesel used in commercial transport more extensively than what is possible under the Directive. In addition to diesel cars, the tax on driving power is levied on cars fuelled by other driving powers, such as electricity or gas, whose taxation is based on less stringent criteria than the taxation on petrol, to ensure that the objective of neutral

[9] Act amending the Act on the Excise Duty on Liquid Fuels (1399/2010).https://www.finlex.fi/fi/laki/alkup/2010/20101399

taxation of transport driving powers in keeping with the spirit of the energy tax system and required under State aid regulation could be also met in their case.

As the energy content tax on bio-based petrol and diesel grades is also determined on the basis of the calorific value, their per-litre energy content tax is lower than the tax on corresponding fossil fuels.

A reduction of 5 cents per litre for paraffinic fossil diesel oil and biodiesel, as well as 4 cents per litre for ethanol diesel, is granted on the energy content tax on fossil fuels which have lower local emissions than conventional fossil fuels. This reduction was introduced in 2012. Its amount was determined on the basis of the calculated benefit that could be achieved by using paraffinic diesel in the bus fleet serving an urban subregion in the early 2010s. In the calculation of the emission benefit, the principles set out in Directive (2009/33/EC) of the European Parliament and of the Council on the promotion of clean and energy-efficient road transport vehicles were followed.

As the vehicle fleet has evolved, the local emissions of new diesel vehicles have been reduced significantly by modern exhaust gas purification methods. Recent studies indicate that the current tax reduction on paraffinic diesel oil and ethanol diesel is no longer justified, taking into account the advancement of emission treatment technologies in the vehicle fleet (Euro emission classes) and the distribution of driving performance in urban areas and outside them. Based on these estimates, the differentiation of fuel grades is groundless, or at least results in significant overcompensation.

As the environmentally-related energy tax reform entered fully into force also for diesel oil at the beginning of 2012, the share of fuels eligible for the grade-related tax reduction for paraffinic diesel was initially low; currently, however, almost four fifths of all taxable fossil diesel oil and biofuels replacing it are already within the scope of the tax reduction.

In connection with the budget and spending limits negotiations in September 2019, the Government decided to abolish the tax expenditure for paraffinic diesel as part of reducing business subsidies. The removal of the tax expenditure for paraffinic diesel oil would increase central government revenues by approx. EUR 115 million per year once the expenditure has been eliminated fully.

Carbon dioxide tax

The basis for calculating the carbon dioxide tax on petrol and diesel oil as well as the corresponding biofuels is the price of carbon dioxide, or EUR 77 per tonne, and the carbon dioxide emission coefficient specific to each fossil product. As the carbon dioxide tax also factors in the life-cycle carbon dioxide emissions of the fuel, the per tonne price of carbon dioxide used in the calculation of the CO_2 tax (EUR 77) should be increased by approx. 20% in order to be comparable to the price of carbon dioxide tonnes calculated on the basis of emissions from combustion alone. Similarly to the energy content tax, the carbon dioxide tax on both fossil fuels and biofuels is proportionate to their calorific value, which means that the tax per litre is lower on biofuels than fossil fuels.

Following the entry into force of the energy tax reform of 2011, the calculation basis of the CO_2 tax on transport fuels was adjusted and took its current form in 2012. This meant that in addition to biofuels, the average life-cycle greenhouse gas emissions of the fuel are also taken into account in the carbon dioxide emissions of fossil petrol and diesel oil as required by the European Commission. This change harmonised the tax bases for fossil fuels and biofuels in order to avoid fiscal State aid problems.

The majority of the fuel grades on the Finnish market are blends of several components, each component of which is subject to tax set out in the excise duty table. High-blend biofuels produced exclusively from renewable raw materials are also available on the market. However, at least the minimum tax required under EU legislation must be levied on each litre of fuel placed on the market. This means that if the tax calculated on the basis of the excise duty table for a single fuel component or a blend consisting of several fuel components placed on the market is lower than the minimum level required in the EU, the minimum level of fuel tax must be applied. For example, the tax on paraffinic biodiesel sold as a high blend biofuel (100%) is 28 cents per litre determined for product group 57 in the table. A tax of 33 cents per litre must be levied on it, however, which is the minimum tax level laid down in the Energy Taxation Directive for all transport diesel fuels.

When determining the CO_2 tax on biofuels that meet the sustainability criteria, the tax is reduced in proportion to the tax level applicable to the corresponding fossil or non-sustainable biofuel, as the former are considered to achieve a reduction in the life-cycle CO_2 emissions compared to fossil fuels. The starting points and default values used in the taxation of biofuels are based on Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC[10] and 2003/30/EC[11], later referred to as the *RES Directive*[12]. The reductions in greenhouse gas emissions that can be achieved by means of biofuels in proportion to the life-cycle greenhouse gas emissions of fossil fuels are one of the criteria used to determine the CO_2 tax. The carbon dioxide tax on biofuels that meet the sustainability criteria, including ethanol and biodiesel of agricultural origin, has been halved, and biofuels produced from waste, residues, lignocellulose and inedible cellulose, later referred to as *category T*, are fully exempted from the CO_2 tax because they can be regarded as almost greenhouse gas neutral fuels when examining the fuel chain as a whole and because their raw materials are unsuitable for food production. The requirements relating to the sustainability of raw materials, for example, which must be met in order for the products to be taxable in keeping with the tax model, also originate in the RES Directive.

The promotion of biofuel use in transport in Finland is based on fuel distributors' binding obligation to supply the proportion of biofuel annual laid down in an Act as transport fuel. Provisions on the obligation to distribute biofuels are laid down in the Act on the Promotion of Biofuels in Transport (446/2007)[13], which is discussed in detail later in this section. Rather than promoting the use of biofuels, the purpose of fuel taxation is to tax all fuels as objectively and neutrally as possible on the basis of their energy content, carbon dioxide emissions and local emissions. Taxation supports the use of the most environmentally friendly fossil fuels and biofuels.

Both fossil and bio-based transport fuels are subject to a strategic stockpile fee paid in connection with excise duties, which is entered as revenue in a non-Budget fund.

[10] Directive 2001/77/EC of the European Parliament and of the Council on the promotion of electricity produced from renewable energy sources in the internal electricity market. https://eur-lex.europa.eu/legal-content/FI/ALL/?uri=CELEX:32001L0077

[11] Directive 2003/30/EC of the European Parliament and of the Council on the promotion of the use of biofuels or other renewable fuels for transport. https://eur-lex.europa.eu/legal-content/FI/ALL/?uri=CELEX%3A32003L0030

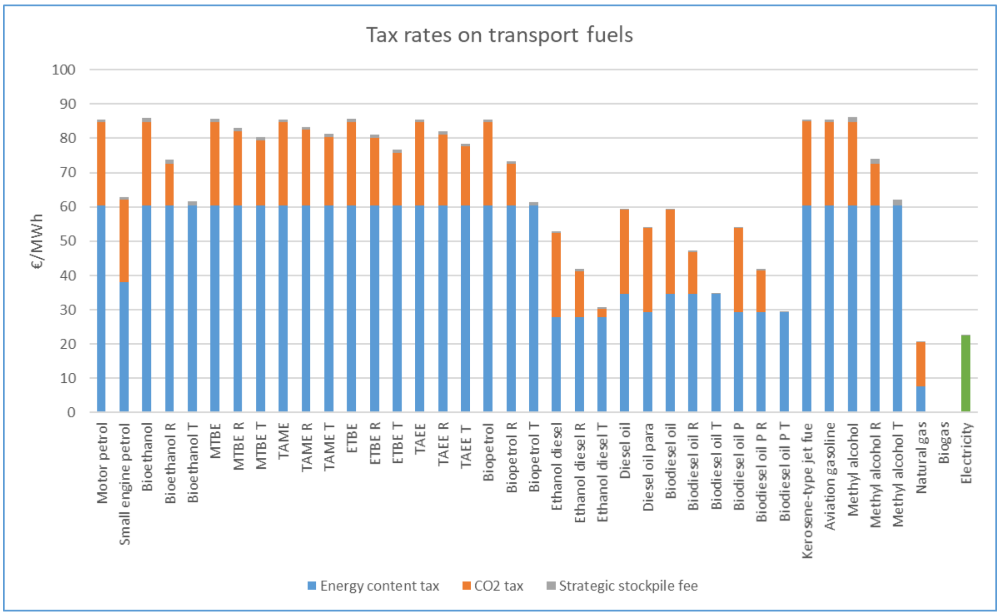
[12] Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC https://eur-lex.europa.eu/legal-content/FI/TXT/?uri=CELEX%3A32009L0028

[13] Act on the Promotion of Biofuels in Transport (446/2007). https://finlex.fi/fi/laki/alkup/2007/20070446

Levels and development of transport fuel taxes

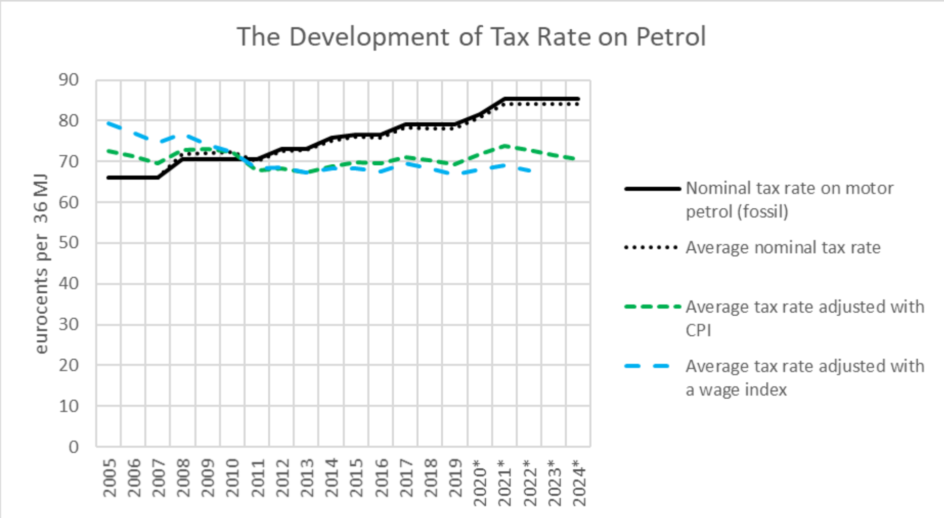
Figure 2 below describes the determination of transport fuel taxes, including exceptions:

Figure 2. Determination of transport fuel taxes.



As Figure 2 shows, the basis of the energy content tax is, in principle, the same for all fuels. An exception to this rule is small engine petrol and paraffinic fuels, whose tax has been reduced on the basis of quality criteria. In addition, the energy content tax on all diesel fuels and the corresponding biofuels has been reduced compared to the level required by the tax model. In cars, the tax on driving power makes up for this discount. The carbon dioxide tax on each fuel is determined based on its characteristics. No separate tax level for the transport use of gas and electricity has been determined, and their tax levels thus are clearly lower than the level for transport fuels. In cars, this difference is also partly compensated for by the tax on driving power, in which energy consumption, CO_2 and local emissions are taken into account.

Figure 3. Development of the petrol tax level. Source: Statistics Finland, Ministry of Finance.



As Figure 3 shows, the average tax level for petrol and the corresponding biofuels went down in 2011, as a tax level corresponding to their energy content and CO_2 emissions was determined for several components of the fuel mixture at the pumps, rather than taxing all components at the higher level per litre applied to fossil petrol. The tax level for petrol is currently slightly higher in real terms than in 2010, given the trends in CPI.Compared to the trend in the index of wage and salary earnings, the petrol tax has decreased.

Figure 4. Development of the diesel tax level. Source: Statistics Finland, Ministry of Finance.

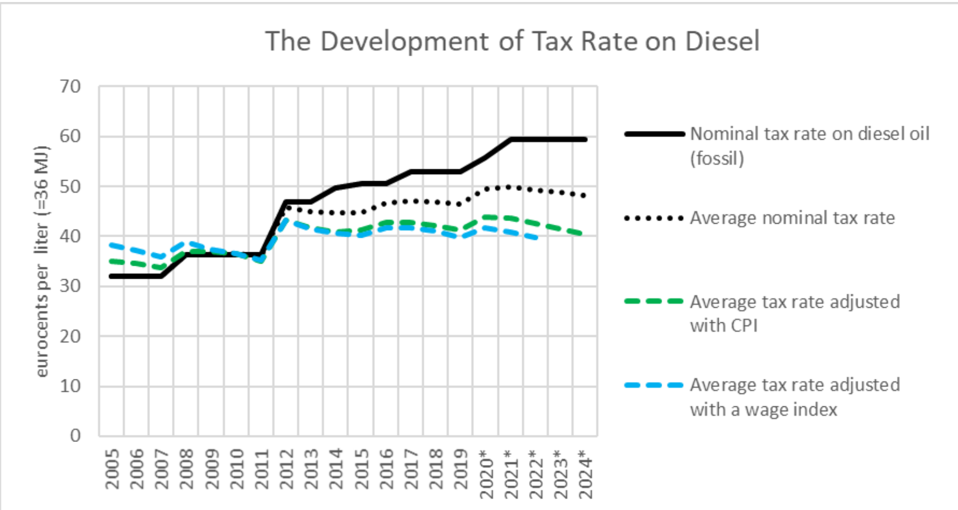


Figure 4 shows that in 2011–2012, the same structural change that reduced the average tax took place in the taxation of diesel oil and its biofuel substitutes as in the taxation of petrol. The tax expenditure for diesel oil and the biofuels that replace it was reduced to 25.95 cents per litre. The tax level was increased by 7.9 cents per litre, for which cars and vans received full compensation, however, in the form of a reduced tax on driving power. The tax on driving power for HGVs was also reduced, in addition to which this sector, similarly to other businesses, benefited from the elimination of the employer's national pension contributions. Increases in the environmental tax brought in as part of the energy tax reform of 2011 were a direct compensation for these contributions.

Similarly to other liquid fuels, diesel oil is sold as blends which include bio-based components subject to a lower tax level in addition to, or instead of, fossil fuel components. The tax on paraffinic components has also been reduced. Due to the increase in the share of fuels subject to a lower tax level since 2012, the average tax level for diesel has not changed significantly even in nominal terms, except for a small increase in August 2020. Taking into account the change in the general price level, the average tax level for diesel has been lower than the 2012 level in recent years, regardless of tax increases. Considering that no adjustments have been made to the level of the tax on driving power since 2012, we can conclude that the overall taxation of both diesel cars and HGVs is also lower today than in 2012.

Biofuel distribution obligation

Pursuant to the Act on the Promotion of Biofuels in Transport (446/2007), also referred to as the Distribution Obligation Act, a distributor of transport fuels (oil company) liable to pay tax must supply biofuels for consumption. The energy content share of biofuels in the total energy content of petrol, diesel oil and biofuels supplied by the distributor for consumption will rise steadily to 30% in 2029. In addition, the Act lays down a separate obligation to distribute advanced biofuels, which will rise gradually to 10% in 2030. Advanced biofuels refer to biofuels produced from raw materials listed in Part A of the Annex to the Distribution Obligation Act. The biofuels included in the distribution obligation must meet EU sustainability criteria. Hydrotreated vegetable oil (HVO)[14], which can be used in diesel cars at high concentrations, is used to a significant extent to meet the distribution obligation in Finland. Rather than promoting the use of biofuels, the purpose of fuel taxation is to tax all fuels as objectively and neutrally as possible on the basis of their energy content, life-cycle carbon dioxide emissions and local emissions, and thus contribute

[14] In the excise duty table, paraffinic diesel oil.

to ensuring that the tax system and the distribution obligation are compliant with EU law.

2.1.3 Heating fuels

The energy tax regime defines the energy products (fuels) that are subject to tax in heating and mobile machinery use. The taxation of fuels used for heating as well as in power plants and mobile machinery, which are later referred to as heating fuels, including light and heavy fuel oil, LPG, coal, natural gas, peat and tall oil, is regulated under the Act on the Excise Duty on Liquid Fuels for the part of liquid fuels and under the Electricity Tax Act for the others. Similarly to transport fuels, the energy taxation reform of 2011 replaced volume or weight based excise duties on heating fuels by an energy content tax and carbon dioxide tax based on combustion emissions, which are determined on consistent tax bases. Structurally, a similar change took place in the case of transport fuels and heating fuels.

The emissions generated over the life cycle of a heating fuel, for example during production and transport, have been taken into account in the energy taxation of heating fuels from the beginning of 2019. This was similar to the change affecting transport fuels implemented earlier. The value used in the calculation of the carbon dioxide tax is EUR 53 per tonne of carbon dioxide. As we noted in the context of transport fuels above, the value of a carbon dioxide tonne used in the calculation of the carbon dioxide tax for heating fuels (EUR 53) should also be increased by approx. 20% in order for it to be comparable to the value of a t CO_2 based on emissions from combustion only.

As the taxation of peat and tall oil is not based on the environmentally-related tax model, they are subject to a separate energy tax rather than the energy content and carbon dioxide taxes. In addition, peat is only subject to tax in heat production when used in a power plant or heating plant whose capacity exceeds 5,000 MWh per year, while the use of peat volumes smaller than this are excluded from the tax regime. Tall oil used for heating is subject to excise duty equivalent to that on heavy fuel oil. The purpose of the tax is to encourage the further processing of tall oil as a chemical industry raw material rather than using it for energy.

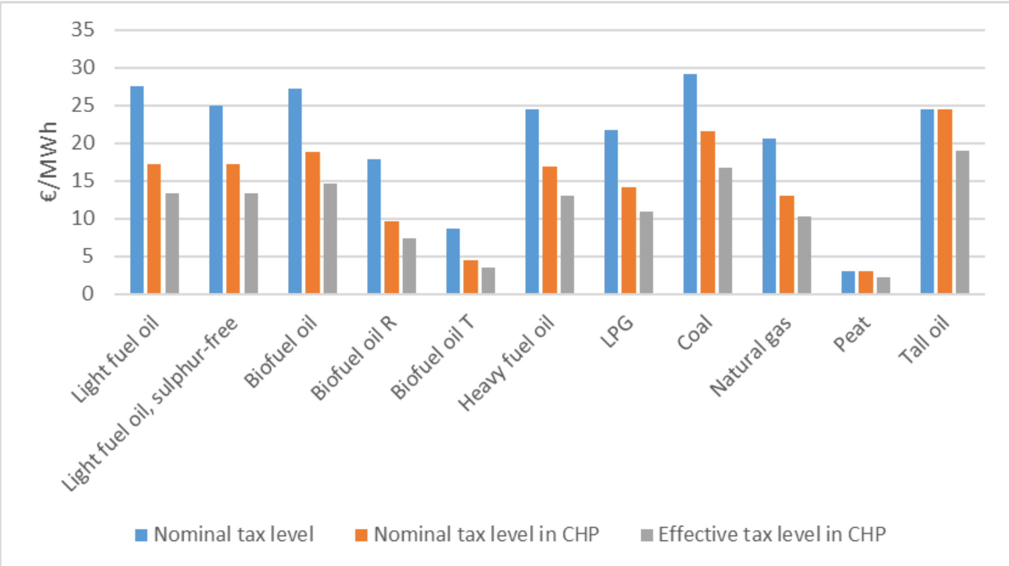
Similarly to transport fuels, heating fuels are also subject to a strategic stockpile fee in connection with excise duties, with the exception of peat and tall oil. Gaseous and solid biofuels are exempt from tax and the strategic stockpile fee. In the interest of clarity, the tax amounts on heating fuels have been converted into taxable units for each fuel in the excise duty table.

The taxable fuel volume used for heat production in CHP is calculated by multiplying the heat amount released for consumption by a coefficient of 0.9. This calculation rule applied to fuels used for heat production lowers the taxation of heating fuels by around 20% to 25% in CHP compared to separate heat production. In addition to the calculation rule, an energy content tax reduced by EUR 7.63 per megawatt hour is applied to CHP (for technical reasons, currently implemented as a 100% reduction on the energy content tax). To ensure that the minimum tax levels laid down in the Energy Taxation Directive are met, energy content tax levied on category T biofuels in CHP (waste, residues, lignocellulose, non-edible cellulose) is reduced by 50%. This is necessary as the carbon dioxide tax on category T biofuels is zero. The nominal tax level for peat is the same in CHP as in separate heat production, in which it is approximately one tenth of the tax level specified in the environmentally-related energy tax model.

Tax levels for heating fuels and their development

See Figure 5 below for the tax levels for heating fuels converted into megawatt hours and the reduced tax rates for CHP, which are important in terms of the tax base. In addition, CHP benefits from the calculation rules which reduce the effective tax level.

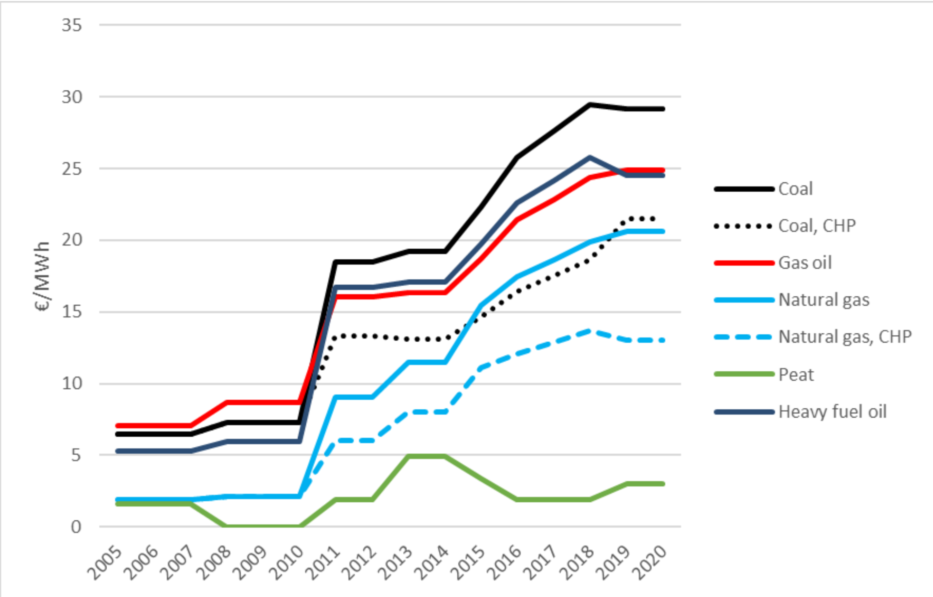
Figure 5. Tax levels for heating fuels.



It should be noted that taxable fuels used in CHP currently account for around two fifths of the total tax base of heating fuels, with variations between individual fuels. CHP accounts for 100% of the taxable consumption of coal, 55% of natural gas and 70% of peat.

Figure 6 shows the development of nominal tax levels since 2007. In connection with the change in the energy taxation structure in 2011, on average two and a half times higher overall tax levels were imposed on heating fuels to partially compensate for the tax revenues lost when the employer's national pension contributions were dropped. In the calculation of the carbon dioxide tax on heating fuels, EUR 30 was initially used as the value of t CO_2. In the tax reform of 2011, the carbon dioxide tax was halved to reduce tax incentives which overlapped with emissions trading and to improve the competitiveness of energy-efficient combined production. Until 2015, the energy content tax on natural gas was lower than the target level in the environmentally-related tax model, as the 2011 tax reform allowed natural gas users time to adapt to the new tax system which was consistent with the use of other imported fossil fuels. As the energy content tax level for natural gas went up at the beginning of 2015, the tax expenditure for natural gas was removed fully.

Figure 6. Development in the nominal tax levels of heating fuels.



As Figure 6 shows, the tax levels for heating fuels have gone up several times since 2011, mainly for the part of the carbon dioxide tax. The Figure shows the tax levels before tax expenditures. As mentioned above, almost all taxable consumption of coal and the majority of taxable natural gas consumption is related to CHP, which is eligible for a reduced tax level.

At the beginning of 2019, the 50% reduction of the carbon dioxide tax on CHP was abolished and replaced by a 100% reduction in the energy content tax (a reduction of EUR -7.63/MWh in tax levels). This change was motivated by the fact that the 50% reduction in the CO_2 tax in CHP undermined the tax incentive for reducing emissions for fuels included in the environmentally-related tax model. By transferring the tax expenditure from the carbon dioxide tax to the energy content tax, it was possible to increase the taxation of coal use and emissions guidance in CHP without significantly increasing its total tax burden. In the tax reform that entered into force at the beginning of 2019, not only emissions from fuel combustion but also life-cycle greenhouse gas emissions were factored in the calculation criteria of the carbon dioxide tax, and the value of the carbon dioxide tonne on which the tax is based was reduced accordingly. Life-cycle emissions were taken into account in an effort to ensure the tax model’s compatibility with the biofuel oil distribution obligation to be introduced at the beginning of 2021 under EU law.

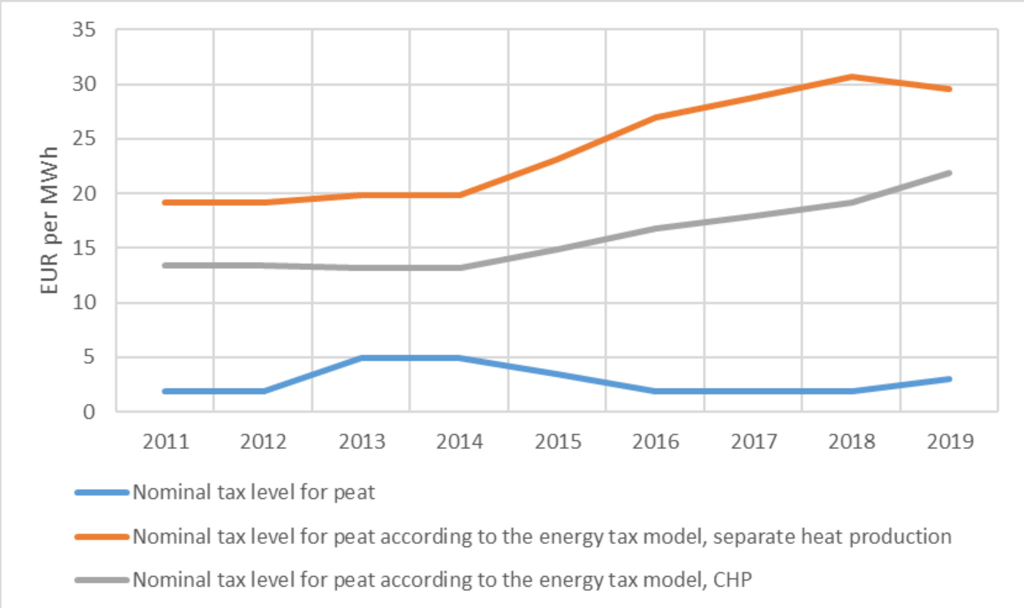
Motor fuel for mobile machinery is taxed at a level equal to light fuel oil (gas oil) used in heating. In both cases, fuel oil is used which contains a red dye supplemented with the EU's common marker, Solvent Yellow 124[15][16][17] to distinguish it from transport diesel subject to a higher tax[18].

The tax on peat has gone up and down over the years, independently of other tax reforms. As Figure 7 shows, the tax expenditure for peat[19] has increased considerably over the past decade, as the peat tax has not always been increased simultaneously with taxes on other heating fuels or the increase has been lower. If the tax level for peat, which currently is EUR 3.0/MWh, were determined in keeping with the current

[15] Council Directive 95/60/EC of 27 November 1995 on fiscal marking of gas oils and kerosene https://eur-lex.europa.eu/legal-content/FI/TXT/PDF/?uri=CELEX:31995L0060&qid=1599556798775&from=FI
[16] European Commission. Fiscal marking of gas oils and kerosene. https://ec.europa.eu/taxation_customs/business/excise-duties-alcohol-tobacco-energy/excise-dutiesenergy/fiscal-marking-gas-oils-and-kerosene_en
[17] Commission Implementing Decision (EU) 2017/74 establishing a common fiscal marker for gas oils and kerosene. https://eur-lex.europa.eu/legal-content/FI/TXT/PDF/?uri=CELEX:32017D0074&from=FI
[18] Decree on Excise Duty on Liquid Fuels (1547/1994). https://www.finlex.fi/fi/laki/ajantasa/1994/19941547
[19] An estimate of the tax level of peat based on the average value of milling peat and sod peat.

energy tax model, it would be nearly EUR 30/MWh in separate heat production and approx. EUR 22/MWh in CHP.

Figure 7. Development of the tax expenditure for peat.



2.1.4 Electricity

The fuels used to produce electricity are exempt from tax both in separate condensing power plant production and CHP. Electricity consumption is subject to tax, and taxes are levied on all electricity regardless of the production method. Consequently, the tax is not based on the carbon or energy content of the fuels used to produce the electricity. The tax exemption for fuels used to produce electricity is based on the Energy Taxation Directive and motivated by the need to coordinate the functioning of the electricity market and taxation, especially in the importation and exportation of electricity.

The excise duty on electricity is differentiated into two categories. Category I tax is generally levied on business activities, such as services, forestry and construction, as well as on electricity used in the public sector and households. Category I electricity tax is 2.24 cents per kilowatt-hour. The lower category II tax covers electricity consumption in industry, mining, data centres and greenhouses. While other areas of agriculture also fall in tax category II, this reduction takes the form of an energy tax refund for the agriculture. Category II electricity tax is 0.69 cent per kilowatt-hour. Some 10,000 industrial companies are within the scope of the reduced electricity tax.

Additionally, more than 30,000 farmers benefit from a reduced electricity tax level in the form of tax refunds for agriculture.

Similarly to other excise duties, the principle in electricity taxation is to only tax electricity when it is released for consumption. In other words, electricity can be supplied by the power plant to the electricity grid and transmitted along the grid without paying tax; the tax is only payable as the electricity is transferred from the network to the point of consumption. To enable this, the transmission of electricity in different parts of the supply chain is exempt from tax.

All electricity produced by a power plant and transmitted through the electricity grid is taxable. Key taxpayers are network operators and electricity producers. In practice the producer, or the power plant, supplies the electricity it generates tax free to the grid, through which the electricity can be transmitted further to other grids without paying tax. There is also no tax on transmitting electricity from another country to the Finnish electricity grid. The electricity is metered as it is supplied from a distribution network for consumption in households or industrial installations, for example, and network operators supplying the electricity are liable to pay category I or II tax based on its intended use. In situations where the producer also consumes the electricity it generates, for example in their production activities, rather than transmitting it to the grid, the producer pays the tax. However, the electricity consumed in the auxiliaries of the power plant is tax free. There is no tax on the transmission of electricity to another country, and the production of electricity is consequently not burdened by national taxes.

Exemptions apply to small-scale electricity production. The smallest producers who generate electricity at power plants with a rated capacity of up to 100 kV are exempted from all obligations related to electricity taxation. These producers do not need to register as taxpayers or submit tax returns on their electricity production.

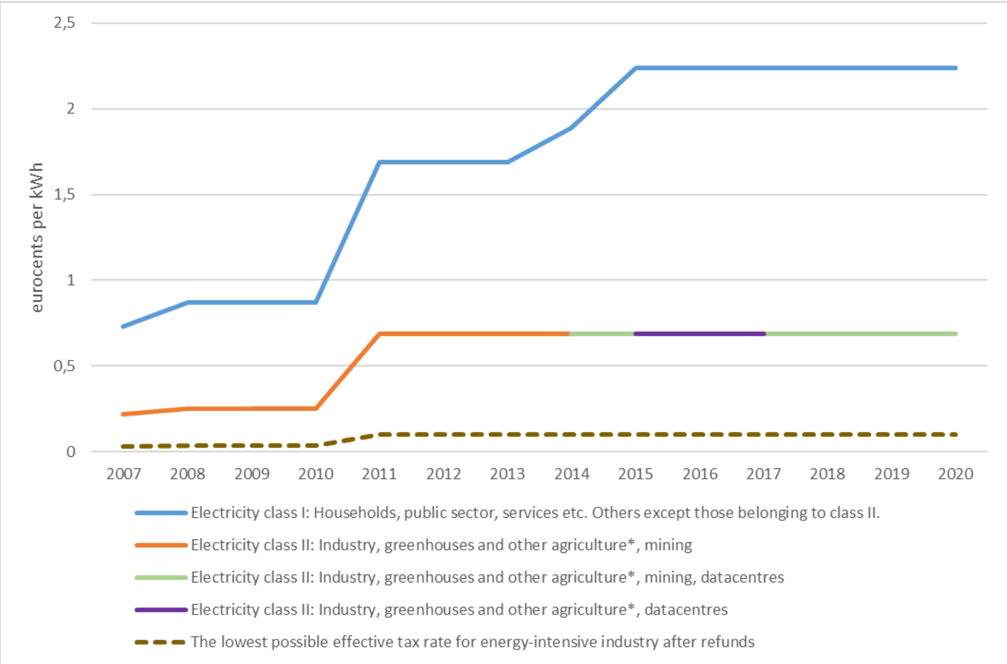
Small-scale producers of electricity with a rated capacity of more than 100 kVA but not more than 800,000 kilowatt-hours a year, on the other hand, register as taxpayers liable to pay electricity tax with the Tax Administration. Rather than being liable to pay electricity tax for the electricity they generate and consume themselves, these small-scale producers file a so-called zero-rate tax return once a year, in which they only report the volume of electricity generated. The annual return is used to supervise the yearly limit for tax-free production. If the annual production exceeds 800,000 kWh, the producer is liable to pay tax on all the electricity it produces and uses itself.

If electricity generated in a micro or small power plant is transmitted through the electricity grid for consumption, however, the tax exemption is not transferred with the electricity, and the network operator transmitting the electricity for consumption is liable to pay category I or II energy tax on it.

Under an amendment to the Electricity Tax Act which entered into force at the beginning of 2019, double taxation on electricity was abolished in situations where electricity is transmitted to storage and, for example, from there back to the electricity grid to be released later.

Figure 8 shows the development of tax levels for the two electricity tax categories since 2007. The tax levels for both categories went up significantly in connection with the energy tax reform of 2011, and category I tax has been increased twice since then. Data centres were transferred to the lower electricity tax category II in 2014, and mining was removed from it in 2015 and transferred back to it in 2017. Businesses eligible for tax refunds for energy-intensive companies receive a refund for the energy taxes they pay, which means that their effective electricity tax is also lower than for other industries. The average refund amounted to approximately 70% per cent of the taxes in 2019, while the highest refund was almost 85%. The electricity tax levels have not changed since the beginning of 2015, and consequently their real levels have since gone down by a few per cent. Compared to 2010, however, their levels are more than double also in real terms.

Figure 8. Development of the electricity tax levels.



*Other agricultural sectors pay category I electricity tax but receive a refund equal to the difference between the tax categories

2.1.5 Strategic stockpile fee and oil damage duty

Under the Act on Security of Supply (1390/1992)[20], security of supply refers to safeguarding economic functions and ancillary technical systems vital to the livelihood of the population, the national economy and national defence in exceptional circumstances or comparable serious disturbances.

Under this Act, responsibility for developing security of supply and coordinating preparedness rests with the Ministry of Economic Affairs and Employment, which steers and supervises the National Emergency Supply Agency tasked to develop and maintain security of supply in Finland. The tasks of the National Emergency Supply Agency are specified in the Government Decree on the National Emergency Supply Agency (455/2008). The Government sets national targets for security of supply in a decision issued approximately every five years. The latest decision (1048/2018) on the objectives of security of supply was issued in December 2018.

The Act on Security of Supply also contains provisions on the strategic stockpile fee, which is levied in connection with excise duties on energy products as part of the overall tax level. Despite its name, the strategic stockpile fee is a tax. Rather than being accrued in the Budget, the revenue from the strategic stockpile fees is transferred directly to the off-budget National Emergency Supply Fund. This is an exception to the main principle of universality of tax revenues. The National Emergency Supply Fund, in which funds accrue from taxable consumption of energy products and electricity, covers expenditure incurred by the State from strategic stockpiling, technical contingency arrangements and preparedness planning. Under the Act on Excise Duty on Liquid Fuels and the Electricity Tax Act, these fees are levied on liquid fuels, electricity, coal and natural gas. As fuel tax is not levied on fuels used for electricity production, they are also not subject to the strategic stockpile fee. The fee is levied in connection with electricity taxes; on fuels used for heat production, it is collected in connection with the fuel taxes. The amounts of the fee for energy products are 0.68 cent/l for petrol, 0.35 cent/l for light fuel oil and diesel, 0.28 cent/kg for heavy fuel oil, 0.11 cent/kg for LPG, EUR 1.18/t for coal, EUR 0.084/MWh for natural gas, and 0.013 cent/kWh for electricity. Following the principle of equivalence, a strategic stockpile fee is also levied on products that replace these fuels[21]. Peat or tall oil are not subject to the strategic stockpile fee.

[20] Act on Security of Supply (1390/1992).
https://www.finlex.fi/fi/laki/ajantasa/1992/19921390
[21] The amount of the strategic stockpile fee is itemised in the excise duty tables for energy found in the Appendices to this report.

According to the National Emergency Supply Agency, the fee comprises around half a per cent of the retail price of energy. It is not, however, dependent on the retail price. The amount of the fee is currently not logically determined for different energy products or electricity. Its levels have not changed for decades, despite changes made to the structure of energy taxation, and the strategic stockpile fee does not comply with the Finnish energy tax structure, which is mainly based on the energy content and life-cycle CO_2 emissions of each energy product. The strategic stockpile fee is 0.9% of the total tax on fossil petrol but only 0.6% of the tax on fossil diesel. In addition to peat and tall oil, on which the strategic stockpile fee is not collected, the lowest fee is levied on LPG and jet fuel, accounting for about 0.4 per cent of the total tax level in both cases. The fee on renewable bio-based fuel oil used for heating accounts for more than 4% of the total tax level. The proportion of the strategic stockpile fee in effective total tax levels may be more than ten times higher when the energy tax level has been reduced, such as in CPH, or it is refunded, such as the tax refunds for energy-intensive companies or agriculture. In this case, tax reductions and refunds do not apply to the strategic stockpile fee, which is paid in full. The fee amount is also illogical from other perspectives, such as energy contents or market prices.

In 2019, the yield of the strategic stockpile fee was approximately EUR 43 million. The yield, and thus the revenue for the National Emergency Supply Fund, has varied significantly on a monthly and annual basis as the tax base of different energy products has changed.

The Act on the Oil Pollution Compensation Fund (1406/2004) contains provisions on the oil damage duty, which is levied on crude oil and other oil products imported in and transported through Finland falling under tariff headings 2707, 2709 and 2710. A duty of EUR 0.50 is levied on each full tonne of oil. The fee is doubled for oil transported by a tanker not equipped with a double hull across the entire cargo tank area. The revenue from the oil damage duty amounts to approx. EUR 8 million a year. This tax-like duty is collected by the Tax Administration, accounted to the off-budget Oil Pollution Compensation Fund, and allocated to various uses through the fund's organisation. The Oil Pollution Compensation Fund is an off-budget entity from which compensation is paid for costs incurred from oil spills, their prevention and environmental restoration. In addition, the Fund provides compensation and grants to cover the costs incurred from acquiring oil spill combating equipment and maintaining preparedness for oil spill response. The capital limit laid down in the Act on the Oil Pollution Compensation Fund was increased to EUR 50 million for a fixed period until the end of 2019. The capital limit has since been returned to its normal level of EUR 10 million. Collection of the oil damage duty was suspended on 1 March 2020, as the capital of the Finnish Oil Pollution Compensation Fund exceeded EUR 10 million at the beginning of 2020. Fee collection will only resume once the fund's capital has fallen below EUR 5 million.

Under Article 1(2) of the Excise Duty Directive, Member States may levy other indirect taxes on excise goods for specific purposes, provided that those taxes comply with the Community tax rules applicable for excise duty or value added tax as far as determination of the tax base, calculation of the tax, chargeability and monitoring of the tax are concerned, but not including the provisions on exemptions. The strategic stockpile fee was introduced as a charge levied in connection with fuel taxation before the introduction of the current, EU-approved energy tax system based on energy content and CO_2 emissions. Consequently, the strategic stockpile fee cannot currently be considered to meet the Excise Duty Directive’s requirement concerning the criteria for determination of energy tax base, as the fee is determined on different criteria than the energy tax. Neither does the oil damage duty meet the requirements of EU legislation in terms of its determination basis or the time of its chargeability.

2.1.6 Tax refund for energy-intensive industries

The tax refund for energy-intensive companies reduces the energy taxation of energy-intensive industries. Through this regime, an effort has been made to safeguard the international competitiveness of energy-intensive industries while attempting to use energy taxation to curb energy consumption and carbon dioxide emissions. The refund is paid annually on application, which must be submitted within six months of the end of the company's financial year. The industries entitled to energy tax expenditures are defined in the Electricity Tax Act; the energy-intensive industry eligible for subsidies refers to the extraction of minerals and industrial manufacturing and processing of goods, as well as small-scale non-industrial support activity which takes place on the production site of an industrial enterprise and which is mainly related to the company's in-house industrial activity. The operations defined as eligible for subsidies also include professional greenhouse cultivation. The idea is that only electricity used in industries referred to in the Electricity Tax Act is eligible for the lower category II electricity tax, and that only the electricity and heating fuels consumed in industries referred to in this act are within the scope of the tax cuts. For example, electricity in tax category I consumed at head offices or research institutes separate from industrial plants is not eligible for tax refunds. Fuels used in vehicles, machinery or other engines are also excluded.

Under the Electricity Tax Act, an energy-intensive company is eligible for a tax refund insofar as the amount of excise duties included in the price of taxable energy products used or purchased by it, other than transport and machinery fuels, exceeds 0.5% of the company's value added[22]. In this respect, the company is eligible to a 85% refund of the excise duties it has paid. However, a contribution of EUR 50,000 is deducted from the refund.

The formula for calculating the tax refund thus is:

$$\text{Tax refund} = (\text{amount of energy taxes} - 0.5\% \times \text{value added}) \times 85\% - 50{,}000€$$

In 2019, a total of EUR 228 million of regular tax refunds for energy-intensive companies was paid to 177 companies[23]. The companies eligible for tax refunds paid energy taxes totalling EUR 330 million. The refunds thus accounted for about 70% of the energy taxes.

See Table 1 for the Ministry of Finance's estimate of how the energy taxes and tax refunds of companies currently eligible for tax refunds are divided between main sectors. The estimate is based on data on companies' energy product use and value added in the financial year ending in 2018 and the tax levels of 2020.

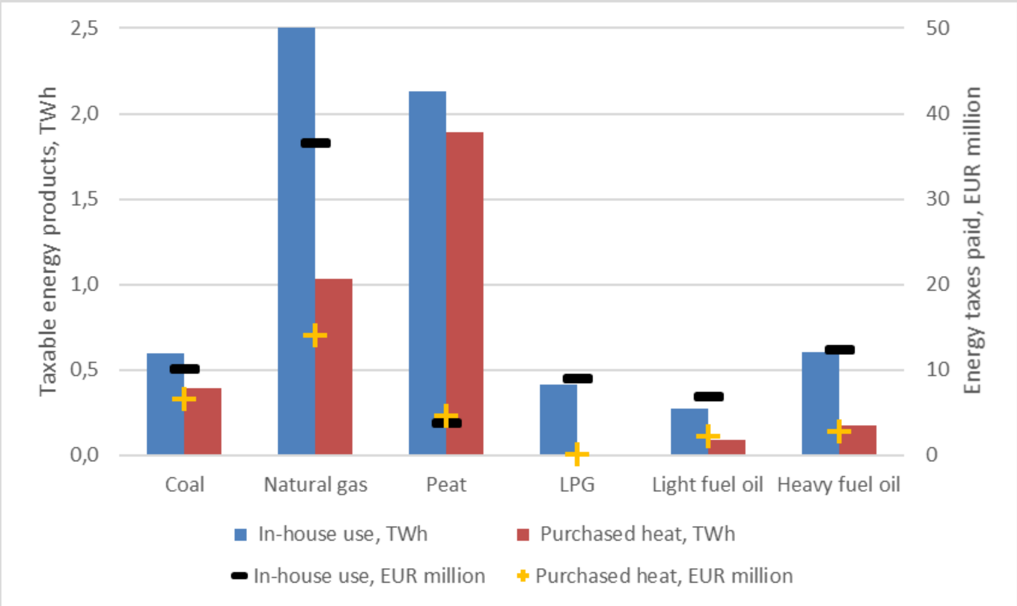
[22] The value added of a company is calculated as the sum of the company's operating profit, impairment, personnel costs and depreciation, from which figure is subtracted the tax refund applied for, if the refund is shown in the company's financial statements.
[23] In addition to regular refunds, previous refund decisions may be subject to adjustments, as a result of which the regular refund amount does not necessarily equal the refund amount paid from the relevant expenditure item in the Budget.

Table 1. Tax burden of energy-intensive industries. Source: Ministry of Finance.

Main industry	Number of companies	Energy taxes paid, EUR million			Refund	Refund/ Energy taxes	Energy tax burden/ Value added
		Electricity	In-house use of energy products	Purchased heat energy products			
Mining	10	9	3	0	7	64%	0.9%
Greenhouse cultivation	23	4	2	0	3	60%	3.9%
Chemical industry	35	40	13	9	44	70%	1.0%
Metal industry	16	41	9	2	37	72%	1.0%
Forest industry	45	121	38	8	122	73%	1.1%
Food industry	36	7	10	10	16	58%	0.9%
Other industry	16	5	4	1	5	49%	0.8%
Total	181	227	79	30	234	70%	2.4%

Figure 9 shows the distribution of taxable energy product use in companies eligible for tax refunds. The most common taxable energy products are peat and natural gas. The proportion of natural gas is high, especially in heat produced by industrial companies. About three fifths of the heat generated with natural gas is produced in CHP plants. The proportion of peat in paid energy taxes is considerably lower than its share of excisable energy product use, which is explained by the fact that the tax on peat is clearly lower than the tax on other energy products.

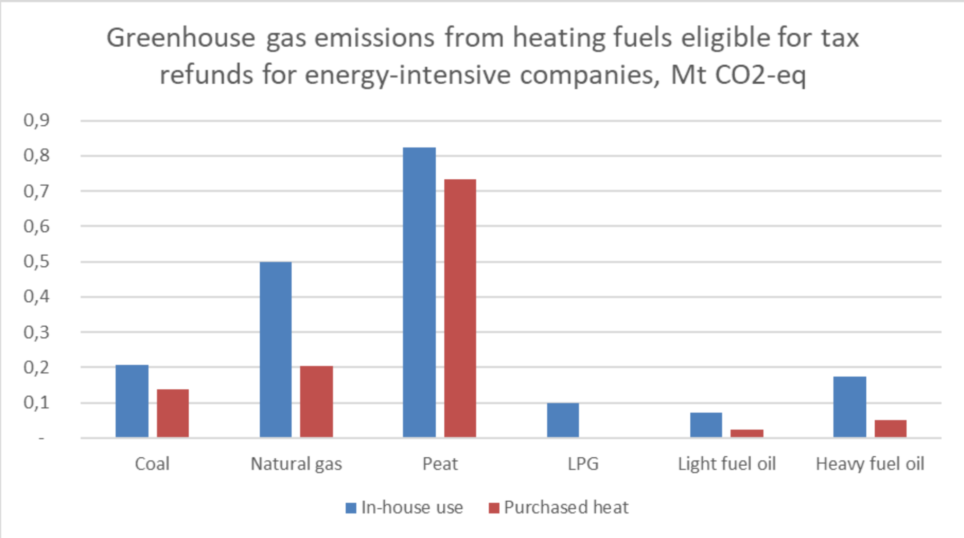
Figure 9. Breakdown of taxable energy product use in companies eligible for tax refunds.



See Figure 10 for greenhouse gas emissions from heating fuel use by energy-intensive companies eligible for refunds itemised by the heating fuels used by the companies themselves and the fuels included in purchased heat based on consumption data from 2018. The greenhouse gas emissions from in-house consumption of heating fuels totalled approx. 1.9 Mt, and the greenhouse gas emissions from fuels included in purchased heat were about 1.1 Mt[24]. Peat accounted for around 44% of greenhouse gas emissions from in-house consumption of heating fuels and for 64% of heat purchases.

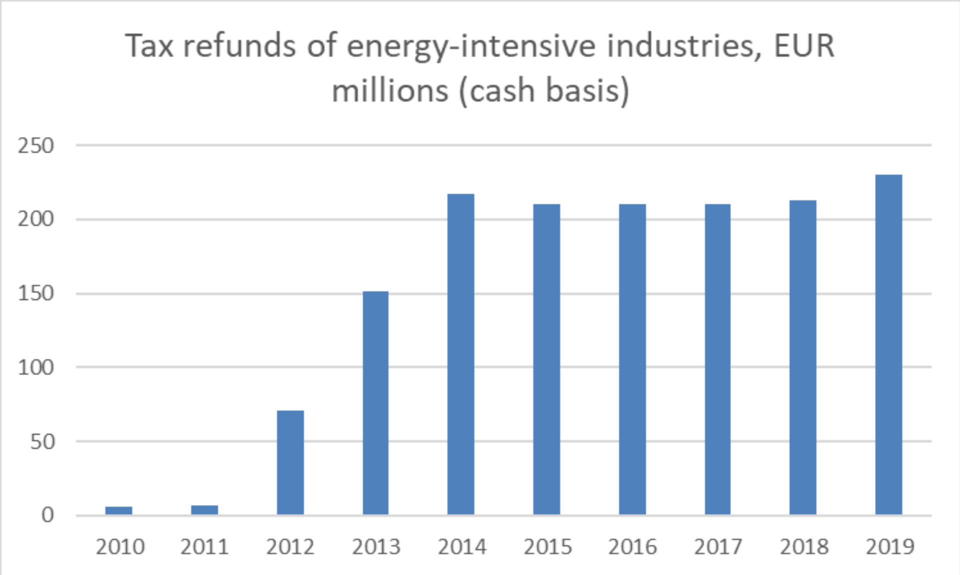
[24] The emission figures include emissions from separate heat production and the proportion of heat in emissions from CHP. If we also factor in the proportion of electricity generation in emissions from CHP, the emissions from in-house use of fuels eligible for tax refunds would be approximately 2.7 Mt.

Figure 10. Greenhouse gas emissions from heating fuels eligible for tax refunds for energy-intensive companies. Source: Ministry of Finance.



The energy tax reform of 2011 raised the total amount of tax refunds for energy-intensive industries significantly (Figure 11), as taxes on both electricity and heating fuels were increased. As a result, individual tax refund amounts went up, and more companies were eligible for the refunds. From the beginning of 2012, the refund was additionally increased by reducing the threshold value used as the coefficient for value added from 3.7% to 0.5%. Subsequent increases of the tax on heating fuels have continued to raise the amount of taxes paid by companies and thus the refund amounts, also conferring eligibility for the refund on new companies. For the development in refund amounts based on payments, see Figure 11 below.

Figure 11. Tax refunds of energy-intensive companies, EUR million (cash basis). Source: Ministry of Finance.



2.1.7 Mining

In Statistics Finland's industrial classification mining, or the mining of ores, minerals and energy minerals, belongs to main class B (mining and quarrying)[25]. Similarly to industry, which belongs to main class C[26], it is currently eligible for energy tax expenditures. Main class B contains additional activities required by transport and marketing carried out in connection with mining or the extractive industry, including crushing, milling, grinding, other processing, screening, washing or enriching metal ores or minerals. These functions are often performed by either the units which extract minerals or ones located in their vicinity. If the crushing or enrichment of ores and minerals takes place in connection with further processing, on the other hand, they fall within the relevant industrial sector in the classification. Mining and quarrying also excludes the further processing of the extracted materials, which the classification places in connection with the industry in question. Stone finishing and the manufacture of stone products are also excluded from mining activities. Both mining and extractive industry companies belong to the class of mining and extraction. Drawing a line between the industrial classes of manufacturing and mining

[25] Statistics Finland's Standard Industrial Classification (2008), B Mining and quarrying. https://www.stat.fi/meta/luokitukset/toimiala/001-2008/b.html
[26] Statistics Finland's Standard Industrial Classification (2008), C Manufacturing. https://www.stat.fi/meta/luokitukset/toimiala/001-2008/c.html

is currently irrelevant to energy tax expenditures, however, as both industries are eligible for them.

The energy tax treatment of the mining industry has varied dramatically over the years: in 2015, mining was subjected to a higher tax in electricity tax category I, and its eligibility for the tax refunds intended for energy-intensive industries was removed. In 2017, mining was returned to the lower electricity tax category II, and it recovered its eligibility for tax refunds for energy-intensive companies. In the current situation, mining operators have been entitled to purchase electricity at the lower category II tax level, in addition to which energy-intensive mining companies are eligible to apply for a refund of their energy taxes at the end of the financial year. Mining companies entitled to the energy tax refund mainly engage in the extraction of metal ores, other mining activities and quarrying, such as gravel extraction, or activities that serve mining operations.

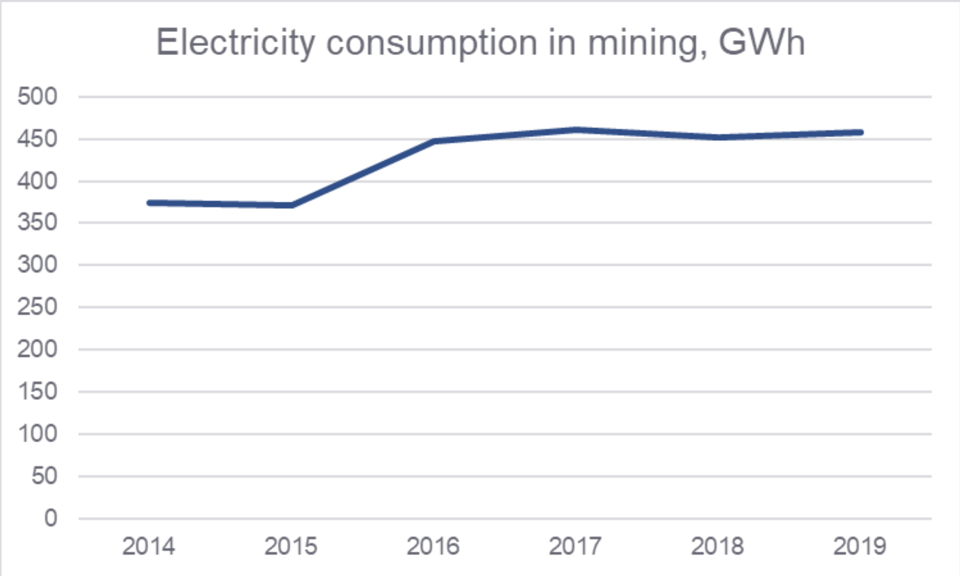
Mining is currently not subject to a specific mine tax. Neither is mining within the emissions trading scheme. The current Government Programme sets down the objective of removing mining from the scope of the industrial energy tax rebate system. It also contains a reference to studying the prospects for introducing a new mine tax in order to ensure that society is reasonably compensated for mineral wealth extraction. A study relevant to this objective was initiated in August 2020 as a project of the Government's analysis, assessment and research activities[27]. One of the issues being examined involves comparing the impacts of a separate mine tax to the impacts of changes to the energy taxation of mines as set out in the Government Programme. The report is due for completion in spring 2021.

In 2019, there were 44 active mines in Finland, 11 of which extracted metal ores, 13 carbonate stones, 13 other industrial minerals and 7 other industrial stone[28][29]. No detailed statistical data are available on energy consumption in mining. Assisted by the Finnish Tax Administration, the Ministry of Finance examined the amounts of electricity used in mining activities in 2014–2019 (Figure 12). Of particular interest was drawing a line between electricity tax categories I and II in 2015–2016, a period during which mining was in principle subject to category I tax unless, based on Statistics Finland's industrial classification, the activity could be classified as manufacturing. Based on this survey, companies found that drawing the line between

[27] Government's analysis, assessment and research activities. Mine tax options and impacts.
[28] Sector reports: Sector report on the mining industry. Ministry of Economic Affairs and Employment Publications 2019:57.
http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/161860/TEM_2019_57.pdf
[29] Key figures of mining. 2020. Ministry of Economic Affairs and Employment.
https://tem.emmi.fi/l/DZRMdRqVjC_M/f/kmHs

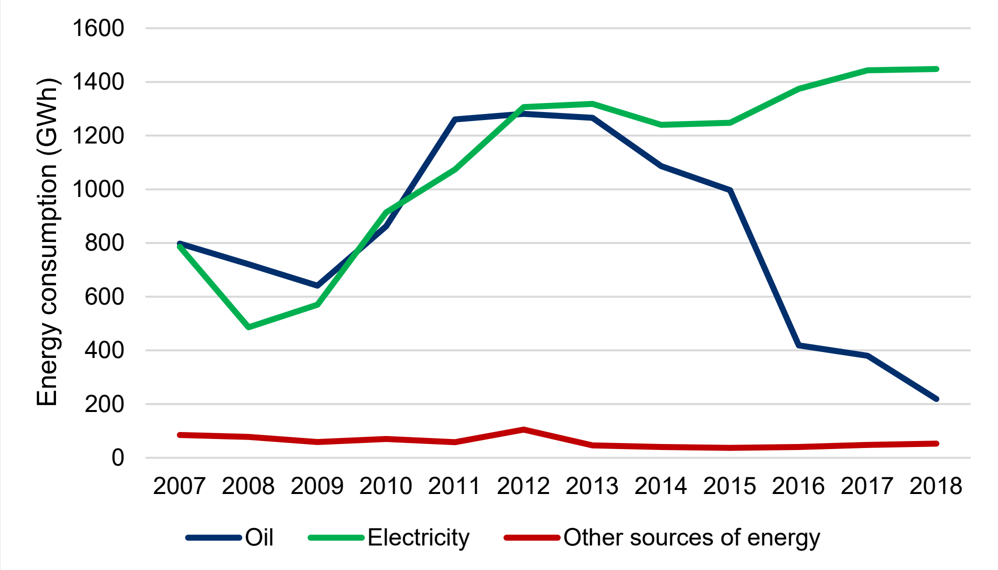
industry and mining activities was challenging, and metering electricity consumption in different functions required additional work. Consequently, according to the survey, taxation under the Mining Act in 2015 and 2016 was not carried out without problems.

Figure 12. Estimate of electricity consumption in mining in 2014–2019. The estimate is based on electricity consumption data provided by mining companies.



The share of electricity in the total energy use on sites classified as belonging to the mining sector in statistics has increased significantly, as can be seen in Statistics Finland’s data on energy consumption in mineral extraction (Figure 13). The proportion of electricity grew more or less in step with oil consumption until 2011, whereas in 2013, oil consumption started to decline sharply while electricity consumption remained level or even increased slightly. It should be noted, however, that Statistics Finland's classification ‘mineral extraction’ includes not only mining strictly speaking but also other activities that are included in mining and quarrying and that serve mining, which is why the energy consumption figure does not exclusively describe the energy consumption of mining.

Figure 13. Energy consumption in mineral extraction in 2007–2018 by source of energy30. In Statistics Finland's Standard Industrial Classification TOL2008, the class Mining and quarrying includes activities falling within classes B05-09, or Mining of coal and lignite, Extraction of crude petroleum and natural gas, Mining of metal ores, Other mining and quarrying, and Mining support service activities (Statistics Finland, 2020).



2.1.8 Energy tax refund for professional agriculture

The excise duty included in the price of energy products is partially refunded to professional greenhouse cultivators and farmers under the Act on Refunds of Excise Duty on Certain Energy Products Used in Agriculture (603/2006)[31], later referred to as the *Act on Tax Refunds for Agriculture*. Tax refunds are paid for light and heavy fuel oil, biofuel oil and electricity used in agriculture and taxed in Finland.

Agriculture refers to the cultivation of agricultural and horticultural crops on the applicant's holding, livestock production and husbandry, apiculture, horse management and compulsory set-aside, the storage, preparation and packaging of agricultural and horticultural products produced on the holding, and the drying of cereals, regardless of where the drying takes place. Greenhouse cultivation refers to

[30] Energy in Finland (Industrial Classification TOL 2008). Statistics Finland, 2020. http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__ene__tene/statfin_tene_pxt_001_fi.px/
[31] Act on Refunds of Excise Duty on Certain Energy Products Used in Agriculture (603/2006). https://finlex.fi/fi/laki/ajantasa/2006/20060603

the cultivation of horticultural plants in a permanent building which is covered with transparent material and which has a heating apparatus.

Electricity used directly in greenhouse cultivation can be purchased at the reduced category II tax level if it can be metered separately as it is supplied from the electricity grid. The metered electricity consumption can then be divided accurately between the greenhouse and private use. Professional greenhouses are also eligible for the energy tax refund for energy-intensive companies.

The electricity tax expenditure for other agricultural production and non-metered greenhouses is paid by refunding, on application, the difference between tax categories I and II; in practice, the electricity tax for agriculture corresponds to the industrial electricity tax rate II.

In keeping with a policy contained in Prime Minister Katainen's Government Programme, from 2014 the use of energy taxation as an environmental policy instrument was extended to CO_2 emissions from the agricultural sector not included in the emissions trading scheme. The energy tax refund for agriculture was limited to the energy content tax, and the carbon dioxide tax amount thus remained a burden on agriculture. The refund of the excise duty on fuels used in agriculture is directly linked to the Act on Excise Duty on Liquid Fuels. This also means that changes to the energy tax laid down in the Act on Excise Duty on Liquid Fuels no longer require a separate amendment to the Act on Tax Refunds for Agriculture. A similar linkage was not possible for electricity tax, and thus any changes to the electricity tax levels also require amendments to the Act on Tax Refunds for Agriculture.

Currently, the amount of excise duty refunded is 7.63 cents per litre for light fuel oil and bio-based fuel oil, and 8.56 cents per kilogram for heavy fuel oil, both of which correspond to the amount of the energy content tax. In addition, the strategic stockpile fee is not subject to refund and thus remains to be paid. In 2017 and 2018, the subsidy was increased on a temporary basis due to difficult agricultural conditions. A total of approximately 34,200 beneficiaries received a refund in 2019. While the refund amounts vary considerably from farm to farm, they are small on average. No refund amounts of less than EUR 50 are paid. The average refund amount was around EUR 955, and 15,855 farms, or 46.4% of the beneficiaries, received a refund amount between EUR 50 and 500. The median value of all refunds was EUR 555. The energy tax refunds for agriculture totalled about EUR 33.7 million in 2019, of which the share of light fuel oil was about EUR 20 million and the share of electricity EUR 13 million, with the remainder being composed of biofuel oil and heavy fuel oil. The direct electricity tax expenditure for greenhouses was additionally around EUR 9 million, which means that the total amount of energy tax expenditures for agriculture was approx. EUR 43 million.

In relative terms, the greatest proportion of tax refunds for agriculture in 2019 was paid for light fuel oil (Table 2). Electricity is central to greenhouses, which consume significantly more electricity in proportion than other areas of agriculture. Tax category II is applied directly to professional greenhouses equipped with electric meters, which is why the electricity consumption shown in the Table below does not reflect all electricity use in greenhouses.

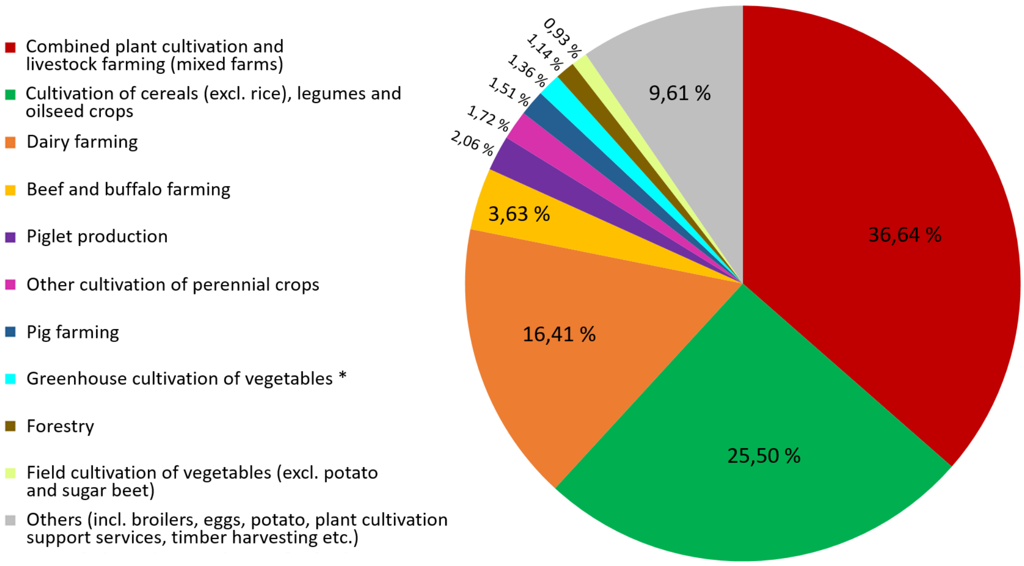
Table 2. Refunds of energy tax on various energy products for agriculture and greenhouses in 2019.

	Energy tax refund (EUR million)		
Energy product	**Agriculture**	**Greenhouses**	**Total**
Light fuel oil	19.8	0.6	20.4
Heavy fuel oil	0.0	0.3	0.3
Biofuel oil	0.0	0.0	0.0
Electricity consumption	13.0 + 9*		~22

* Category II tax is applied directly to electricity supplied to professional greenhouses with electric meters. The value of this direct support is approx. EUR 9 million. Greenhouses with no meter are subject to category I tax, and they are eligible for an energy tax refund on application, similarly to other farmers.

Some 80% of the energy tax refunds in euro amounts are divided between three agricultural sectors: mixed farms (combined crop production and livestock farming); cultivation of cereals, legumes and oilseeds; and dairy farming (Figure 14). Energy tax refunds were granted to 97.1% of all applicants in 2019.

Figure 14. Distribution of energy tax refunds in euros (%) between agricultural sectors.



* Category II tax is applied directly to electricity supplied to professional greenhouses with electric meters. The value of this direct support is approx. EUR 9 million, which is not included in the data underpinning the Figure.

Greenhouses are eligible for tax refunds under the same conditions as other energy-intensive companies. Currently, an estimated 23 greenhouse enterprises receive a total tax refund for an energy-intensive company of EUR 3 million. This figure is based on data on the energy products consumed by the companies and their value added in the financial year ending in 2018 as well as tax levels in 2020 (Table 1, section 2.1.6).

2.1.9 Recycling industry

The circular economy is about recovering materials for reuse. In the recycling industry, this takes place on an industrial scale and through industrial processes. The recycling industry, or the industrial manufacturing and processing of recycled materials, is at present classified as waste treatment rather than an industry. The manufacturing of recycled raw materials falls within industrial class E (Water supply, sewerage, waste management and remediation activities). Consequently, the higher category I electricity tax is applied to it, rather than the lower category II applied to other industries and manufacturing (classes B and C).

2.1.10 Energy tax expenditures

The Energy Taxation Directive lays down the framework for the structure of energy taxation and any exemptions to it. As in other countries, individual differentiated tax treatments differing from the basic tax structure enabled under the Directive have also been introduced in Finland, where they have been nationally defined as tax expenditures. Among other things, these tax treatments have been justified by improving energy efficiency, supporting renewable fuels, ensuring security of supply, reducing overlapping guidance with emissions trading, reducing the costs of the transport sector and supporting the export sector.

As the benchmark system for energy products in Finland, to which the tax levels in use are compared, have in practice been selected two levels associated with criteria related to product quality: the tax levels for transport fuels and heating fuels. Exemptions under mandatory EU legislation, for example for electricity production, commercial aviation and maritime transport, have been regarded as compatible with the benchmark system. However, the tax level for transport fuels is exceptionally applied as the benchmark level for all motor fuels, regardless of how the tax level is determined in the Finnish energy tax structure. In other respects, the benchmark system was mainly created on the basis of the attributes of the Finnish energy tax structure, which include the fact that the tax levels for energy products are determined based on their energy content and life-cycle CO_2 emissions, and that higher taxes are levied on transport use than on heating use in the benchmark system. As the benchmark system was created on the basis of these principles after the energy tax reform of 2011, a large share of the energy tax expenditures of the time was abolished, and a different benchmark system would naturally result in a many-fold increase in the amounts of tax expenditures or sanctions in Finland without any actual changes to the different tax levels or reductions. From this point of view, it is already obvious that the definitions of tax expenditures do not enable international comparisons of tax expenditures or other subsidies calculated on their basis, including business subsidies, fossil fuel subsidies or environmentally harmful subsidies. As the benchmark tax level of electricity has been selected the higher one of the two categories in the tax expenditure calculation. For example, the quality grades of fuels or, as mentioned above, the differences in tax levels for transport and heating have not been defined as tax expenditures.

As a rule, tax expenditures are calculated on the basis of tax revenue foregone. The expenditure arises from a tax provision that deviates from the specified benchmark, and the loss of tax revenue is calculated in a routine and static manner, with no changes to other provisions. For a description of the benchmark tax system and the methods on which the tax expenditure calculations are based on, see the Tax expenditures web page of the Ministry of Finance[32]. New tax expenditures are defined as legislation evolves, or more expenditures are discovered in the current legislation. It should be noted that approximately one third of the tax expenditures defy attempts to determine their value in euros, and that only an order of magnitude can be given for some.

See Table 3 for the expenditures currently defined as energy tax expenditures, their benchmark levels, notes on the data used in the calculation and the expenditure amounts:

[32] Ministry of Finance. 2020. Tax expenditure. https://vm.fi/verotuet

Table 3. Identified tax expenditures in energy and transport taxation.

Tax expenditure	Benchmark tax level	Notes on data	Estimate in 2019, EUR million
Reduced tax rate for diesel fuel	Tax rate for diesel based on the energy tax model for transport fuels	Up-to-date data from tax returns	745
Reduced tax rate for light fuel oil used in mobile machinery	Tax rate for diesel based on the energy tax model for transport fuels (diesel tax plus the tax expenditure for diesel)	No accurate or up-to-date data. Based on modelling rather than statistics (VTT-TYKO).	472
Reduced tax rate for transport electricity	Tax rate for electricity based on the energy tax model for transport fuels This theoretical level has not been specified.	No accurate or up-to-date data. Based on modelling rather than statistics (VTT-ALIISA).	4
Reduced tax rate for natural gas used for transport	Tax rate for natural gas based on the energy tax model for transport fuels	No accurate or up-to-date data. Based on modelling rather than statistics (VTT-ALIISA).	6
Reduced tax rate for CHP	Tax level for each fuel used in CHP based on the energy tax model for heating fuels.	Up-to-date data from tax returns, excluding for peat	100
Reduced tax rate for peat	Tax level for peat based on the energy tax model for heating fuels	No accurate or up-to-date data on use in CHP. The latest estimates date back two years.	169
Peat use is exempt from tax up to 5,000 MWh capacity	Tax level for peat based on the energy tax model for heating fuels	No accurate or up-to-date data. The latest estimates date back two years and include rough assumptions.	16
Tax exemption for wood-based fuels	Tax rate for wood-based fuels based on the energy tax model for heating fuels	No accurate or up-to-date data. The latest estimates data back two years.	224
Tax exemption for biogas	Tax rate for electricity based on the energy tax model for transport fuels in transport use and the energy tax model for heating fuels when used for heating and in machinery	No accurate or up-to-date data. For the part of heating, the latest estimates date back two years. For transport, based on modelling (VTT-ALIISA)	10

Tax expenditure	Benchmark tax level	Notes on data	Estimate in 2019, EUR million
Tax exemption for wood-based fuels	Tax rate for wood-based fuels based on the energy tax model for heating fuels	No accurate or up-to-date data. The latest estimates data back two years.	224
Tax exemption for biogas	Tax rate for electricity based on the energy tax model for transport fuels in transport use and the energy tax model for heating fuels when used for heating and in machinery	No accurate or up-to-date data. For the part of heating, the latest estimates date back two years. For transport, based on modelling (VTT-ALIISA)	10
Reduced electricity tax rate for industry and greenhouses (tax category II)	Electricity tax category I	Up-to-date data from tax returns	564
Reduced tax rate for data centres (tax category II)	Electricity tax category I	Up-to-date data from tax returns	included in the above
Tax exemption for electricity used in rail traffic	Electricity tax category I	No accurate or up-to-date data. The latest estimates date back two years.	19
Light fuel oil used in diesel engines for rail traffic	Tax rate for diesel based on the energy tax model for transport fuels (diesel tax plus the tax expenditure for diesel)	No accurate or up-to-date data. The latest estimates date back two years.	15
Tax expenditure for waste incineration	Tax level for waste based on the energy tax model for heating fuels	No accurate or up-to-date data. No accurate information on the properties of the waste that would allow the determination of the benchmark tax level	47
Tax expenditure for paraffinic diesel oil	Tax level based on the energy tax model for transport fuels (taking into account the Clean Vehicles Directive) with the tax expenditure for diesel oil deducted	Up-to-date data from tax returns	104
Tax refund for energy-intensive companies	Tax refund amount	Up-to-date data from tax returns	235
Energy tax refund for agriculture	Tax refund amount	Up-to-date data from tax returns	35

A memorandum produced by the Ministry of Finance's Tax Department in summer 2020[33] describes the expenditures included in the Finnish energy taxation system, the way they are currently reported and, above all, the further analyses enabled by the currently reported estimates of energy tax expenditures in euro amounts. Conclusions made in this memorandum include the following:

- Adding up the euro amounts of individual tax expenditures does not give a true picture of their total amount.
- In some cases, increasing one tax expenditure either increases or reduces others.
- Energy tax expenditures are not commensurate,
- and making direct and uniform international comparisons between them is impossible.
- The elimination of tax expenditures would in many cases not increase the tax revenues by an amount corresponding to their imputed value.
- In the case of a large part of tax expenditures, accurate estimates for a given year and on the basis of that year's consumption cannot be made.
- Examining several tax expenditures together based on estimates of their euro amounts alone is too vague at the level of magnitudes and likely to lead to misunderstandings. Producing a time series analysis of a set of several tax expenditures based on their euro amounts would also not make sense.

One dimension of analysing the situation further is assessing and reporting on energy tax expenditures based on their harmful effects on the environment. While this dimension is important, significant problems are associated with the aggregation of tax expenditures, in addition to which assessing harmfulness for the environment is not straightforward. On the subject of expenditures harmful for the environment, the memorandum notes:

- Several of the energy tax expenditures can be regarded as at least partly harmful for the environment.
- Overall assessments of environmental harms resulting from tax expenditures are often based on adding up the sum of tax expenditures, which is impossible in itself.

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[33] Ministry of Finance. 2020. Memorandum: Energiaverotuet 12.8.2020. https://api.hankeikkuna.fi/asiakirjat/04bd03cb-0c69-4747-a890-c9e0bcf06f71/f3a7ab42-c72c4134-961e-283045a621f9/POYTAKIRJA_20200819103130.PDF

- Even when based on the best currently available information, a categorical division into energy tax expenditures harmful for the environment and others does not make it possible to work out the total harm for the environment relying on calculations of energy tax expenditures.
- The total amount of environmentally harmful expenditures cannot necessarily be determined within the current constraints of tax expenditure calculation, which is why other means of describing harmful expenditures must be sought.

The memorandum notes that the difficulty of reporting does not eliminate the need to describe energy tax expenditures as tax expenditures or report on their potential harmful effects on the environment. It is nevertheless highly important to identify the types of analyses that the reported estimates of various energy tax expenditures in euro amounts enable in each case, to act accordingly and, on the other hand, to avoid obvious misunderstandings in decision-making or in the public domain as far as possible. The tax expenditures were not defined for the calculations from the perspective of environmental harm or in a manner that would be compatible with an examination of this type, and one tax expenditure may include features that are both beneficial and harmful for the environment. The degrees of these features vary. The reference level based on the benchmark system is also not necessarily anywhere near the level that would be desirable from an environmental point of view.

The concept of business subsidy has not been formally defined in Finland. Despite this, business subsidies have been mapped and listed in several recent reports relying on different definitions. When defining business subsidies, the treatment of other companies is often used as the reference point. When calculating energy tax expenditures, however, the taxation of another fuel or other use is often applied as a benchmark.

Energy tax expenditures have nevertheless usually been regarded as business subsidies in different Finnish reports, unlike VAT expenditures, for example, which have sometimes been excluded from the definition. Payers of energy tax, and thus also those directly benefiting from energy tax expenditures, are companies; on the other hand, energy tax expenditures can also be seen to partly benefit households, for example through fuel prices. In addition to the one based on the beneficiaries, other definitions of a business subsidy have been based on whether the tax expenditure also comprises EU State aid by definition and, regarding its nature as a business subsidy, whether it is targeted at all undertakings or limited to certain sectors or types of undertakings. In addition to the fact that energy tax expenditures have the nature of business subsidies and the difficulty of defining the share of the subsidy allocated to companies, we also face all the problems related to the calculation and aggregation of expenditures discussed above when looking at business subsidies.

The following section deals with the principles of good subsidies, which can also be partly applied to tax expenditures. Systematic assessment of tax expenditures allows the public authorities to evaluate whether the expenditure scheme is effective, efficient and up to date[34]. It should be remembered that tax expenditures are not by all means always ineffective or even harmful. However, a careful assessment is needed to identify useful tax expenditures. In recent years, the number of studies produced on different energy tax expenditures has increased. The most recent ones have focused on tax expenditures for diesel fuel[35], CHP[36] and peat[37] as well as tax refunds for energy-intensive companies[38].

Finally, it is important to note that energy tax expenditures describe the structure of energy taxation by comparing existing tax levels with the benchmark system. The calculation of tax expenditures does thus not yet give any indication of what type of tax structure would be optimal in terms of fiscal, energy, environmental or social policy objectives or economic growth, nor how the current situation could be remedied. Consequently, the tax expenditure figures with their millions of euros are as such poorly suited for evaluating the environmental impact of taxation or the entire budget, for example. When examining tax expenditures from an environmental perspective, it should also be noted that if there can be no differentiation at all on various criteria in tax levels for different sectors in the future, promoting ambitious climate targets by higher energy taxes could become difficult and ineffective in terms of costs if

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[34] Rauhanen, T., Grönberg, S., Harju, J., Matikka, T. 2015. Yritystukien arviointi ja vaikuttavuus. Publications of the Government´s analysis, assessment and research activities 8/2015. https://tem.fi/documents/1410877/2768022/Yritystukien_arviointi_ja_vaikuttavuus.pdf/3a3a093a-d66e-4ea1-bb9c96aec27da0fb

[35] Government´s analysis, assessment and research activities. 2020. A study: Assessing the impacts of the diesel fuel tax subsidy. https://valtioneuvosto.fi/-/10616/tutkimus-dieselin-verotuen-poisto-auttaisi-vahentamaan-paastoja-haitalliset-vaikutukset-kotitalouksille-voidaan-kompensoida-eri-tavoilla

[36] Koreneff, G., Lehtilä, A., Hurskainen, M., Pursiheimo, E., Tsupari, E., Koljonen, T., Kärki, J. 2016. Yhdistetyn sähkön- ja lämmöntuotannon hiilidioksidiveron puolituksen poiston vaikutukset. VTT-R01173-16. https://www.vttresearch.com/sites/default/files/julkaisut/muut/2016/VTT-R-01173-16.pdf

[37] Afry Management Consulting Oy. 2020. Selvitys turpeen energiakäytön kehityksestä Suomessa. Raportti työ- ja elinkeinoministeriölle 8/2020. https://afry.com/sites/default/files/2020-08/tem_turpeen_kayton_analyysi_loppuraportti_0.pdf

[38] Laukkanen, M., Ollikka, K., Tamminen, S. 2019. The impact of energy tax refunds on manufacturing firm performance: evidence from Finland’s 2011 energy tax reform. Publications of the Government´s analysis, assessment and research activities 2019:32. http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/161569/32_The%20impact%20of%20energy%20tax%20refunds.pdf?sequence=1&isAllowed=y

emissions trading or other overlapping environmental guidance, concerns over carbon leakage or eroding industrial competitiveness reduce the possibilities of increasing general tax levels. Considering that a significant increase in energy tax levels may be required to attain the national climate targets and obligations, from this perspective it would be justified to ensure that the structure of energy taxation will continue to enable adequate sector-specific incentives if necessary, and thus the achievement of climate policy targets in the most cost-effective way possible.

Principles of good subsidies

According to a report drawn up by public servants at the Ministry of Economic Affairs and Employment,[39] the objective of the business subsidy system is to use tax resources as effectively and efficiently as possible to promote growth in the national economy. Aids should primarily be used to attain the economic objective of promoting long-term productivity growth. Productivity growth is underpinned by the structural renewal of business and economy, efficiency of business operations, labour mobility and investments in tangible and intangible capital.

In addition, individual aids should be temporary instruments used to remedy a market failure. Long-term aids slow down the exit of less productive companies from the market and the transfer of market shares to more efficient companies. Business subsidies should not in principle prevent the functioning of the market mechanism, as the market allocates resources (labour and capital) efficiently.

With regard to taxation, economic activity is best supported by a neutral and clear-cut tax system with a broad tax base and low tax rates. Tax expenditures are defined as tax regulations that differ from the benchmark tax system. A good tax system distorts consumption and investment decisions as little as possible. The attributes of a good tax system additionally include administrative efficiency, fairness, predictability, transparency and simplicity. Clear, simple and administratively effective tax legislation improves the efficiency of taxation from the viewpoint of both the administration and the taxpayer. From the perspective of administrative efficiency and simplicity, tax collection and payment should take place at the lowest possible cost. Excise duties, for example, are highly cost-effective in this respect, with an average collection cost of 0.1% of the taxes levied.

[39] Ministry of Economic Affairs and Employment. 2014. Yritystukijärjestelmän uudistaminen; yhteenveto.
https://valtioneuvosto.fi/documents/10184/1043924/yhteenveto.pdf/1fe0384b-f1f3-4ae7-8752-d8d70f5cd3

The general conditions for aids granted for economic activity are laid down in an Act[40], which is mostly also applied to key tax expenditures. Under this Act, the aid must have a clearly defined economic or social objective. If the aid has an economic objective, it must also target actions which address the market failure. The aid must comprise appropriate and cost-effective means for achieving these objectives. The distortive effects of the aid on competition must be minimised even when the aid is used as a policy instrument to achieve non-economic objectives.

Barring specific reasons, the aid must also be of a limited duration, and it must provide an incentive.

2.2 EU legislation

2.2.1 Energy Taxation Directive

The energy products referred to in the Energy Taxation Directive are motor petrol, gas oil, domestic and heavy fuel oil, natural gas, LPG, methane, electricity, coal, lignite and coke, as well as other liquid, solid and gaseous hydrocarbons. Under the Energy Taxation Directive, different types of biofuels, including alcohols and vegetable oils, must also be taxed on the same criteria as fossil petrol, gas oil or domestic fuel oil. Mixtures of vegetable oils and alcohols, or esters, are also taxable products. They include typical biodiesel fuels.

Under the Energy Taxation Directive, a minimum tax shall be levied on energy products released for consumption, which a Member State may choose to exceed. The energy products defined in the Directive for which the Directive does not lay down a minimum tax level must also be taxed as a motor fuel or heating fuel on the basis of their intended use. In keeping with the so-called equivalence principle, any product intended for use, offered for sale or used as motor fuel, or as an additive or extender in motor fuels, shall additionally be taxed at the rate for the equivalent motor fuel. Any other hydrocarbons, except for peat and wood-based fuels, intended for use, offered for sale or used for heating purposes shall be taxed at the rate for the equivalent energy product. For example, alcohol added to petrol must be taxed at the same rate as petrol, and vegetable oil added to diesel oil must be taxed as diesel under the Directive. Similarly, gases containing hydrocarbons when used as motor or heating

[40] Act on the General Conditions of Aids for Economic Activity (429/2016). https://www.finlex.fi/fi/laki/alkup/2016/20160429

fuel shall be taxed according to their intended use. In keeping with the equivalence principle of the Energy Taxation Directive, such hydrocarbons as biogas are taxable products both as heating and transport fuels. Similarly, excise duty shall also be levied on fuel additives mixed with a fuel.

The Energy Taxation Directive also contains provisions on the structure of excise duties and allows tax reductions for fuels which are more environmentally friendly than other products on the market. The precondition for granting a reduction is that the quality or use of the product eligible for the reduction is controlled, enabling the tax authority to verify that the conditions for the tax reduction are met. Some of the exemptions are mandatory for the Member States, including the basic principle of tax exemptions for fuels used for generation of electricity and for air and sea navigation other than for pleasure purposes. The starting point in electricity taxes is the exemption of fuels used for the generation of electricity and taxation of the end product, or electricity, when it is released for consumption. While the Energy Taxation Directive allows for different tax reductions, aid procedures must be assessed under the EU provisions on State aid and tax discrimination.

Under the Directive, granting tax exemptions or reductions for biofuels is possible under certain conditions. The tax reduction can only apply to the part of the fuel or fuel mixture that is entirely bio-based. In the case of a fuel mixture consisting of a biocomponent and a fossil fuel, the proportion of fossil fuel shall be taxed at the normal rate for petrol or gas oil. Tax reductions can only be introduced for a set period, and the reductions in excise duties must be adjusted to account for changes in the price of raw materials to avoid overcompensating for the extra costs involved in the manufacture of biofuels. In addition, the Commission should be notified of any tax reduction schemes applied by the Member States. Before the national introduction of a subsidy scheme intended to promote the use of biofuels, an EU State aid procedure must always be undertaken under the Energy Taxation Directive, and thus the Commission's prior approval of the measure must also be sought. In Finland, this procedure has been resorted to in connection with biofuels used in certain pilot projects. The tax system adopted in Finland, which takes into account the energy content and life-cycle carbon dioxide emissions of the fuel, does not include aid requiring a State aid procedure referred to above.

European Commission report on the evaluation of the Energy Taxation Directive and the Council's discussion on the report

In September 2019, the European Commission published an evaluation report on the current Energy Taxation Directive[41]. In keeping with the current practice, the report is based on the 'Better Regulation Guidelines', and its purpose was to assess how the Energy Taxation Directive (ETD) meets its main objective, namely supporting the proper functioning of the internal market. It also assesses whether new concerns and challenges have arisen since its adoption in 2003, which cannot be addressed by the Directive in its present form.

In 2003, the Directive had a positive impact on the EU legislative framework by updating and widening the scope of harmonised legislation to electricity and the most common energy products used as motor and heating fuels. However, as technologies, national tax rates and energy markets have evolved, the Directive no longer makes the same positive contribution. Furthermore, the EU legislative framework and policy objectives have developed significantly, and some aspects of the Directive now lack relevance and coherence.

From the viewpoint of effectiveness and efficiency, the minimum rates of taxation had initially some converging effect on the rates of petrol and gas oil. This effect has been gradually diminishing in the absence of an indexation mechanism of the minimum rates originally laid down in the Directive and because the vast majority of Member States tax most energy products considerably above the Directive's minima. The minimum rates on electricity and heating fuels are too low to contribute to the smooth functioning of the internal market. No consistency of the tax levels between different energy products is expected of the Member States, as they can be set freely above the minimum levels. The wide range of possibilities for exceptions in the Directive have further increased the divergence in tax rates between the EU Member States. For example, tax reductions justified by national competitiveness in some countries often have a negative impact on the functioning of the internal market. The Energy Taxation Directive does not set clear conditions relating to new, environmentally-friendly technologies, which in some cases results in discrimination against them as compared to conventional technologies. This also applies to biofuels, especially because the Directive does not directly take into account the energy content of energy products. After verifying that State aid rules are not breached, Member States may apply reductions to biofuels under certain conditions by their own definition, which

[41] Commission report: evaluation of the Energy Taxation Directive. 2019. https://ec.europa.eu/taxation_customs/news/commission-report-evaluation-energy-taxation-directive%C2%A0_en

both has a negative effect on the functioning of the internal market and slows down the market entry of the most advanced biofuels.

According to the evaluation report, the current Directive contributes to a limited extent to the wider economic, social and environmental EU policy objectives. The main reasons identified for this include disregard of the energy content and CO_2 emissions of energy products, too low minimum levels of taxation and too many exemptions and reductions. For the same reasons, the Directive does not contribute to the decarbonisation of transport. For example, the Directive includes mandatory tax exemptions concerning international commercial aviation and maritime transport and optional exemptions and reductions for other modes of transport. Neither does the Directive support the objectives set in international agreements such as the 2015 Paris Agreement. There is also a lack of alignment between the Directive and the EU emissions trading system. The Directive is also not aligned with other key legislative instruments in the energy domain, including the Renewable Energy Directive and air quality legislation.

The evaluation report concludes that the Energy Directive is outdated and that its added value for the good functioning of the single market is limited.

During its EU Presidency, Finland prepared draft conclusions on the report, which were discussed several times in the indirect taxation subgroup of the Council’s Working Party. The conclusions were adopted by the Economic and Financial Affairs Council on 5 December 2019, and they serve as a guideline as the Commission is currently preparing its proposal for an Energy Taxation Directive update. The conclusions note that a reform is needed to lend better support for climate change mitigation and the functioning of the internal market. For example, the current Energy Taxation Directive does not take into account the differences in emissions between different forms of energy, or distinguish between renewable and non-renewable energy sources. This is inconsistent with the energy policy, which encourages the transition to renewable and other clean energy sources. Neither does the Directive cover new fuels or, for example, energy storage. The current Energy Taxation Directive sets minimum tax rates for different energy products. These levels are at times illogical compared to each other and too low, however, which is why they do not encourage a transition to energy-efficient technology and emission-free operation. The conclusions also pointed out that, from the viewpoint of the internal market, tax rates which vary from one Member State to another are problematic as minimum tax rates are low. These differences may distort competition and erode the tax base in countries with high taxes.

The Commission is expected to publish its proposal for reviewing the Energy Taxation Directive in summer 2021.

2.2.2 Excise Duty Directive

The Excise Duty Directive adopts a general system of harmonised excise duties and, in particular, deals with the production, storage and movement of goods subject to excise duties between Member States. The main objective of the Excise Duty Directive is to enable free movement of goods within the EU while ensuring that excise duties are charged correctly in the Member States.

The cornerstone of the EU's excise duty regime is a system based on authorisations, in which excise duties on the production, storage and movement of excisable goods are suspended. In the system of suspended excise duties, products may be moved between authorised operators established in different Member States or, once imported, released to a consignee or exported outside the Community.

The Excise Duty Directive applies to liquid fuels and certain other energy products, electricity, alcohol and alcoholic beverages, and tobacco products, which are subject to separate product-specific directives. These directives contain provisions on such aspects as the product's minimum tax levels and the structure of taxation.

Excise duty is based on the principle of territory, according to which each EU Member State levies duties on the consumption of excisable goods consumed in its territory. Excise duties are levied when products are released for consumption from tax warehouses or received from another Member State or from outside of the Community. Tax liability arises in the Member State in which the products are released for consumption.

The Excise Movement and Control System (EMCS) is a computerised system introduced to improve the surveillance of movements of untaxed excisable goods between Member States. On 19 December 2019, the Council adopted Directive 2020/262 (EU) laying down the general arrangements for excise duty (recast)[42], which will be applied from 13 February 2023. Among other things, this Directive will extend the use of the computerised system from the current movement of untaxed excisable products to also include the movement of taxed products between Member States.

[42] Council Directive (EU) 2020/262 laying down the general arrangements for excise duty (recast). https://eur-lex.europa.eu/legal-content/FI/TXT/?uri=CELEX:32020L0262

2.2.3 Prohibition of discriminatory taxation and State aid regulations

Taxation must be compliant with the provisions of the Treaty on the Functioning of the European Union, later referred to as *TFEU*, and especially its provisions on tax discrimination and State aid, which place restrictions and procedural requirements on the use of subsidies granted in the form of tax reductions.

Article 110 TFEU[43] prohibits the Member States from imposing discriminatory taxation of any kind on the products of other Member States. The objective of this Article is to ensure the free movement of goods between Member States under normal conditions of competition by eliminating any form of protection which may result from the application of any internal taxation that is discriminatory on products originating in other Member States. Under this Article, no Member State shall impose, directly or indirectly, on the products of other Member States any internal taxation of any kind in excess of that imposed directly or indirectly on similar domestic products. Furthermore, no Member State shall impose on the products of other Member States any internal taxation of such a nature as to afford indirect protection to other products. A tax or charge violates the prohibition of discrimination if a tax calculated differently or in accordance with different detailed rules is imposed on a product imported from another Member State than the tax imposed on a similar domestic product.

EU State aid rules are part of the EU competition law, the aim of which is to ensure a level playing field throughout the Union. Provisions on State aid are contained in Articles 107 to 109 TFEU[44][45][46]. This regulation is an important part of the functioning

[43] Consolidated version of the Treaty on the Functioning of the European Union - Part Three: Union policies and internal actions - Title VII: Common rules on competition, taxation and approximation of laws - Chapter 2: Tax provisions - Article 110. https://eur-lex.europa.eu/legal-content/FI/TXT/?uri=CELEX%3A12008E110

[44] Consolidated version of the Treaty on the Functioning of the European Union - Part Three: Union policies and internal actions - Title VII: Common rules on competition, taxation and approximation
of laws - Chapter 1: Rules on competition - Section 2: Aids granted by states - Article 107. https://eur-lex.europa.eu/legal-content/FI/TXT/?uri=CELEX%3A12008E107

[45] Consolidated version of the Treaty on the Functioning of the European Union - Part Three: Union policies and internal actions - Title VII: Common rules on competition, taxation and approximation of laws - Chapter 1: Rules on competition - Section 2: Aids granted by states - Article 108. https://eur-lex.europa.eu/legal-content/FI/TXT/?uri=CELEX%3A12008E108

[46] Consolidated version of the Treaty on the Functioning of the European Union - Part Three: Union policies and internal actions - Title VII: Common rules on competition, taxation and approximation of laws - Chapter 1: Rules on competition - Section 2: Aids granted by states - Article 109. https://eur-lex.europa.eu/legal-content/FI/TXT/?uri=CELEX%3A12008E109

of the European internal market and designed to ensure that Member State authorities do not grant aid which distorts competition and is therefore incompatible with the internal market. Its aims also include reducing aid competition between Member States.

Under Article 107 TFEU, any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, in so far as it affects trade between Member States, be incompatible with the internal market. In order for a subsidy to be regarded as State aid, four criteria cited in this Article must be met at the same time: the aid is granted through State resources, the aid favours certain undertakings or the production of certain goods, the aid distorts or threatens to distort competition, and the aid affects trade between Member States.

The provisions of Article 107 TFEU restrict the use of State aid measures, such as direct aid or tax reductions and exemptions, as an economic policy instrument. For example, differentiation of taxes or granting tax exemptions to a product or an operator usually fulfils the definition of State aid and, as a general rule, requires the approval of the Commission.

While the Energy Taxation Directive allows for different tax reductions, aid procedures must be assessed under the EU provisions on State aid and discriminatory taxation. These provisions impose significant restrictions on using exemptions.

Measures regarded as State aid must be notified to the Commission before they are put into effect. The purpose of the notification procedure is to ensure that the aid is compatible with the common market, and no aid measure can be put into effect until the Commission has approved the aid scheme. The Commission has approved aids if they can be justified by such reasons as environmental considerations. In that case, the Guidelines on State aid for environmental protection and energy 2014–2020[47] adopted by the Commission must be applied to energy taxation.

The EU State aid rules and their interpretation allow one exception in the context of taxation to the principle according to which the differentiation of taxes is regarded as State aid subject to approval by the Commission. This is the rule that a tax measure is not considered State aid if it is in line with the character, structure and logic of the tax system and consistently applied to all products and operators. However, the tax basis

[47] Commission Communication – Guidelines on State aid for environmental protection and energy 2014–2020 (2014/C 200/01). https://eur-lex.europa.eu/legal-content/FI/TXT/?uri=celex:52014XC0628(01)

must be objective, and the tax must be applied consistently to all competing products and companies.

If State aid is paid in amounts beyond those set down in Union law or otherwise in violation of it, this constitutes unlawful aid and may result in the recovery of any aid paid over the last 10 years with interest. In addition, State aid is subject to the cumulation rule, under which aid schemes or individual aid amounts as well as block exemptions are cumulative. All individual aids granted to a specific project must thus be taken into account in the aid intensity, or the maximum rate of aid in relation to eligible costs. An individual company can thus have several projects, each one of which is separately subject to the accumulation rule. The purpose of this rule is to prevent the payment of excessive aid to a measure or project.

Under certain conditions, fiscal aid may also be introduced without the Commission's prior approval. This is possible in the simplified procedure laid down in Commission Regulation (EU) No 651/2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty[48], later referred to as the *Block Exemption Regulation*. Aids within the scope of the Block Exemption Regulation constitute State aid subject to ex post notification and reporting to the Commission. The Commission may carry out ex post monitoring of such aid.

Under Article 44 of the Block Exemption Regulation, aid schemes in the form of reductions in environmental taxes fulfilling the conditions of the Energy Taxation Directive shall be compatible with the internal market. They shall be exempted from the notification requirement if the beneficiaries of the tax reduction are selected on the basis of transparent and objective criteria and shall pay at least the respective minimum level of taxation set by the Energy Taxation Directive. In practice, this means that when granting aid, the Member State must ensure that the structure and minimum levels of the Energy Taxation Directive are effectively respected in the Member State. If aid is paid in amounts beyond those set down in Union law, this constitutes unlawful aid and may result in the recovery of the aid from the beneficiary with interest.

In addition to Article 44, the general conditions of the Block Exemption Regulation must be applied to energy tax expenditures. Among other things, these conditions specify that aid may not be granted to an undertaking in difficulty. Aid may also not be paid to a beneficiary which is subject to an outstanding recovery order following a previous Commission decision declaring an aid illegal and incompatible with the

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[48] Commission Regulation (EU) No 651/2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty. https://eur-lex.europa.eu/legal-content/fi/TXT/?uri=CELEX%3A32014R0651

internal market. The Member State shall also monitor the fulfilment of these general conditions of the Block Exemption Regulation in order to be able to grant aid without prior Commission decision. Otherwise, the aid may be considered unlawful. For example, at least ex post control based on sampling must be carried out to monitor undertakings in difficulty. In addition, an undertaking may be required to make a declaration in connection with the aid application stating that it is not in financial difficulty.

The general conditions of State aid also include compliance with the transparency obligation, in other words the obligation to publish information. This is one of the conditions for the aid being approved. The purpose of the transparency rule is to ensure that Member States, undertakings and citizens have easy access to the full text of the aid schemes subject to the obligation to publish, together with relevant information on individual aid measures which exceed the threshold. The objective of the transparency rule is to raise awareness of State aid at national, regional and EU level, thus contributing to a better control of aids in the Member States and across the Union. In practice, Finnish companies could check if the aid granted by other EU Member States to their competitors is compliant with EU rules. Information on tax subsidies must be published within one year of the date on which the tax return was submitted. In this respect, the regulation differs from the rules on other State aid types, the information on which must be published no later than six months after the date on which the aid was granted. For the part of tax subsidies, the exact amount of aid granted to an individual undertaking is also not published; the aid amount is only indicated as one of the ranges cited in the Regulation.

The aid schemes relevant to energy taxation which meet the requirements of Article 44 of the Block Exemption Regulation in Finland concern aid granted as a tax refund for energy-intensive companies, a reduced electricity tax for industrial undertakings and data centres, a tax expenditure for CPH and an energy tax refund for agriculture. While the Block Exemption Regulation and the existing aid schemes were about to expire at the end of 2020, the Block Exemption Regulation would remain in force until 31 December 2023 under a proposal made by the Commission.

2.2.4 EU climate and energy policy[49]

The EU is committed to a reduction of 20% in greenhouse gas emissions generated in its area by 2020, 40% by 2030, and between 80% and 95% by 2050 compared to 1990 levels. In order to achieve these targets, the EU is regulating emissions in three sectors:

1. In the emissions trading sector, which comprises large energy generation plants and industrial facilities as well as internal air traffic in the EU.
2. In the effort sharing sector, which comprises transport, agriculture, fuels for mobile machinery, building-specific heating, use of refrigerants, small energy plants and industrial facilities as well as waste management.
3. In the land use, land-use change and forestry sector (LULUCF).

The emissions reduction target for 2020 has been divided between the emissions trading and effort sharing sectors. The target set for the emissions trading sector is 21% and the target for the effort sharing sector is 10% compared to 2005. The corresponding emissions reduction targets for 2030 are 43% in the emissions trading sector and 30% in the effort sharing sector. In addition, the LULUCF Regulation applicable to the land use sector sets for the first time a target for this sector to be attained by 2030. In December 2019, the EU adopted carbon neutrality by 2050 as its long-term target.

The EU's emissions reduction targets for 2020 and 2030 will be achieved by means of legislative packages for the emissions trading and effort sharing sectors and, as far as the target for 2030 is concerned, also for the land use sector. Rather than imposing obligations on each Member State, the emissions trading system operates at the EU level, and the obligations imposed by it apply to operators. The number of emission allowances to be issued will be reduced linearly from year to year, ensuring that the targets set for this sector for 2020 and 2030 will be met. Similarly, the Effort Sharing Decision and the Effort Sharing Regulation set emissions reduction targets for each Member State for 2020 and 2030. The Member States have annual emission quotas for the periods 2013–2020 and 2021–2030. In the land use sector, the LULUCF Regulation obliges the Member States to maintain their calculated greenhouse gas removals at a level no lower than the calculated emissions of this sector in 2021–2030.

[49] Cederlöf, M., Siljander, R. 2020. Annual Climate Report 2020. Ministry of the Environment publictions 2020:17, K 18/2020 vp. https://julkaisut.valtioneuvosto.fi/bistream/handle/10024/162323/YM_2020_17.pdf?sequence=1&isAllowed=y

In the effort sharing sector, the Member States can make use of flexibility mechanisms to achieve the targets. Between 2013 and 2020, the Member States have been able to use temporal flexibilities, which means that they can bank and borrow emissions between individual years. If necessary, they can also purchase emission units from other Member States to cover their emissions reduction obligation, or use previously purchased international emission reduction units. In the period 2021–2030, Member States may utilise similar flexibilities as during the ongoing period, with the exception of international emission reduction units. In addition, two new flexibility mechanisms will be in place: a limited amount of emission allowances may be transferred from the emissions trading sector to cover emissions in the effort sharing sector, and under certain conditions and to a very limited degree, possible credits from the land use sector can be used to meet the obligation in the effort sharing sector. On the other hand, if the land use sector becomes a net emission source, it may be necessary to reduce emissions in the effort sharing sector further to compensate for the calculated emissions in the land use sector. The Member States may also trade in land use sector units.

The European Green Deal published by the European Commission in February 2020 contains a plan to impose more ambitious EU targets for 2030 and to adopt an EU climate law laying down the carbon neutrality target for 2050. The European Commission issued a proposal for a climate law in March. Legislative proposals on setting a higher emissions reduction target for 2030 will be issued in summer 2021.

Objectives of the EU Energy Union

At the request of the European Council, the European Commission published an Energy Union Strategy in February 2015. Its goal is to give Europe and its citizens affordable, secure and sustainable energy. The target of carbon neutrality in 2050 set in the European Green Deal will require a fundamental transformation of Europe's energy system. The Energy Union is a key EU policy instrument for achieving the required change. The other goals of the Energy Union include reducing the EU energy system’s dependence on external markets and promoting the reform of energy infrastructure. The Energy Union Strategy is based on five interconnected pillars:

- The objective of energy security is to improve the continuity and security of energy supply, to decentralise energy sources and to reduce the EU's dependence on imported energy.
- The objective of a fully integrated European energy market is to promote competition between producers and to ensure a competitive energy price. Strong electricity interconnection capacity between Member States will enable the functioning of the internal energy market.

- The objective of energy efficiency is reducing energy consumption, emissions and importation of energy.
- The objective of decarbonising the economy is to encourage investments in clean technology and infrastructure to reduce emissions.
- The objective of research, innovation and competitiveness is to support breakthroughs of low-carbon technologies by coordinating research and financing investment projects.

In 2016, the European Commission adopted an extensive package of legislative proposals titled 'Clean energy for all Europeans'. This clean energy package contained proposals for an Electricity Market Regulation and Directive, regulations on electricity risk preparedness and the reform of the Agency for the Cooperation of Energy Regulators as well as a revision of the Energy Efficiency Directive, the Renewable Energy Directive and the Energy Performance of Buildings Directive. In this context, the EU's renewable energy and energy efficiency targets for 2030 were also revised. The statutes were adopted in 2018 and 2019, and their implementation is currently under way.

The Regulation on the Governance of the Energy Union adopted in the context of the Clean Energy for all Europeans Package entered into force at the end of 2018. The European Commission monitors the implementation of the Energy Union in the Member States based on the obligations laid down in the Regulation on the Governance of the Energy Union to draw up a national energy and climate plan and long-term strategies. The Regulation also imposes on the Member States extensive obligations to report to the Commission.

In their national energy and climate plans, the Member States shall report to the Commission on the potential for the application of high-efficiency cogeneration and, as part of energy balances, on heat generation from combined heat and power plants, including industrial waste heat. The current energy taxation system in Finland includes a tax incentive for CHP.

European Green Deal

The European Green Deal was published by the European Commission in February 2020. The objectives of this package of measures include reducing emissions significantly, investing in top research and innovation, and preserving Europe's natural environment. Its intention is to lay the foundation for a fair and just green transition.

The European Green Deal is taking the EU towards a sustainable economy. This will require turning climate and environmental challenges into opportunities and implementing changes fairly. The new growth strategy is to turn the EU into a modern, resource-efficient and competitive economy where (i) there are no net emissions of greenhouse gases by 2050, (ii) economic growth is decoupled from resource use, and (iii) no person and no place is left behind. The European Green Deal outlines the necessary investments and available financing tools as well as explains how to ensure a just and inclusive transition.

In order to achieve the EU's target of climate neutrality in 2050, a European Climate Law is being drafted, which will turn the political commitment into a legal obligation and an incentive for investment. A decision on imposing a more ambitious EU emissions reduction target for 2030 is to be made in autumn 2020, with legislative proposals on this target being issued in summer 2021. The preconditions for achieving the target include large-scale measures which will increase investment in environmentally friendly technologies, support innovation, promote a modal shift and decarbonisation, improve energy efficiency and step up international cooperation on improving global environmental standards.

2.2.5 International picture of energy taxation

As Finland's tax structure was reformed at the beginning of 2011, it largely corresponded to the proposal for a new Energy Taxation Directive published by the European Commission in that year. The Member States failed to reach an agreement on the reforms, however, and in 2015, the Commission decided to withdraw its proposal. Finland has one of Europe's highest levels of energy taxation, whereas the structure of the Finnish energy taxation system can be seen as pioneering in Europe. Eight EU Member States currently have included some type of a carbon dioxide tax in their energy taxation, and only a few base their energy taxes extensively and objectively on the CO_2 emissions of each product. What makes the Finnish model of CO_2 taxes unique is the fact that rather than on emissions from the combustion of energy products, it is based on average life-cycle carbon dioxide emissions. This means that the sustainability of biofuels, for example, can be taken into account in the basic tax structure without special exemptions or tax reductions. A special feature of Finnish energy taxation compared to many other countries is that, similarly to the structure of the Energy Taxation Directive, instead of directly granting businesses lower tax rates for energy products than those paid by households, for example, some special tax treatments have been granted to specific sectors, which include tax reductions for CHP and tax refunds for agriculture and energy-intensive companies. Eligibility for the reduced electricity tax rate, on the other hand, has been limited to certain sectors in Finland (industry, mining, data centres and agriculture) rather than being available for the entire business sector.

Few reliable, inclusive and advanced international comparisons of energy taxation are available. The main reason for this problem is a lack of data, as no detailed data on the Member States' energy taxation systems and their exemptions and reductions are available even at the European level. The current Energy Taxation Directive, which was adopted in 2003, allows the Member States considerable room for manoeuvre in terms of their tax structures and exemptions and reductions which, combined with very low minimum tax levels, has led to a failure of any significant harmonisation of energy taxation as a whole and, in turn, diverse practices. This is why a comparison could include a model in which the tax is based on the carbon and energy content of each fuel and, on the other hand, a model in which fuel taxes have been defined with no regard to fuel attributes. The same fuel can be taxed at different levels in different uses, and other elements of energy and transport taxation or energy-related subsidies may potentially alter the actual tax burden of fuel use.

Consequently, the problem is that even if the nominal level of taxation were known, its effective level in an individual country may be difficult to determine due to direct tax reductions, tax refunds and national taxes or payments applicable to different sectors.

Most recently, this problem emerged in the assessment of the current Energy Taxation Directive carried out by the European Commission[50]. The Commission ended up only describing European energy taxation in relation to the current Energy Taxation Directive verbally and in general terms, without attempting comparisons between individual Member States or a detailed analysis by energy product or sector. Other international organisations, including the OECD[51], have similarly tried to produce comparisons of energy taxation between countries. So far, these attempts have not progressed beyond general comparisons at the sectoral level and their reliability has been questionable, mainly due to the challenges of data collection carried out on a voluntary basis in different countries. If necessary, the European Commission can oblige the Member States to provide data, and it is thus currently using separate surveys to improve its understanding of the Member States' energy taxation as part of the Energy Taxation Directive review. In the following section, an international comparison is discussed as far as the existing data allows.

[50] Commission report: evaluation of the Energy Taxation Directive. 2019. https://ec.europa.eu/taxation_customs/news/commission-report-evaluation-energy-taxation-directive%C2%A0_en

[51] OECD. 2019. Taxing Energy Use. http://www.oecd.org/tax/taxing-energy-use-efde7a25en.htm#:~:text=Taxing%20Energy%20Use%20(TEU)%202019,how%20governments%20could%20do%20better

Transport fuels

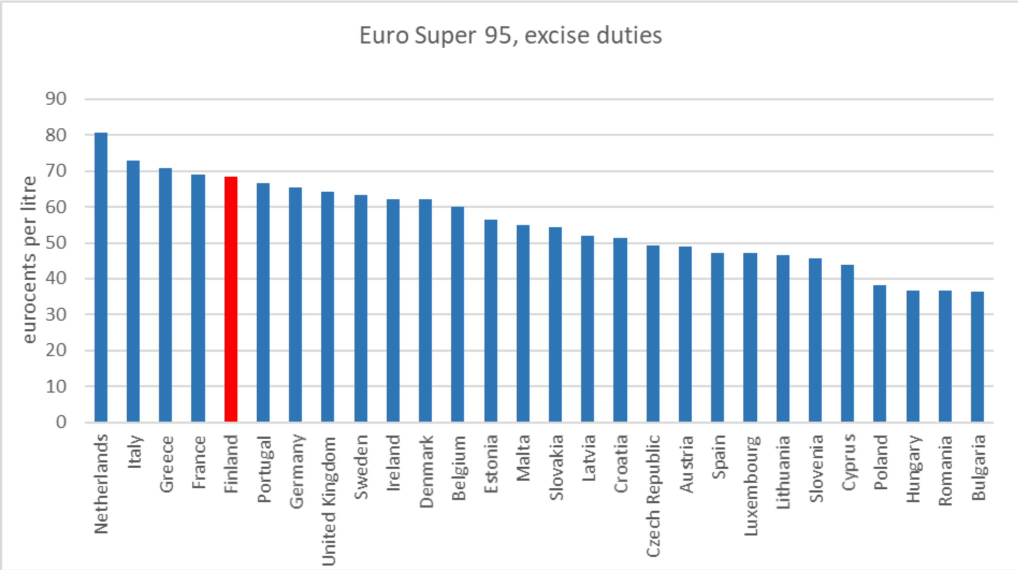
While an international comparison of transport fuel taxation can be carried out in a more straightforward manner than comparisons of taxes on other energy products or electricity, it is also fraught with numerous challenges due to the dissimilar tax structures which the Energy Taxation Directive allows, provided that the tax level in all cases exceeds the minimum. Several Member States have differentiated their tax levels based on fuel quality, such as its sulphur content, energy content or carbon dioxide emissions or the biofuel content of a mixture, which means that several tax levels are used for both petrol and diesel in many countries. Diesel intended for a specific commercial use may also be subject to a reduced tax rate. In some countries, biofuels are additionally subject to a volume-based tax equivalent to that levied on fossil fuels, which thus is higher per unit of energy, while in some countries biofuels are completely exempted from tax.

Another challenge lies in the fact that transport fuels are taxed in the Member States either as components or ready-made mixtures, which means that the rates in their excise duty tables, which are often used for simplified comparisons, are not comparable. In the case of Finland, for example, such comparisons frequently show the component subject to the highest tax in blends, or basic grade fossil diesel oil[52]. However, this tax does not represent the actual tax burden of diesel oil at the fuel pump, or the average diesel tax. In 2019, for example, it only accounted for slightly more than one fifth of the taxable consumption of diesel oil. Taking the other components of a blend into account would be important, as the tax treatment of biofuel components, in particular, differs significantly between Member States, ranging from a high tax level equivalent to that levied on the corresponding fossil fuel to full tax exemption.

The Weekly Oil Bulletin[53] of the European Commission's Directorate-General for Energy is so far one of the few existing comparisons in which attempts have been made at comparing energy taxes on fuel paid at the pump between different countries. Each country's tax level has been determined mainly on the basis of sample blends defined by the Member States' statistical authorities, taking into account the taxation of the most commonly used components in them[54].

[52] Tax category 50 of the excise duty table in the Appendix to this report.
[53] Weekly Oil Bulletin. https://ec.europa.eu/energy/data-analysis/weekly-oil-bulletin_en
[54] The data on Finland provided by Statistics Finland

Figure 15. Petrol tax rates, EU countries and the United Kingdom. Source: Weekly Oil Bulletin.



As we can see in Figure 15 above, the tax levied on Euro Super 95 petrol grade in Finland was the fifth highest in the EU in early summer 2020. The taxes were increased in Finland at the beginning of August 2020, which was not taken into account in the comparison. Following the tax increase, the average energy tax on different petrol grades in Finland will be approximately 71.9 cents per litre in 2021 based on the predicted fuel distribution in which the obligation to distribute biofuels is accounted for. So far, it is not known whether other Member States intend to adjust their taxation in 2021, apart from the index increases used in some countries.

When comparing diesel taxes, the comparison must also take into account the fact that some Member States have introduced different tax rates for cars and HGVs. In Finland, this takes the form of an additional time-based tax on diesel cars, or the tax on driving power, which brings the tax burden of diesel up to the level required by the energy tax model, compared to which the current tax level represents a reduction of 25.95 cents per litre. In other words, the volume-based tax on diesel alone does not describe the tax burden of this fuel in Finnish car traffic. At least five EU Member States, including the Nordic countries, have a similar structure in place[55]. On the other hand, at least eight Member States have brought in a reduced diesel tax for HGVs in commercial use or vehicles intended for transporting passengers. See the following

[55] European Commission. 2019. Commission staff working document Evaluation of the Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity. https://ec.europa.eu/taxation_customs/sites/taxation/files/energy-tax-report-2019.pdf

Figure 16 for these reductions[56]. The Figure compares diesel taxes paid by HGVs in EU Member States and the UK.

Figure 16. Diesel tax levels, EU countries and the UK. Sources: Weekly Oil Bulletin, CNR Comité national routier, BHI, Taxes in Europe Database (European Commission).

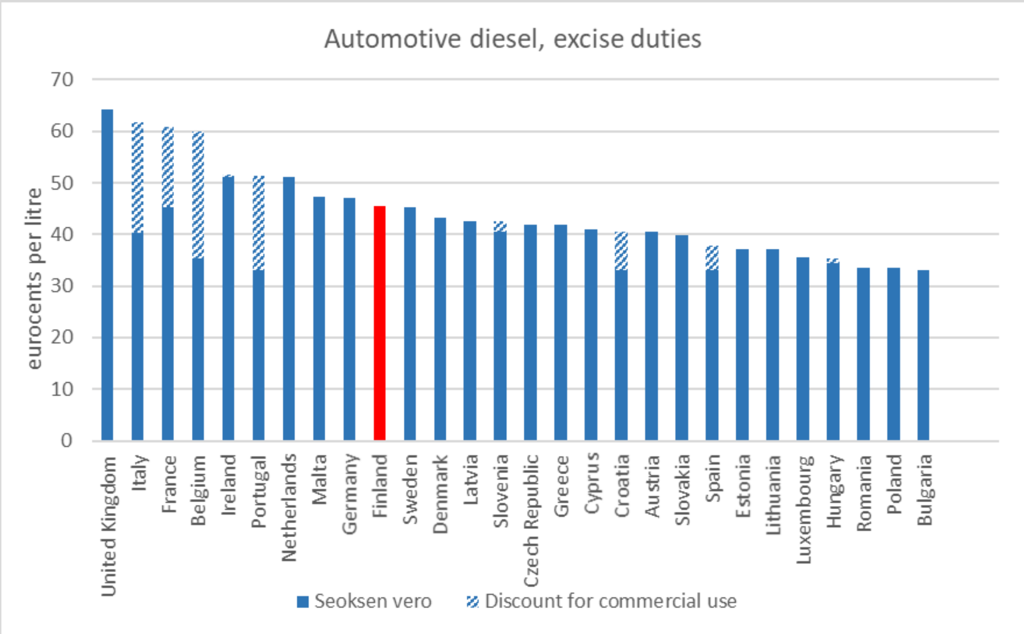


Figure 16 shows that the diesel tax paid by HGVs in Finland was the fifth highest in the EU in early summer 2020. The taxes were increased in Finland at the beginning of August 2020, which was not taken into account in the comparison. Following the tax increase, the average tax on different diesel grades under the current legislation in Finland will be approximately 47.5 cents per litre in 2021 based on the predicted fuel distribution in which the obligation to distribute biofuels is accounted for. So far, it is not known whether other Member States intend to adjust their taxation in 2021, apart from the index increases used in some countries. It should be noted that the levels shown above do not alone describe the taxation of diesel as fuel for cars in all Member States. As mentioned above, in the Finnish tax model a tax expenditure of 25.95 cents per litre of diesel is paid in the form of a tax on driving power imposed on cars. If the tax expenditure were abolished by raising the volume-based tax to the level required by

[56] There are some structural dissimilarities in the reductions. The data were collected from the following sources; CNR: https://www.cnr.fr/en/publications, BHI: https://www.bhi.dk/gb/services/fuel-excise-duty/, European Commission: https://ec.europa.eu/taxation_customs/tedb/taxSearch.html.

the energy model, the diesel tax paid by HGVs would be higher by more than 20 cents per litre in Finland than in the EU Member State with the second highest tax level.

Both the prices of raw materials of components in petrol and diesel blends and the regulation of fuels, for example in the form of the distribution obligation, differ significantly between the European countries, and the tax levels cannot be directly inferred from the price of fuel or the costs incurred from it in different Member States.

Biofuels

As mentioned above, there are significant dissimilarities between European countries when it comes to the taxation of biofuels. The highest tax levels per litre are the same as those applied to fossil fuels which, for such fuels as ethanol, means a tax of about one and a half times that levied on petrol in terms of the energy content. In some Member States, biofuels are mainly exempted from tax. The regimes adopted in individual Member States mainly depend on the primary policy instrument. For example, the State aid rules prevent tax reductions or tax exemptions in those Member States in which a distribution obligation is in place. In its evaluation report[57], the European Commission noted that the current Energy Taxation Directive has become obsolete regarding biofuels and led to their unfavourable treatment compared to fossil fuels in the energy taxation of many countries. As the Energy Taxation Directive lacks specificity, Member States have produced their definitions from national starting points, for example regarding the compositions required to qualify for a reduction. This hampers the functioning of the internal market and may lead to indirectly favouring domestic products compared to similar foreign products.

The tax treatment of biofuels in Finland is unique in the EU. While the tax levels per litre are significantly lower than those levied on fossil fuels, there are no actual reduced tax rates for biofuels. Their lower tax results from a tax structure based on energy content and life-cycle CO_2 emissions, which treat both fossil and bio-based fuels neutrally. The use of biofuels in Finland is promoted by an annual increase in the distribution obligation[58], the use of which would not be permitted under the State aid rules if the tax level for biofuels had been reduced by means of a conventional tax reduction requiring State aid approval. On practical terms, the distribution obligation determines the level of biofuel consumption. We could thus say that the tax treatment of biofuels as a combination of taxation and other means of promotion is favourable for biofuels in Finland by international standards, and thus the biofuel sector, for

[57] Commission report: evaluation of the Energy Taxation Directive. 2019. https://ec.europa.eu/taxation_customs/news/commission-report-evaluation-energy-taxation-directive%C2%A0_en
[58] Ministry of Economic Affairs and Employment. Biofuels. https://tem.fi/en/biofuels

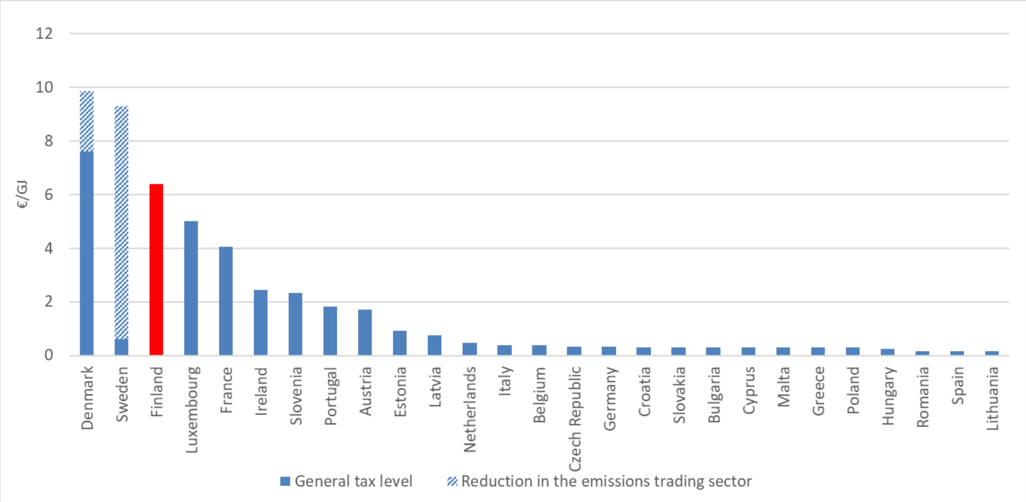
example, has held up the Finnish tax structure as an example of an effective regime it in its lobbying.

Heating fuels and electricity

Unfortunately, little or no comparable data are available on the taxation of heating fuels and electricity. While a database[59] based on a biannual survey and maintained by the European Commission shows the nominal levels and some of the reduced rates for key fuels, it has no data on such details as national and in some cases regional taxes, restrictions of scopes, tax refund schemes and other national features, which are largely permitted under the Energy Taxation Directive.

The nominal tax levels for coal in business use according to the Commission's tax database are shown as an example in Figure 17 below. It is important to note that these are the highest tax levels before sector-specific exemptions allowed by the Directive in the form of reduced rates are applied. As regards coal in Finland, the reduced rates apply to CHP use and to energy-intensive companies, as for other energy products. The effective tax level for CHP is approximately EUR 3.6/GJ, taking the discount into account. Tax refunds for energy-intensive companies reduce their actual lowest tax level to less than one euro per gigajoule.

Figure 17. Nominal tax levels for coal in business use. Source: European Commission, Taxes in Europe Database.



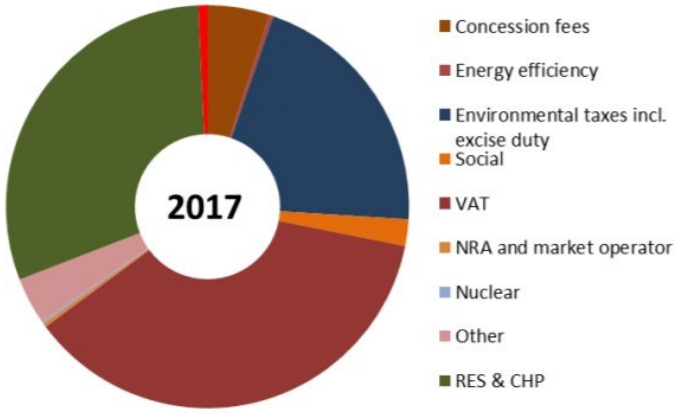
59 European Commission.Taxation and Customs: Taxes in Europe Database v3. https://ec.europa.eu/taxation_customs/tedb/taxSearch.html

Especially given that similar reductions are also in place in other EU Member States, it can be said that the current tax levels in Finland are some of the highest in the EU. If the tax refunds for energy-intensive companies are removed in keeping with the Government Programme and the tax on heating fuels is increased, Finnish energy taxation will be the very highest in the EU in all sectors. Denmark and Sweden have exempted the emissions trading sector from the carbon dioxide tax with certain restrictions. Especially in Sweden, this means a very low level of taxation in the emissions trading sector due to the large carbon dioxide tax share.

Electricity taxes are the most difficult area for comparing energy taxation in the international context as, in addition to the fact that the numerous exemptions and reductions allowed by the Energy Taxation Directive are applied to electricity taxation significantly more often than to energy products, electricity is subject to considerably high national taxes and charges in many countries. One of the most comprehensive overviews of electricity taxation in EU Member States produced recently was included in the Energy prices and costs[60] report published by the Commission 's Directorate-General for Energy in 2018. The report was underpinned by extensive studies on the prices of electricity and energy products charged to operators of different sizes and analyses of the drivers of price changes. It should be noted that even though electricity taxation in Finland is straightforward as it is based on the electricity tax, strategic stockpile fee and value added tax, this is not the case in other countries - the report's category 'taxes' includes a great deal more than excise duties, which is shown in the the breakdown of the average composition produced by the Commission's Directorate-General for Energy, in Figure 18.

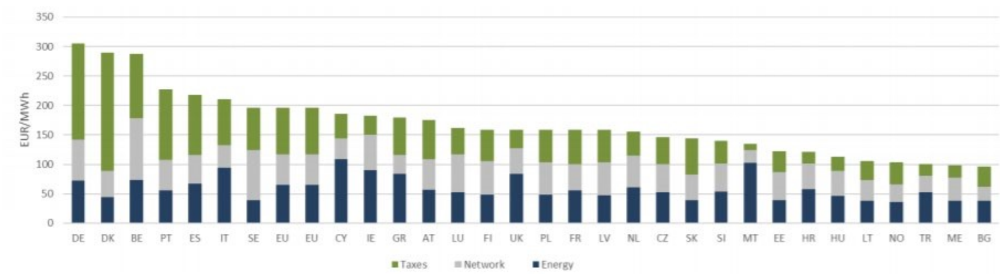
[60] European Comission. 2019. Energy prices and costs in Europe. https://ec.europa.eu/energy/data-analysis/energy-prices-and-costs_en

Figure 18. Taxes and fees included in electricity prices charged to households as itemised in the European Commission's Energy prices and costs in Europe report.



According to the Commission, the level of both electricity prices and taxes paid by households in Finland are at the average EU level (Figure 19).

Figure 19. Composition of the electricity price paid by households. Source: European Commission report ‘Energy prices and costs in Europe’.



Figures 20 and 21 show the electricity prices and taxes paid by large (IF in the Figure) and small (IB)[61] industrial operators. This Figure also leads to the same conclusion. The highest electricity tax level in Finland is EUR 6.9 for small industrial companies, whereas energy-intensive companies usually pay EUR 1 to 2 per megawatt hour. The minimum tax level in Europe is EUR 0.5 per megawatt hour. Finland is also planning to reduce the electricity tax to this level in line with the Government policies.

[61] IB: 20 to 500 MWh per year, IF: 70,000 to 150,000 MWh per year.

Figure 20. Composition of industrial electricity prices paid by large and small operators, the first 16 countries. Source: European Commission report ‘Energy prices and costs in Europe’.

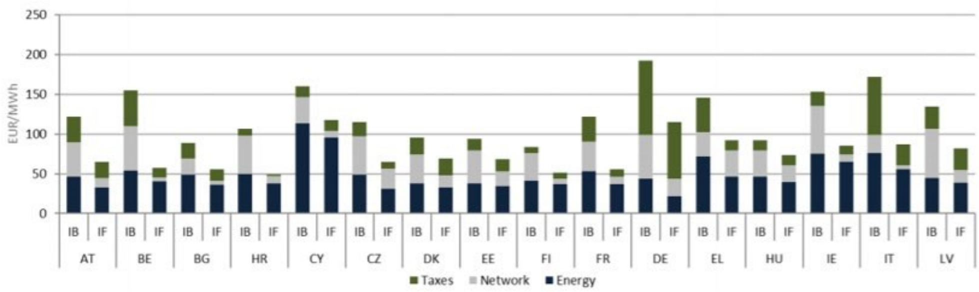
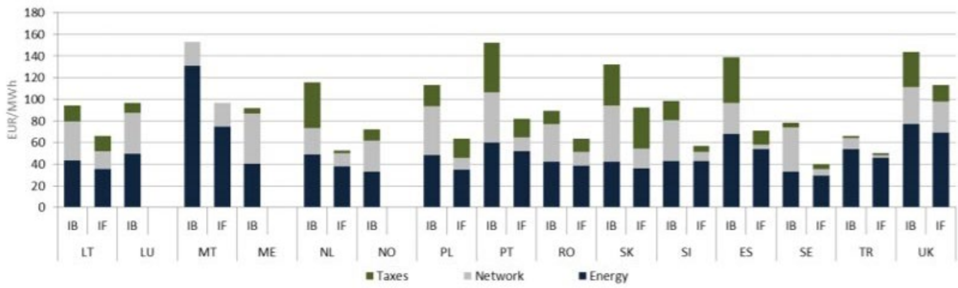


Figure 21. Composition of industrial electricity prices paid by large and small operators, the remaining 15 countries. Source: European Commission report ‘Energy prices and costs in Europe’.



However, it should further be noted that even a comparison at this level cannot fully account for all factors or sector-specific exceptions. Based on this indicative comparison, it is nevertheless safe to say that as a whole, electricity prices or taxes are not high in Finland at the moment, at least not in terms of competitiveness.

Mining

In summer 2020, the Ministry of Finance conducted a survey to investigate energy taxation on mining and quarrying in EU Member States. The responses indicate that the level of energy taxation for mines in Europe is as a rule equivalent to the level of energy taxation for industry, which is often lower than the tax level for energy consumed by households, for example. At least three Member States (Lithuania, Poland and the Czech Republic) impose particular taxes or compulsory levies on mines, which target the extraction of mining raw materials. Based on the survey results, we can thus say that while the current state of energy taxation in Finland, in which mining is treated similarly to industry in energy taxation, is a common practice in Europe, there are also exceptions in the form of special taxes.

General level of energy taxation

An individual analysis of a specific fuel or sector does not necessarily give a general indication of a state's energy taxation level, as the Member States' tax levels vary both between fuels and sectors. For example, we can see at a glance that the taxation of different fuels or sectors significant for the national economy is lower, whereas the tax level for a less significant fuel or activity can be kept high. As we noted before, the number of exceptional tax rates is low in Finland by international standards, and the majority of energy products are taxed on consistent criteria, rather than always exercising political discretion on the tax levels of individual fuels[62].

The levels of energy taxation in different countries have traditionally been compared with the help of indicators based on energy tax revenues, which are typically examined in proportion to the total tax revenues or gross domestic product. This is also the approach taken by the Commission's DG for Taxation and Customs Union in the following Figure 22[63]:

Figure 22. Environmental tax revenues in proportion to GDP in EU Member States. Source: European Commission report Tax policies in the European Union.

[62] With the exception of peat, in particular.
[63] European Commission. 2020. Tax policies in the European Union. https://ec.europa.eu/taxation_customs/sites/taxation/files/tax_policies_in_the_eu_survey_2020.pdf

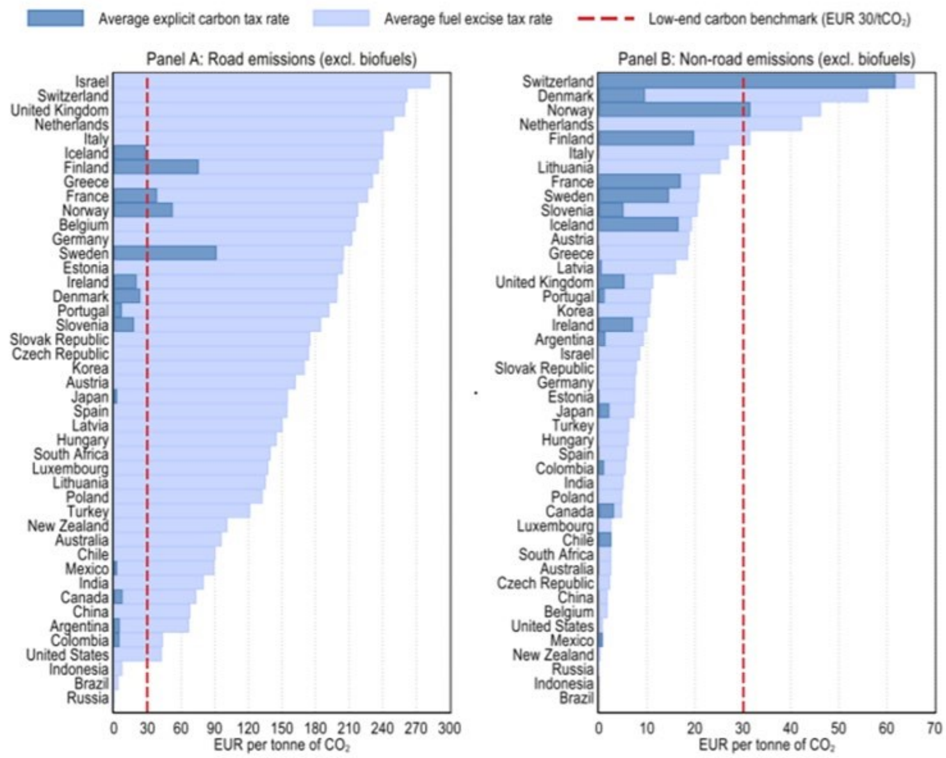
Apart from this indicator being dependent on the magnitude and trends of the GDP figure, it is poorly suited for international comparisons due to its energy consumption structures that differ from the level of energy taxation and that lead to different levels of potential in terms of energy tax revenues. Neither does it take into account the structure of energy taxation; a tax structure which is efficient in the fiscal sense differs from a structure which creates an environmental or energy policy incentive. The effective level of energy taxation can be high in a country where tax revenue is relatively low. On the other hand, the absolute level of taxation is more essential in terms of the harmonisation of EU energy taxation and national competitiveness than its level in proportion to the gross domestic product, for example.

As we can see in Figure 22, Finland ranks above the average in this comparison, regardless of its relatively high GDP. While Finland's tax levels are effectively the highest in Europe, the indicator value is reduced by a shrinking tax base as fossil fuel consumption decreases in line with the targets and the share of biofuels subject to a lower tax or exempted increases in keeping with the environmentally-related tax model. It is illustrative that Sweden, where the level and structure of energy taxation can be considered more progressive than average on the European scale, is found close to the bottom end of this ranking. The indicator discussed above is thus only suitable for assessments from the fiscal viewpoint, preferably from the national perspective. Eurostat and the European Commission have also published a comparison of energy tax revenues per unit of energy between the Member States (implicit tax rate on energy). However, well-grounded criticism has been levelled at the indicator because of its unsuitability for comparisons between Member States or the development of energy taxation in individual Member States. Differences in the structure of energy consumption, especially between transport with its high tax level and heating with a lower tax level on the one hand and energy production on the other, are the most significant challenge for this indicator, too. For example, it is impossible to say how the levels or changes should be interpreted: in other words, was the increase in the indicator value achieved through tax increases, or is it due to a reduction in renewable fuel use, or perhaps closures of factories, in which case the relative share of transport will increase.

So far, the most advanced comparisons include the Taxing Energy Use report regularly produced by the OECD. The data for this report are based on a highly detailed OECD model of energy consumption in each country, which the member states are asked to complement with their tax levels for each detail. As mentioned earlier, unlike the tax data collected by the Commission, the complementary data for this model is supplied by the authorities in the OECD member states on a voluntary basis, which has caused difficulties. This work is developing rapidly, however, and in the future it will also be possible to make reliable comparisons at the sector level.

Figure 23 below compares the effective tax level per CO_2 emissions separately for road and non-road emissions:

Figure 23. Effective fossil carbon tax by country. Source: OECD report Taxing Energy Use.



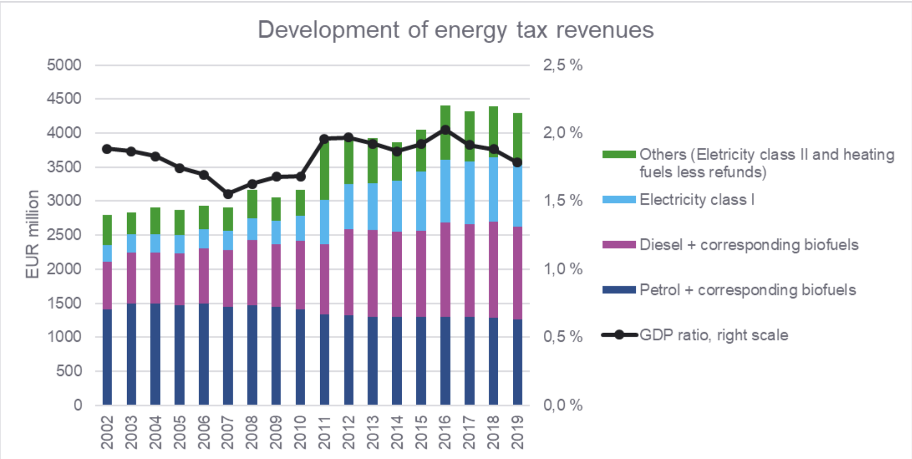
Including biofuels in the CO_2 emissions when comparing emissions from combustion is a challenge in itself. The benefit obtained from bio-based fuels is associated with a reduction in the life-cycle emissions of the fuel rather than reducing emissions from combustion. In Figure 23 above, the OECD has decided to remove biofuels from the calculation. The Figure indicates that Finland's energy tax levels are effectively high also at the global level. The environmentally-related nature of taxation is not taken into account in the comparison but, as noted before, Finland is a pioneer in this area.

In some EU Member States, energy tax levels have been linked to an index in one way or another in order to maintain their importance both in the fiscal and the environmental sense. Sweden, for example, has decided to increase energy taxes at the same rate with the index, unless otherwise decided[64].

2.3 Energy tax revenues and tax base development

See Figure 24 for the actual development of the energy tax revenue between 2002 and 2019. There has been a nominal increase of EUR 1.8 billion in the energy tax revenues between 2002 and 2019[65]. In the same period, the energy tax to GDP ratio decreased by around 0.1 percentage points to 1.8% in 2019. The nominal energy tax revenues have gone up particularly as a result of the increases in the nominal tax levels for transport and heating fuels as well as electricity in the 2010s.

Figure 24. Development of energy tax revenues.



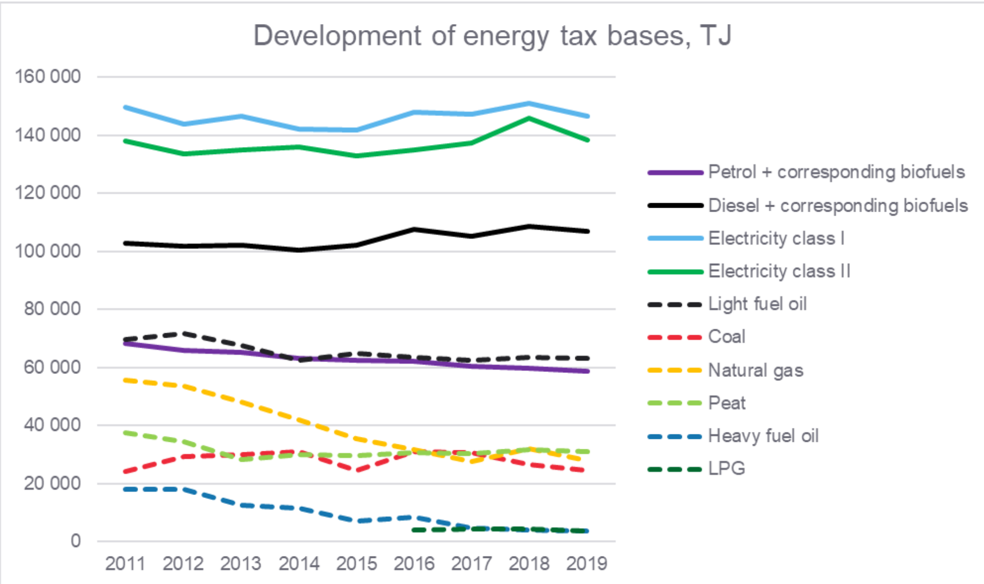
In contrast to the increase in nominal tax levels, the smaller tax bases and the fact that energy products with higher tax levels have been replaced by products subject to a lower tax level have tended to reduce the energy tax revenues. As we can see in

[64] Regeringskansliet. Beräkningskonventioner 2020; En rapport från skatteekonomiska enheten i Finansdepartementet. https://www.regeringen.se/rapporter/2019/10/berakningskonventioner2020/

[65] The energy tax revenues are presented using the concepts of the national accounts, according to which the tax revenues should be shown on accrual basis. However, the current practice of Statistics Finland does not fully reflect the accrual basis, as the tax refunds paid (in the revenue or expenditure figures) have not been allocated to the time of consumption eligible for a tax refund.

Figure 25, taxable consumption of natural gas and heavy fuel oil and, to a lesser extent, light fuel oil and petrol has decreased in the 2010s. While the taxable consumption of diesel has increased somewhat[66], the tax revenues generated from diesel have been affected negatively by the share of biofuels, which has been increased by the biofuel distribution obligation and the significant increase in the share of paraffinic diesel subject to a lower tax. As discussed in section 2.1.1, the development of the tax base should not be confused with trends in energy consumption, as the tax base only concerns the taxable part of the total consumption.

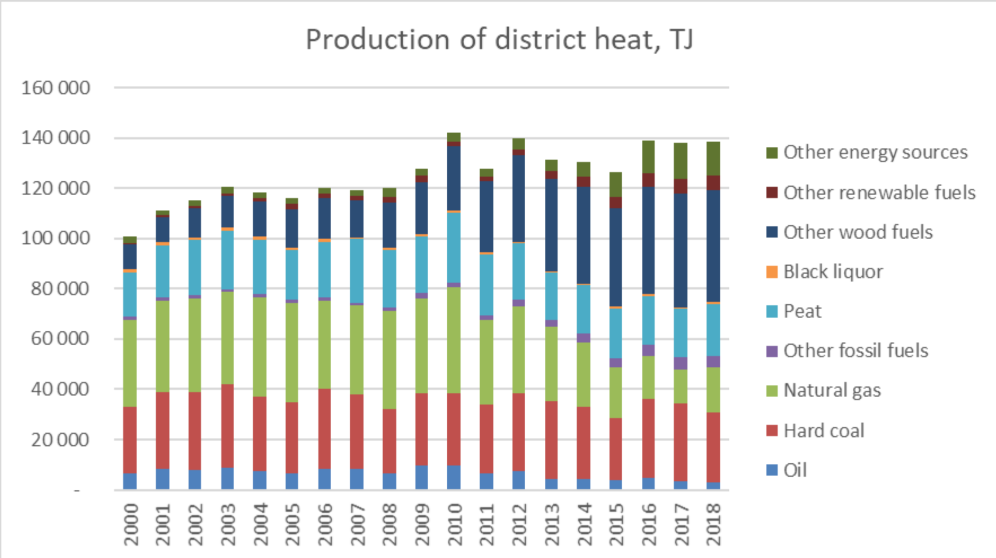
Figure 25. Development of energy tax bases between 2011 and 2019. Sources: Statistics Finland, Ministry of Finance.



As we can see in Figure 26, the use of fossil fuels in heat production has been replaced especially by wood fuels in the 2010s and, in recent years, also by other renewable fuels and such other energy sources as heat pumps.

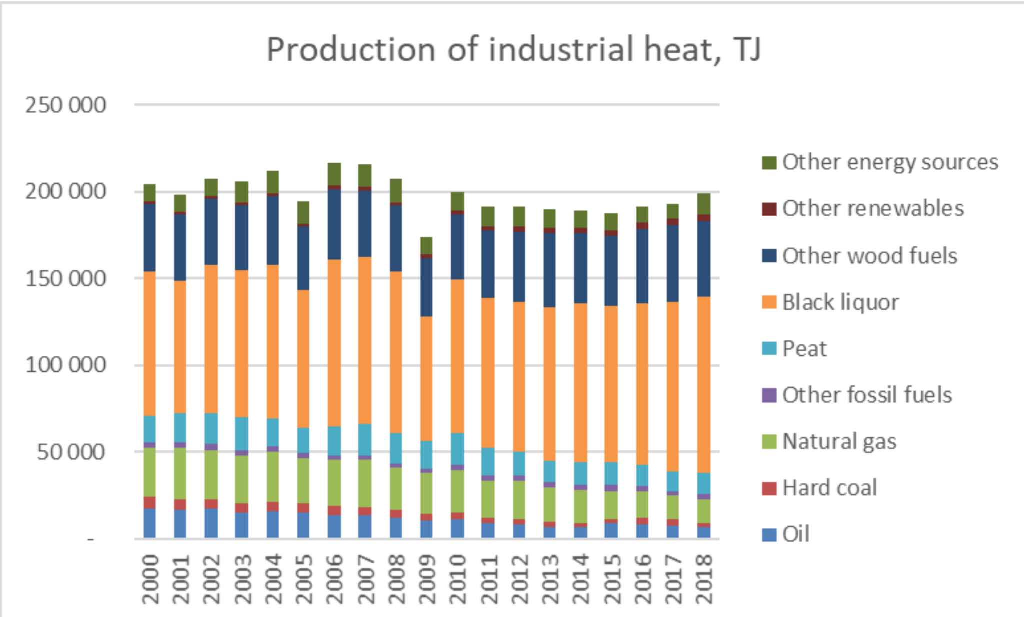
[66] Instead of the tax base calculated on the basis of tax data, Statistics Finland's diesel consumption figures for 2011 and 2012 were used, as the increase in the levels of diesel tax at the beginning of 2012 resulted in a significant storage impact between 2011 and 2012.

Figure 26. District heat production by energy source, TJ. Source: Statistics Finland.



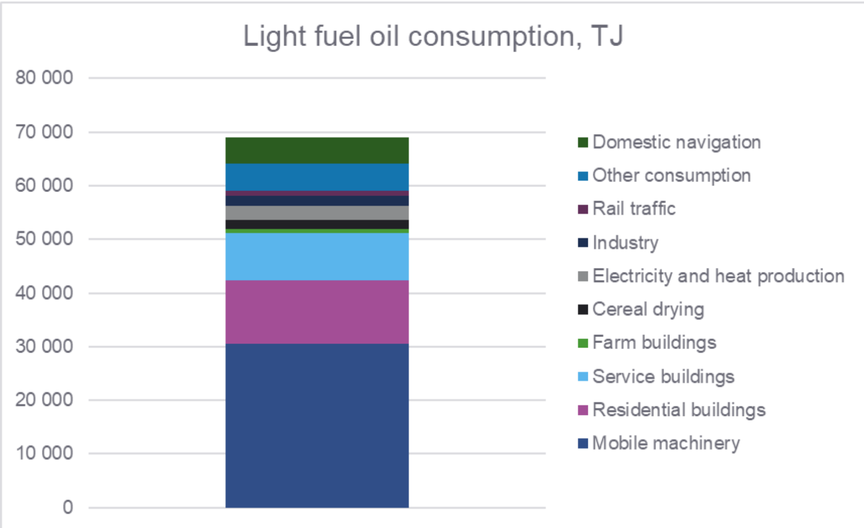
As shown in Figure 27, the consumption of fossil fuels has also decreased in industrial heat production, and the share of black liquor and wood fuels has increased accordingly.

Figure 27. Industrial heat production, TJ. Source: Statistics Finland.



Outside transport and energy production, the most important taxable fuel is light fuel oil. Figure 28 shows the estimated distribution of light fuel oil consumption by use in 2018 based on Statistics Finland data[67]. The consumption of light fuel oil in mobile machinery is put at approx. 31,000 TJ, of which consumption in agricultural machinery is estimated to account for about one fifth. The estimated consumption of light fuel oil used for heating buildings is around 21,000 TJ, of which residential buildings are estimated to account for around 55%. In addition to machinery and heating, smaller quantities of light fuel oil are used for drying cereals in agriculture and in rail traffic. In addition to taxable consumption, light fuel oil has tax exempt uses, especially in commercial waterborne transport.

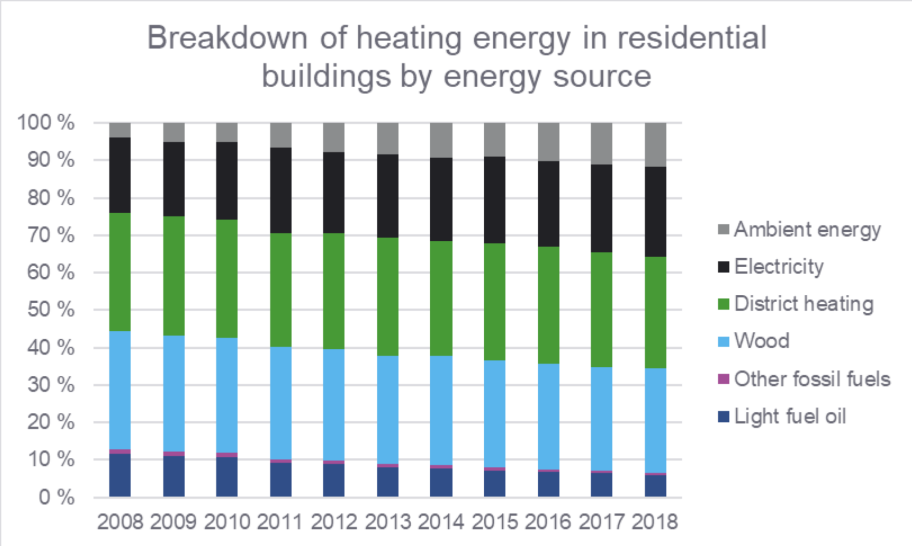
Figure 28. Breakdown of light fuel oil consumption by use in 2018. Source: Statistics Finland.



In the 2010s, the consumption of light fuel oil has decreased especially in the heating of buildings, whereas it has remained more or less unchanged in machinery use. Figure 29 shows a breakdown of heating energy sources for residential buildings from 2008. The proportion of light fuel oil as the energy source for heating residential buildings has decreased by approx. 6 percentage points since 2008, while the proportion of energy generated by heat pumps has increased by about 8 percentage points. In 2018, district heating accounted for around 30% of the 160,000 terajoule heat demand in residential buildings, while wood accounted for approx. 28%, electricity for approx. 24%, heat pumps for approx. 12% and light fuel oil for approx. 6%.

[67] The breakdown of light fuel oil consumption should be taken with a pinch of salt as, due to a lack of statistical data, significant uncertainties are associated with it.

Figure 29. Breakdown of heating energy consumption in residential buildings by energy source. Source: Statistics Finland.

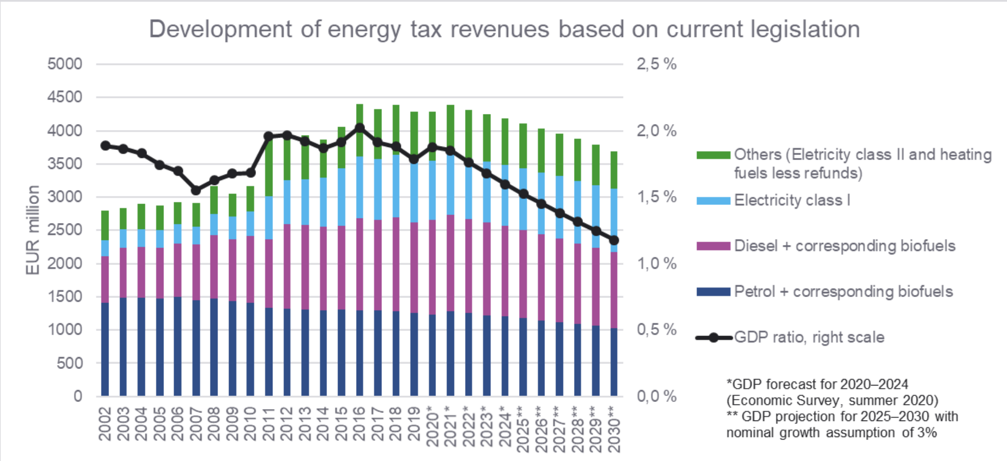


Development of energy tax revenues in the 2020s

The projection in Figure 30 describes the development of energy tax revenues until 2030 with the current legislation, or excluding the other tax changes set down in the Government Programme besides those that have already entered into force. It is estimated that the current legislation will reduce energy tax revenues by about EUR 0.1 billion between 2019 and 2024, and about 0.6 billion by 2030. The projection indicates that tax revenues from petrol, diesel and the corresponding biofuels will go down by about EUR 450 million by 2030. In addition to a moderate decline in consumption, the decrease in tax revenues is explained by an increase in the proportion of biofuels, which are subject to a lower tax level, along with the increased distribution obligation. Energy tax revenues from heating fuels will decrease by approximately EUR 200 million by 2030 according to the projection. In particular, tax revenues from heating fuels in the projection are decreased by the dwindling consumption of coal and light fuel oil as well as the higher proportion of biofuels subject to a lower tax as the obligation to distribute bio-based fuel oil increases. The revenues from category I electricity tax will increase in the projection by approximately EUR 40 million as electricity consumption goes up slightly.

The decline in the GDP ratio of energy tax revenues will be significantly stronger than the decline in nominal tax revenue. The GDP ratio of energy taxes would decrease by about 0.2 percentage points by 2024 if the nominal GDP develops as anticipated in the Ministry of Finance's Economic Survey of summer 2020. In 2030, the tax-to-GDP ratio would be approx. 0.6 percentage points lower than in 2019 if, after 2024, the nominal GDP increased by 3% per year.

Figure 30. Energy tax revenue projection until 2030 based on current legislation. Source: Ministry of Finance.



2.4 Technical development of energy production and consumption

2.4.1 Impact of energy market integration

Being based on a number of different technologies and energy sources, the structure of electricity and heat production in Finland is rather diverse. Along with the growing integration of the European energy market and climate change mitigation measures, the energy sector has undergone major changes over the past ten years. Technological advancement in the sector is rapid and, with ambitious climate targets, energy production and consumption will remain in flux for a long time to come.

While the production structure of electricity and heat is influenced by national tax, energy and climate policy decisions, it is also affected by the policies of the neighbouring countries, as Finland is part of the common European electricity market. In the electricity market, the wholesale price of electricity is set across an area that covers almost entire Europe. All day-ahead offers of buying and selling participate in a single auction. The principle is that electricity is produced where its variable costs are the lowest. Consequently, Finnish power plants compete in the electricity market directly with plants in other countries.

Despite the single market for electricity, the wholesale price of electricity is not the same throughout Europe. The reason for this is that countries' internal transmission networks and cross-border connections do not have sufficient transmission capacity for all situations. When a cross-border connection forms a bottleneck for electricity transmission, the wholesale electricity price diverges between the areas it links. The stronger the connections, the more often the price is the same in different areas of the market.

The enormous growth of wind and solar power in the Nordic countries and in continental Europe drives and increases fluctuations in electricity prices. Plenty of electricity is available at times and the price drops, whereas at other times, electricity is scarce and the price goes up. The fluctuations in Finnish wind power generation over time are also currently reflected in the price of electricity in the Finnish price area. The Nordic countries have a surplus of electricity at the annual level, which has led to a relatively low average price. The high-price periods are short, typically ranging from a few hours to half a day in duration. This creates a challenge for condensing plants based on combustion and CHP plants. Production at condensing plants has declined significantly in the 2000s, and the majority of these plants in Finland have already been decommissioned as unprofitable. In addition to electricity, CHP plants produce heat for the district heating network or for industrial use. When the price of electricity is low, covering the production costs of electricity is a challenge. Consequently, district heating companies rarely invest in CHP plants to replace those which have reached the end of their lifetime. District heating production will increasingly transition to heat-only boilers and new heat sources and technologies.

The reduction in cogeneration is also speeded up by the Act on the Prohibition of Energy Use of Coal (416/2019)[68], which entered into force in 2019. Under this Act, using coal as a fuel for electricity and heat production will be prohibited as of 1 May 2029. Energy companies and industrial establishments with coal-fired power or heat plants are currently making plans for phasing out this form of production and replacing it with other methods. Heat is a local commodity that must be produced near the heat load or district heating network using it. The same does not apply to electricity, and it is consequently enough for companies to find solutions for replacing coal-fired heat production. The electricity production to be phased out will largely go unreplaced.

[68] Act on the Prohibition of Energy Use of Coal (416/2019).
https://www.finlex.fi/fi/laki/alkup/2019/20190416

The EU-wide emissions trading, which makes fossil energy production more expensive than emission-free generation, is another driver of development in energy production. Operators in the emissions trading system must purchase allowances that correspond to greenhouse gas emissions from both electricity and heat generation. As the total volume of emission allowances decreases faster than the demand, the price can be expected to rise beyond the current level of approx. EUR 20/t CO_2 in the 2020s, thus adding to the cost burden of fossil fuels compared to zero-emission energy sources.

2.4.2 Electrification

Electricity consumption in Finland has followed an almost linear trajectory from less than ten terawatt hours in 1960 to the record figure of 90 terawatt hours in 2007. Since that year, the increase in electricity consumption has been curbed and varied between 81 and 88 terawatt hours. Electricity plays an important role in the transition to a low-carbon society, as it is an efficient form of energy that can be easily transmitted, even across long distances, with low losses. The focus of energy use is increasingly shifting from conventional fuels to electricity, especially emission-free electricity.

Many different estimates have been produced of how electricity use and consumption amounts will develop in the future. In the scenarios of the PITKOJATKO project, which meet the Government's target of carbon neutrality by 2035, total electricity consumption will be between 105 and 127 terawatt hours in 2050. Modelling results indicate that the highest levels of electricity consumption would be reached in the 'Continuous Growth scenario', in which strong economic growth continues. This scenario incorporates the most wide-spread use of electricity as a replacement for fuels, as carbon capture and storage are not part of it.

In addition to electrification being a key change in most sectors in the next few decades, digitalisation, energy storage and an expansion in the refining of carbon-neutral electric fuels (so-called Power-to-X solutions) will also drive new electricity consumption.

The shift towards carbon-neutral district heating will increase the use of heat pumps, and thus also electricity, in the production of district heat. Heat pumps can be used to recover surplus heat in industrial plants, at data centres and from waste water, among other things. For a more detailed discussion of the possibilities of using surplus heat, see section 2.4.3.

The number of heat pumps used for building-specific heating is also continuously increasing. However, the increase in the demand for electricity will be partly curbed by more efficient energy use and improved operating efficiency of equipment. Building automation, more widespread cooling, and small-scale electricity production as well as smart solutions for optimising electricity purchases and use will be part of the advancing electrification of buildings.

Finland is committed to halving transport emissions by 2030, which will increase the uptake of new sources of driving power, also in the form of electric cars. The Government Programme contains several entries on improving the charging infrastructure for electric cars. According to the PITKOJATKO study, electricity consumption in transport will reach the peak of 8 TWh in 2050 in the scenario where most cars are fully electric. In the scenario where advanced biofuels predominate as the driving power in transport, the consumption remains at 4 TWh. In terms of taxation, it is essential to realise that the efficiency of an electric motor significantly exceeds that of an internal combustion engine, which means that the amount of electricity needed will be significantly lower than the amount of fuel it replaces.

In industry, electrification will take place through electrifying industrial processes and, indirectly, by such means as switching to hydrogen produced from water by electrolysis. In the scenarios of the PITKOJATKO project, greenhouse gas emissions from the Finnish process industry will be reduced by means of technological changes that will significantly increase electricity consumption, such as the introduction of hydrogen direct reduction in the production of steel from iron ore, the use of hybrid electric furnaces in the mineral industry, and electrolytic hydrogen production in the petrochemical industry.

To the extent that large amounts of affordable electricity will be available in the future, we can expect to see the wider use of various solutions for turning electricity into products, known as power-to-X. The power-to-gas process produces hydrogen from water by electrolysis. Hydrogen can be used as such, refined further, or converted back into electricity in a power-to-power cell. Hydrogen can be processed into methane and later burned in a gas turbine. Hydrogen and methane can thus be used for storing electricity, exploiting an intermittent electricity surplus and thus levelling out the power balance of the electricity system. For the time being, however, poor efficiency and high investment costs are significant obstacles to the widespread use of power-to-power solutions.

Another potential use for electricity will be carbon capture and storage (CCS), for which electricity is needed, especially for the pressurisation of CO_2 for transport. However, significant R&D investments in CCS technology will be necessary before it can make its breakthrough.

2.4.3 Surplus heat

Surplus heat, or waste heat, refers to heat that would escape unused in the environment if not recovered or used. While the exact amount of surplus heat that is captured is not known, this amount is clearly showing a strong growth, both when used at the generation site and in the district heating network.

In its report[69], AFRY Management Consulting examines the production and use of surplus heat and the potential for using it in district heating by plant category. As a whole, AFRY estimates that approx. 130 TWh of waste heat is generated in Finland, of which the amount currently used for district heating is about 3 TWh. The potential of waste heat that could be reasonably utilised was estimated to be approx. 20 TWh, excluding waste heat generated by Loviisa nuclear power plant. The report puts the technically usable waste heat potential of industrial plants at about 15 TWh and that of data centres at around 2 TWh. Waste incineration plants condense around 0.5 TWh of waste heat in the environment. The greatest additional potential at CHP and heat plants producing district heat was found in the flue gases of plants which burn biomass and peat. The report estimates that the total waste heat potential of these boilers is about 1.1 TWh.

VTT Technical Research Centre of Finland Ltd (later referred to as *VTT*), discusses a wide range of surplus heat sources[70] in its report on waste heat in district heating systems and groups the identified sources based on their origin as shown in Figure 31.

Figure 31. Surplus heat sources grouped by origin (in Finnish). Source: VTT.

[69] AFRY Management Consulting Oy. 2020. Selvitys hukkalämmön potentiaalista ja tehokkaasta lämmityksestä, 9/2020.
[70] Rämä, M., Klobut, K. 2020. Hukkalämpö kaukolämpöjärjestelmissä. Teknologian Tutkimuskeskus VTT Oy, VTT-CR-00340-20. https://energia.fi/files4831/Hukka-lampo_kaukolampojarjestelmissa_-_maarittely_ja_luokittelu_VTT_2020.pdf

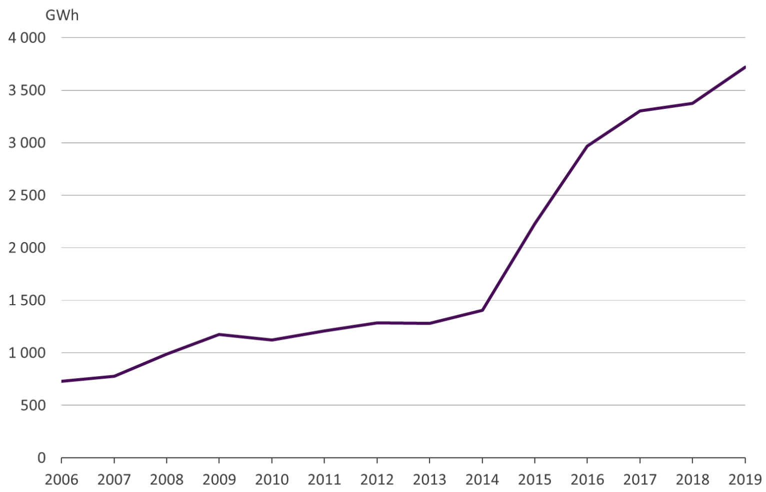
VTT notes in its report that in general, the decisive factor in the use of different heat sources is the temperature level, the potential of an individual site, and fluctuations in availability. The more constantly a heat source is available and the higher its temperature level and potential, the more likely it is that exploiting it makes technical and economic sense. As an example, wastewater treatment plants (high potential, sufficient temperature level, available around the year) are frequently used heat sources, whereas the use of heat pumps in individual buildings (low potential, low temperature level, excess heat outside the heating season) or condensate heat from cooling apparatuses in individual buildings or services (similar to buildings but also partly available during the heating season) are rarely used as sources of district heat.

In general, surplus heat should primarily be used as close to the generation site as possible, for example in the production plant's own processes or in the heating or cooling needs of the property. If this cannot be done, it may be possible to sell the heat to another operator in the same area or to the municipality's district heating network. A preliminary study[71] produced by Pöyry notes that a great deal of untapped potential still remains in utilising surplus heat produced by companies, even though energy production in large industrial clusters is currently already centralised and the energy is sold to other actors in the area, while potential side streams from other operators' production processes are used as fuel in energy production.

According to Finnish Energy, approximately one third of the heat transmitted in Finnish district heating networks comes from a production plant or facility not owned by a district heating company. Part of the heat supplied by third parties is surplus heat recovered from data centres, industrial plants, wastewater, buildings or similar sites. The total amount of surplus heat used as an energy source for district heating has increased rapidly, especially over the last five years, as shown in Figure 32. In 2019, as much as 10% of district heating was produced from surplus heat (Figure 32).

[71] Pöyry Finland Oy. 2019. Ylijäämälämmön potentiaali teollisuudessa. Esiselvitys. Motiva Oy. https://www.motiva.fi/files/16214/Esiselvitys_-_Ylijaamalammon_potentiaali_teollisuudessa.pdf

Figure 32. Use of surplus heat as an energy source for district heating. Source: Finnish Energy.



The higher its temperature, the more useful surplus heat is. If the heat can be used directly with a heat exchanger, it is of higher value than surplus heat whose recovery requires a heat pump. At the usual supply temperature levels (75° to 115° C) of district heating in Finland today, in some cases it is necessary to increase the temperature after the heat pump by means of resistors or other heat production methods if the lower temperature cannot be stabilised with the help of the system's other production. While the higher-temperature heat pumps currently available are an option, the flip side of this solution is a lower power factor and thus increased electricity consumption. On the other hand, VTT estimates in its report that future low-temperature district heating solutions can reduce the supply temperature to an estimated level of 65° C or less if the temperature level required by the process water (58° C) can be partly produced in some other ways, or by using a heat pump.

In its preliminary study on industrial surplus heat Pöyry notes that, among other things, industrial surplus heat can be recovered from process and flue gases, waste and cooling waters and waste fumes. According to this study, the utilisation of industrial surplus heat is fraught with both technical and commercial challenges. Industrial processes are often complex, and changing them is a major step. The requisite investments may also be large, with excessively long repayment periods. The study finds that a large proportion of industrial surplus heat comes at temperatures of below 100° C and even 55° C, which is why mechanical heat pumps are the most efficient technology for exploiting low-temperature surplus heat. The new high temperature heat pumps mentioned above, which produce heat energy at a temperature of over 100° C and have a reasonable efficiency (depending on the heat source temperature), may in the future revolutionise the utilisation of low-temperature surplus heat: they can directly produce district heating water at a temperature of over 100° C, thus reducing the need to prime the district heat, which means raising the temperature to the level required by the system.

In its report, VTT lists heat recovery from flue gases of CHP plants and heat-only boilers, district cooling, and recovery of heat losses from electricity plants as the sources of surplus heat with the greatest potential in the energy industry. Solutions based on using a heat pump to exploit heat from flue gases are regarded specifically as surplus heat rather than the plant's actual heat production. VTT notes that heat recovery from flue gases without a heat pump is a difficult topic in terms of defining surplus heat, as the recovered heat is not clearly defined as surplus heat.

Two techniques are usually used to recover heat from flue gases, one of which is based on direct cooling of the gases with a heat exchanger followed by a heat pump. This requires, however, a clean fuel to make it possible to lower the flue gas outlet temperature sufficiently. Consequently, natural gas is the main option; its flue gases do not contain such impurities as fly ash, and the flue gas temperature can be as low as 50° C, unlike in the combustion of coal, for example, which requires an outlet temperature clearly exceeding 100° C unless expensive special materials are used in the chimney. The available flue gas cooling also depends on the original dimensions of the boiler – in some natural gas plants, for example, the final temperature may already be very low.

If the fuel is not clean enough and it contains a significant amount of moisture, such as wood chips, a flue gas scrubber and a heat pump are often used together to exploit the heat contained in the flue gases. Flue gas scrubbers are a technology that has become more widespread recently. As water is sprayed into the flue gas stream in the scrubber, it removes impurities and cools the flue gases by condensing the water vapour they contain. At the same time, low-temperature heat is released, which is absorbed in the scrubber water and can be utilised by means of a heat pump. The scrubber return water temperature depends on the fuel used and thus the dew point of the flue gases, but it is often in the range of 10° to 20° C. This gives a lower heat pump power factor than the direct cooling of flue gases described above, but the heat output is many times higher because of the large amount of energy bound in the vapourised water. Advancements in heat pump technology have also contributed to improving the profitability of scrubbers. As most boilers using biomass in Finland are relatively small, the typical heat output from their flue gases is between 100 kW and 10 MW.

Surplus heat sources in buildings include ventilation (warm indoor air) and grey water (household water draining into the sewer). In both cases, the temperature level is low for the needs of a district heating system, and a heat pump is required to utilise such sources. The most efficient way of using heat captured by a heat pump is in the building itself, and exhaust air heat pumps, for example, mostly work this way. Using the recovered heat on sites other than the building itself is mainly possible outside the heating season. In the future, it may also make sense to run individual heat pumps momentarily as part of district heating production when this is allowed by the building's heat consumption and the heat stored in its structures. This makes it possible to level out peak consumption or make the most of intermittently low electricity prices. According to VTT's report, the range of greywater heat recovery systems is between 10 and 100 kW. In heat recovery from exhaust air and building-specific cooling, the range of the heat sources is 100 kW.

Waste water can be used as a heat source in a centralised system (water treatment plants) or in individual buildings (greywater heat recovery). The former represents one of the largest point sources in urban areas, whereas the latter is also a possible and interesting option, especially on larger sites (including laundries, hotels or shopping centres with restaurants). Greywater heat recovery in an individual building or site is primarily an energy efficiency measure and the recovered heat is used locally, but it may also serve as a heat source for a heat pump in district heating production. For example, Fortum utilises all the surplus heat produced by Suomenoja wastewater treatment plant in its heat pump plant and transmits between 300 and 350 GWh of heat annually from this plant to the district heating network. The Katri Vala heat pump plant owned by Helen Ltd produces district heating and cooling from treated wastewater flowing under the plant and from district cooling return water. The plant's heat production capacity is 105 MW and the cooling capacity 70 MW.

In 2018, Finnish Energy published a technical guideline for connecting surplus heat sources to the district heating network[72]. The guideline is intended for district heating companies as well as district heating customers considering the possibilities of using surplus heat. The guideline notes that each producer or heat source connected to the network is unique. Similarly, each district heating network is different regarding its size, its network, production and customer structure and its operation. The guideline describes the technical conditions that the district heating network sets for receiving surplus heat and the requirements the district heating system must meet in order to receive it.

With regard to exploiting surplus heat sources, the advancement and more widespread use of technologies will bring down investment costs and, especially in

[72] Sirola V-P., Tiitinen M. 2018. Hukkalämpöjen hyödyntäminen kaukolämpöjärjestelmässä. Finnish Energy. https://energia.fi/files/3127/Hukkalammot_kaukolampoverkkoon_tekniset_ohjeet_20181016.pdf

connection with heat pumps, electricity prices and taxation will have a significant impact on their technical and economic feasibility.

2.4.4 Data centres

A large proportion of the electricity consumed by hardware in data centres is transformed into heat, which must be removed to keep the hardware working without incident. The need to remove heat from the data centre’s interior provides a low temperature heat source. Air cooling is the most common method, which means surplus heat temperatures of 20° to 45° C. High-power data centres are cooled by more efficient liquid cooling systems. The temperatures of the cooling liquid at these centres are from 22° to 80° C downstream from the servers.

Data centres typically produce surplus heat at a relatively steady rate. This heat can be used locally for heating the property and domestic water, and larger data centres, in particular, are suitable for being connected to the district heating network through heat pumps if there is a network nearby.

In its waste heat study[73], AFRY estimated that there are less than ten data centres larger than 5 MW in Finland, and around 50 medium-size data centres of 0.5-5 MW. AFRY puts the total electrical power of data centres currently optimal for waste heat recovery at approx. 300 MW. With the full load hours of 6,000 h/a, this corresponds to heat production of approx. 2 TWh, most of which would be technically usable for district heating.

According to the Finnish Tax Administration’s statistical database, the electricity consumption of large data centres of over 5 MW was about 800 GWh in 2019.

AFRY estimates that the amount of waste heat currently sold by the largest individual data centres is in the range of tens rather than hundreds of gigawatt hours annually. The untapped potential would thus be significant. The utilisation of waste heat produced by data centres is associated with many of the same challenges as the recovery of waste heat from other industries: data centres may be far away from areas where heat is consumed, and the energy sector is not the primary operating area of the heat producer. The required investments may also not necessarily meet the yield requirements of data centre owners.

[73] AFRY Management Consulting Oy. 2020. Selvitys hukkalämmön potentiaalista ja tehokkaasta lämmitksestä, 9/2020.

2.4.5 Heat pumps

Heat pumps recover thermal energy and use a transfer medium to convert it to a suitable temperature. Heat pumps come with a large variety of technologies and in many sizes, and the range of suitable heat sources is wide. Heat pumps can capture heat energy from ambient air, ventilation exhaust air, flue gases, soil, water bodies or condensate waters and sewage. Heat pumps are used for heating buildings as well as in the energy and process industries.

Tens of thousands of heat pumps are installed in residential buildings every year. Heat pumps have become the most popular main heating system in new single-family houses. According to Statistics Finland, more than half a million air heat pumps and more than a hundred thousand ground heat pumps are operating in Finland, as well as approx. 35,000 exhaust air heat pumps. Heat pump energy is also used for heating service, agricultural and industrial buildings. The amount of primary energy produced by heat pumps totalled 6.6 TWh in 2018. Residential buildings accounted for more than 90% of this figure.

Heat pump operation consumes a significant amount of electricity. The coefficient of performance (COP) describes heat pump efficiency and indicates how much heat the pump generates in proportion to the electrical energy it uses. The lower the temperature difference between the heat source and the pipe system supplying heat, the better the COP value. In the Finnish climate, the average annual COP of a ground heat pump is in the range of 3.5, whereas the COP of an air heat pump is 1.8.

The size of the heat pump depends heavily on both the site and the dimensioning method chosen. For example, if the objective is to meet all the needs for heat in a single-family house with a ground heat pump, it must be in the range of 60 kW (peak hot water consumption). Frequently, however, other methods are used to meet the highest peaks in heating needs, which means that the heat pump capacity could be as low as under 10 kW, which equals the peak load of the building's heating system, either fully or almost fully. The peak heating capacity of rooms in terraced houses and apartment blocks is as high as several tens of kilowatts, depending entirely on the size of the building, and that of hot water is hundreds of kilowatts. In industrial installations, the power range of heat pumps is even wider and entirely case specific, ranging from a low performance as discussed above to the range of several megawatts.

A report on the potential of using surplus heat in industry produced by Pöyry notes that mechanical heat pumps are suitable for many different industrial purposes from the drying of fuels and raw materials to the heating of gases and liquids as well as the utilisation of heat in district heating and cooling. With mechanical heat pumps, temperatures even lower than 10° C can be used to produce district heating at a reasonable COP. Better use could indeed often be made of surplus heat in industrial installations by means of advanced heat pumps, especially for heating and even for selling heat to the district heating network.

Kiilto Oy's chemical factory in Lempäälä is a high-profile example of using a heat pump in an industrial installation. A Finnish company called Calefa Oy delivered the heat pumps to the factory as part of its new energy system. The energy recovered by the heat pumps is reused for two purposes: heat is channelled to heating the factory buildings, and after the water has released its heat, it is returned to cool a polymerisation process. The heat pumps also make more cooling capacity available for the plant. The heat pumps have reduced the plant’s natural gas consumption by over one third, or approx. 1,800 MWh, and its carbon dioxide emissions have gone down by 310 tonnes[74].

Conventional heat pumps can produce a temperature of approx. 65° C, which is not sufficient for industrial processes requiring higher temperatures. Heat pump technology has evolved significantly in a few years, and industrial heat pumps representing new technology are currently in the market that can produce temperatures exceeding 100° C. At best, temperatures of up to 120° C or 130° C can be obtained, and pumps producing even higher temperatures are already being developed.

If surplus heat is to be supplied to the district heating network, the heat pump needs a separate connection pipe, heat metering is required, and electricity consumption may have to be metered separately for electricity taxation purposes. For technical reasons, a district heating supply connection cannot usually be used to feed heat into the network, as this would cause problems either at the site or in the district heating network. Consequently, the source of excess heat must be relatively large to make it economically viable to feed the heat into the district heating network. The new Espoo Hospital, which started operating in 2017, is an example of how surplus heat generated in a building can be used in the district heating network. The heat pump system captures surplus heat generated by the hospital's cooling system and brings its temperature up to a level compatible with Fortum's district heating network[75].

[74] Yle, 25 May 2019, Liimatehdas valjasti hukkalämmön hyötykäyttöön: Päästöt putosivat ja energialasku pieneni 100 000 euroa vuodessa. https://yle.fi/uutiset/3-10800350
[75] Granlund Oy, 27 May 2014. https://www.granlund.fi/uutiset/espoon-uusi-sairaala-fortumin-kaukolammon-tuottajaksi/

A heat pump makes it possible to use heat generated by district cooling in the district heating network. In this case, a heat pump is connected between the district cooling and district heating networks, and it uses the return water of the district cooling network (flow coming from customers) as its heat source. The heat pump recovers heat from this water, cooling it to the extent that it can be returned to the district cooling network as supply water (flow to customers). On the other hand, a heat pump is used to bring the recovered low-temperature heat up to a temperature at which it can be fed into the supply side of the district heating network. A practical example of this is Helen Oy's underground Esplanadi heat pump plant, which is located under Esplanadi street in Helsinki at a depth of approximately 50 metres. At best, the plant's large heat pumps produce district heating at 2 x 11 MW and district cooling at 2 x 7.5 MW. A huge 25 million-litre cold water reservoir, which is 40 metres deep and 80 metres long, is co-located with the heat pump plant.

An alternative to a conventional compressor heat pump powered by electricity is an absorption heat pump, which uses chemical reactions to produce cooling without significant electricity consumption from a heat source alone. However, as the temperature of the heat flow to be utilized should be high – water temperature should be at least 70° C (and preferably significantly higher), for example – and the COP of the absorption heat pump is significantly lower (category 1 or less) than the COP of compressor heat pumps, absorption heat pumps are only more cost-effective than compressor heat pumps when heat at a very low price and high temperature is available. In addition, the recent electricity price levels further undermine the competitiveness of absorption heat pumps. For these reasons, compressor heat pumps are currently used almost exclusively for cooling, apart from some individual exceptions.

As mentioned above, heat pump technology has advanced significantly in the last few years and such solutions as high temperature heat pumps have entered the market. They can produce heat at temperatures clearly exceeding 100° C, thus eliminating the need to increase the temperature separately, for example for a district heating network. It is also worth noting that R&D has successfully improved the COP values which, together with other factors, will further improve the attractiveness of heat pumps and are likely to significantly increase their number in the future.

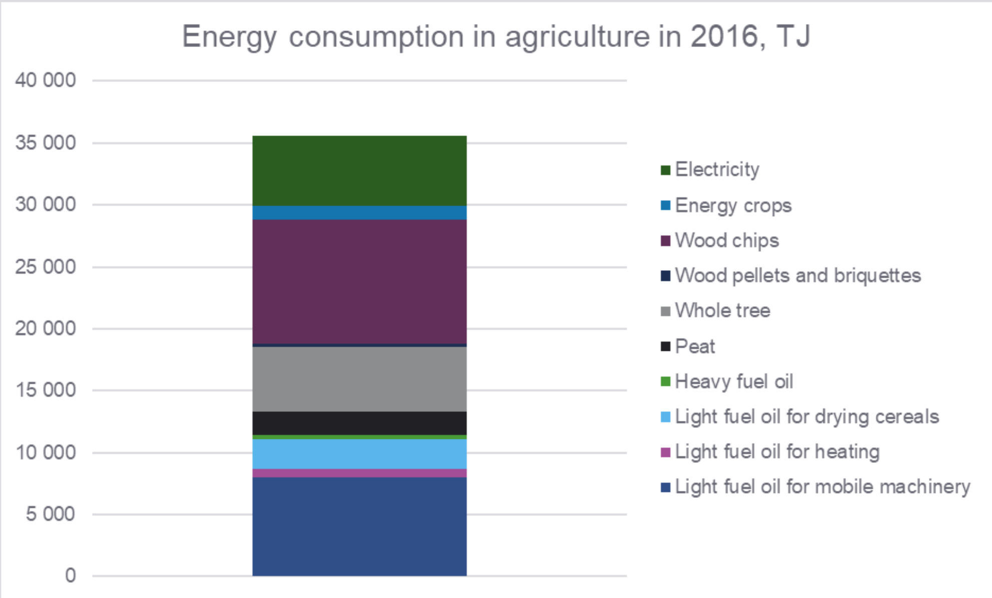
2.4.6 Outlook for energy consumption in the agricultural sector

The agricultural sector has in recent decades increasingly transitioned to renewable energy use for heating, with wood chips as the most important fuel. As little as around 9% of the energy used to heat agricultural buildings and dry cereals is today produced with fuel oil, and dryers account for the greatest share of this consumption. While this declining trend will continue, it is likely to slow down from its current rates. Oil is increasingly used in backup heating systems and when supplementary heat is needed fast. Large wood chip plants are slow to start, and operating them at a very low capacity, for example in the summer, is not recommended for technical reasons. The declining trend of oil use in dryers continues, however, even if the use of wood chips also sometimes has its problems in these installations. Such new solutions as biogas and technical methods that boost energy efficiency contribute to speeding up the development.

The largest users of fossil fuels on farms are tractors and other machinery powered by light fuel oil (Figure 33). The use of oil is declining at a slower pace in machinery than in heating, as no all-round alternative is immediately within sight. While tractors powered by biogas, ethanol and electricity have been developed and some are already on the market, their uptake is slow. However, electricity and gas can become significant power sources replacing fuel oil in small and medium-sized tractors and machines faster than in the largest tractors. Farms are also showing more interest in producing their own fuels in biogas plants. In the field of machinery fuels, however, the fastest change is likely to be brought about by the biocomponent in light fuel oil and its blending ratio.

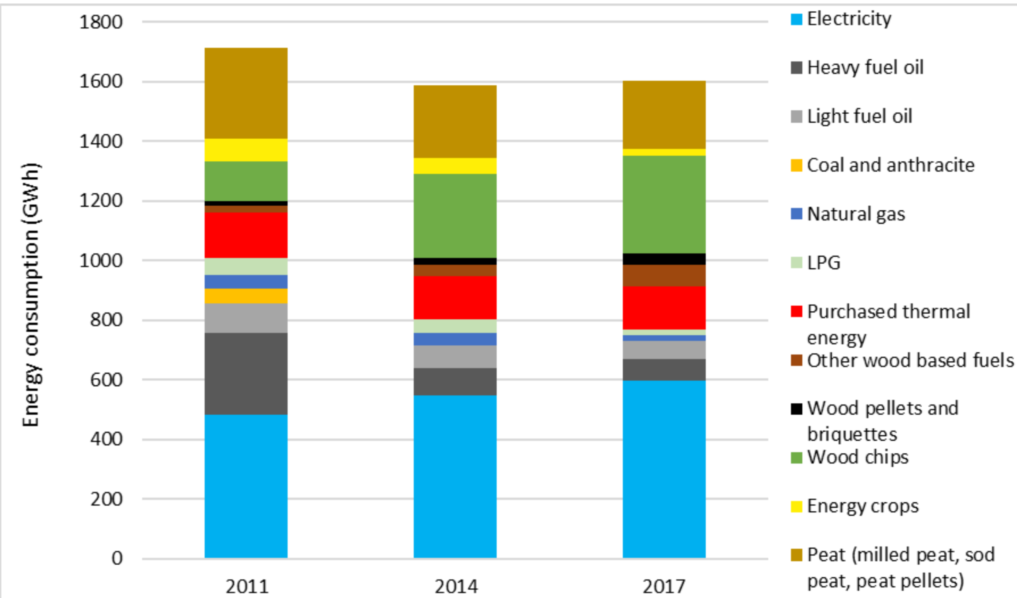
As automation and lighting solutions advance, electricity consumption will continue to grow in the agricultural sector and especially in greenhouses (Figure 34). Equipment powered by electricity is increasingly used in production, and existing technology is being replaced by electrical alternatives. In greenhouse cultivation, production that requires artificial light round the year appears to continue its growth. As the consumption of electrical energy goes up, interest in home-generated electricity is also growing constantly. In 2019, the greatest number of solar energy investment projects supported by the Ministry of Agriculture and Forestry were carried out on farms, which also made some investments in the production of wind power and electricity from biogas.

Figure 33. Energy consumption in agriculture in 2016, TJ. Source: Natural Resources Institute Finland.



While the total energy consumption of greenhouses has decreased slightly compared to 2011, the share of electricity consumption has simultaneously increased (Figure 34).

Figure 34. Total energy consumption in greenhouses. Source: Natural Resources Institute Finland.



2.5 Current state assessment of energy taxation

Almost a decade has now passed since the reform of the early 2010s that brought in environmentally-related energy taxation. During this period, the world has changed in many ways. More ambitious climate policy targets have been set, and the legislative environment has changed and is still changing rapidly. Technology for energy production and use has also taken great strides, and this advancement is set to continue. On the other hand it would be justified to say that, after the reform which introduced environmentally-related taxation, increases in energy tax levels have been driven especially by fiscal objectives, and changes affecting individual sectors or product groups have been motivated by the political needs of the time. In the meantime, number of tax expenditures granted as tax exemptions and reduced tax rates have grown. Consequently, we cannot take it for granted that the current energy taxation, together with the other policy instruments, still adds up to the most appropriate and cost-effective regime from the perspective of climate and energy policy and fiscal objectives. The exact structure and level of energy taxation that would be optimal is a complex question, and the answer depends on how the objectives are weighted. An exhaustive answer to this question cannot be given within the confines of this report. In addition, the current Energy Taxation Directive, which has become obsolete in some respects, places certain restrictions on the structure of taxation. These challenges are discussed in section 2.2.1. In order to develop energy taxation, however, this Chapter attempts to outline some of the impacts of energy taxation and partly also assess whether or not they are appropriate in terms of the objectives set for energy taxation.

The current state assessment as well as the working group’s proposals focus on the taxation of energy production and electricity in different sectors. Transport taxation issues are partly excluded from this discussion, as they are currently being addressed by a dedicated working group. The structure of transport fuel taxation is nevertheless closely linked to the structures of other energy taxation, which is why it has also been assessed by the Energy Tax Working Group.

2.5.1 Climate targets and cost-effectiveness of emissions reductions

National emissions reduction measures can aim for a number of things. Obligations imposed by the EU set a minimum level for Finland’s climate policy in the effort sharing and land use sector. In addition, the Government has set carbon neutrality by

2035 as Finland's climate policy target. Rather than calculated emissions reductions in the effort sharing sector or at the national level, what counts in mitigating climate change is reducing emissions at the global level. From the perspective of assessing the cost-effectiveness of national incentives for reducing emissions, the way in which EU obligations and the national carbon neutrality target are reconciled with global emissions reductions is a key value choice. Without assigning values to the objectives, assessing the cost-effectiveness of emissions reduction incentives is impossible, as the effectiveness of emission policy instruments depends on whether the aim is at reducing emissions at the sectoral, national or global level. As global greenhouse gas emissions ultimately are the key to global warming, it is justified to examine the effectiveness and cost-efficiency of emissions guidance when assessing the current state, especially from the perspective of global emission reductions, while taking EU obligations and the national target of carbon neutrality into account. For more information on EU climate and energy policies and the regulation of emissions in the emissions trading, effort sharing and land use sectors, see section 2.2.4.

Additionality of emissions reductions and national emission reduction measures

In order to reduce emissions at the global level, it is essential that the national reductions in emissions achieved through the measures are as additional as possible on global terms; in other words, they should result in genuine additional reductions that would not have taken place without these measures. Several factors undermine the additionality of the national emissions reduction measures. Some of the most relevant aspects in terms of national energy taxation are discussed in this section.

In the 2010s, environmental economists generally believed that without the cancellation of emission allowances, national incentives which overlap the emissions trading sector would add up to climate policy which has no effect whatsoever on reducing global emissions. Any emission allowances saved in the national emissions trading sector could ultimately be sold and used in other countries participating in the emissions trading scheme, which would mean that there would be no reduction in the total emissions in this sector. In literature, this is referred to as the waterbed effect.

In late 2018, a market stability reserve was introduced in the EU's emissions trading scheme with the aim of reducing the oversupply of allowances. The market stability reserve and the allowance cancellation rule included in it have punctured the waterbed, at least on a temporary basis, making it possible to reduce greenhouse emissions generated in the EU by means of national policy instruments in the emissions trading sector. The length of the time for which the waterbed effect has been eliminated is unclear, however. Some recent studies have attempted to assess the force of the waterbed effect in the light of the current regulation, ending up with rather divergent estimates[76], which illustrates the complexity of the emissions trading system. It should also be noted that the existence of the waterbed effect will depend on not only the current legislation but also future political decisions. For example, the very introduction of the market stability reserve has shown that EU decision-making is not completely detached from the price of emission allowances. In principle, it is therefore possible that national policies which overlap with the emissions trading scheme will make it politically easier to impose more ambitious emissions reduction targets in the EU's emissions trading sector, as this reduces the price of emission allowances. On the other hand, however, it is very uncertain how responsive EU decision-making will be to the emission allowance price.

Even if the waterbed of the emissions trading sector had been permanently punctured, due to possible carbon leakage, more stringent national policies will not necessarily lead to corresponding reductions in emissions at the global level. On the one hand, carbon leakage may occur in situations where the production of a commodity can be easily transferred from one country to another. This applies particularly to energy-intensive industries which compete on the international market; the country in which a commodity is produced has little or no effect on its demand. This also applies to the Single Electricity Market, for instance. On the other hand, situations in which there is no global flexibility in the supply of climate-sustainable goods while the demand for them is global present a significant risk of carbon leakage. Replacing fossil fuels with biofuels could be cited as an example of this. An increase in the domestic demand for biofuels pushes up the price of biofuel raw materials and may in some cases make the limited supply used to produce them unavailable for other uses, thus increasing the use of fossil fuels elsewhere. Additionally, if the increased demand for raw materials led to a reduction in the carbon sink of the global land use sector, the impact could even be negative.

Estimating the costs of emissions reductions

From the perspective of assessing the cost-effectiveness of national emission policies, key value choices include the level at which the costs arising from such policies are examined and how value is assigned to the costs of different actors in comparison with each other. Should the costs be examined at the level of Finnish society or at the global level? What is the value of the same financial cost for people in dissimilar financial positions? What about the regional level? Naturally, no single

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[76] See e.g. presentations given by Grischa Perino and Peter Birch Sorensen at a seminar on emissions trading and the market stability reserve organised by Sitra. https://www.sitra.fi/en/ events/functioning-eu-ets-new-msr/

correct answer to these questions exist, and detailed and explicit value assignments are often difficult to make.

A significant challenge lies in the fact that there is considerable uncertainty about how the costs incurred by actors in society are assessed. Assessing the direct economic cost of emissions reduction measures alone is often challenging. The uncertainty increases when indirect effects on the national economy and citizens' economic position are assessed. The effects on general government revenue and expenditure, or the so-called fiscal impact, is often easier to assess, at least over the short term. While the fiscal impact is central in terms of the sustainability of public finances, it may not be relevant to assessing the societal cost-effectiveness of emissions reductions, as the fiscal impact often is about an income transfer between the private and public sectors. For example, while higher energy taxes are likely to have a positive fiscal impact by increasing general government revenue, they also reduce citizens' disposable income. To simplify the assessment of cost-effectiveness and to reduce the uncertainty associated with it, societal costs in this report mainly refer to direct financial costs incurred by Finnish society. This perspective is obviously too narrow in many respects, which is why an effort is made to complement this approach by assessing energy taxation separately from the viewpoints of energy policy and social policy, among other things.

Energy taxation and cost-effectiveness of emissions reductions

Estimates of the costs incurred from emissions reductions are associated with significant uncertainties, and the public authorities themselves rarely if ever have the best knowledge of where and how emissions reductions can be realised at the lowest economic cost. Thus, as a basic premise, it is justified to strive for policy instruments that are technology neutral and policies affecting all sectors with equal strength. However, the risks of carbon leakage as well as sector-specific obligations and non-fiscal policy instruments must also be factored in at the national level, and deviations from uniform emission policy instruments can thus also be justified.

Effort sharing sector

Most of the emissions not included in the emissions trading sector have been defined as belonging to the effort sharing sector as discussed in section 2.2.4. The binding emissions reduction targets for 2030 set for the Finnish effort sharing sector are very high and unlikely to be attained without stronger guidance. Around two thirds of the emissions in the effort sharing sector are generated in the energy sector. Energy taxation thus arguably plays a key role in cost-effective promotion of emissions reductions in the effort sharing sector.

The level of incentive created by energy taxation is considerably higher in transport than in the remainder of the effort sharing sector, especially regarding incentives for electrification. As an illustrative indicator of incentives for electrification can be regarded the tax cost of an avoided tCO_2, which can be used to put the tax revenues generated from the use of different technologies in proportion to the differences in the emissions generated by these technologies at the same utilisation rate. When a diesel-powered internal combustion engine is replaced with an electric motor, the energy tax cost of an avoided tonne of carbon dioxide in the effort sharing sector is approximately EUR 300/tCO_2 for cars, approx. EUR 200/tCO_2 for HGVs and approx. EUR 60/tCO_2[77] for machinery. As technologies are advancing rapidly, electrification can be a cost-effective way of reducing emissions, both in transport and the remainder of the effort sharing sector. From the perspective of meeting the emissions reduction targets in the effort sharing sector, it is justified to ensure sufficient incentives for electrification, while also avoiding excessively forceful policies. Energy tax incentives for the electrification of transport can already be considered very strong, while the incentives related to other energy consumption are considerably weaker.

Although the level of carbon dioxide tax in transport fuel taxation is high, its impact on the choice of transport fuels can be considered low. The reason for this is that on the one hand, the differences between the specific emissions of the most significant fuels, or fossil petrol and diesel, are minor; on the other hand, the tax exempt prices of the biofuels which replace fossil fuels (marginally) have been much higher than those of fossil fuels[78]. The decisive factor in the use of liquid biofuels in road transport has thus mainly been the main instrument for promoting biofuel use, or the obligation to distribute biofuels and the penalty for non-compliance, which amounts to approx. EUR 1.36 per litre. At its current level, the carbon dioxide tax can consequently be seen as mainly having an incentive effect on the total volume of liquid biofuels used in situations where the difference between the tax exempt prices of biofuels and fossil fuels is somewhat higher than the penalty fee for the distribution of biofuels. Purchasing and distributing biofuel is worthwhile for the fuel distributor if it is no more expensive than the sum of the fine and CO_2 tax. From the viewpoint of meeting the

[77] Assuming that a diesel car consumes 5.64 litres/100 km and an electric car 17.5 kWh/100 km, while both weigh 1,900 kg. In HGVs and mobile machinery, the efficiency of the electric motor is assumed to be 2.5 times that of the diesel engine. As such, there are grounds for the higher energy taxation of cars than HGVs, which are discussed in section 2.5.4. This does not mean that higher incentives for electrification should be provided for cars, however.

[78] At the market prices of early August, the price difference between fossil diesel oil and, for example, biofuel produced from used cooking oil was around 75 cents per litre (in fossil diesel energy units). Converted into the cost of the emissions reduction, this equals nearly EUR 300 per tonne of CO_2 in the effort sharing sector. The current level of the carbon dioxide tax on fossil diesel is 24.56 cents per litre.

emissions reduction target in the effort sharing sector cost-effectively, the maximum level of the incentive arising from the penalty fee related to the distribution obligation and the carbon dioxide tax component (around EUR 640/tCO_2) can be considered extremely high[79].

Emissions trading sector

The Finnish Government's target of carbon neutrality by 2035 is highly ambitious. At the current emission allowance prices, achieving this target will probably require significant national emission policies, also in the emissions trading sector. The energy sector accounted for 84% of the emissions in the emissions trading sector in 2018. As the price of the emission allowance in the EU's emissions trading scheme is significantly lower than the estimated cost of emissions reduction measures in the effort sharing sector, it would be cost-effective at EU level to reduce emissions especially in the ETS sector by more stringent emission policy. The cost-effectiveness of national policy instruments in the emissions trading sector, including energy taxation, is however less clear as it depends on the intensity of the waterbed effect and the likelihood of carbon leakage, both of which are associated with uncertainties. As the cost of emissions reductions achieved in the effort sharing sector is very high, at least currently, it is possible that significant global additionality in emissions reductions could be achieved more cost-effectively in the emissions trading sector. On the other hand, in some activities in the emissions trading sector, reducing emissions will be difficult or impossible without winding down the activity or replacing current processes with technologies that have not necessarily even been invented yet.

As discussed in section 2.2.5, the level of energy taxation in Finland is already high in general compared to other EU countries. Taxation has to some extent been differentiated by type of energy use, similarly to other countries. The highest tax levels for fuel use included in emissions trading are applied to separate heat production, in which the tax levels correspond to the general levels for heating fuels in the tax model[80]. In CHP, the effective tax levels for heat production fuels are roughly one half of those applied to separate heat production. The effective tax levels for energy-intensive industries are in most cases well below one fifth of the general tax levels. In

[79] From the perspective of global emissions reductions, the effectiveness and cost-effectiveness may be even poorer as significant questions marks are associated with the additionality of liquid biofuel use.

[80] In the emission trading sector, the general tax level set out in the tax model in practice mainly applies to natural gas used in separate heat production, to the extent that is it not covered by the tax refund for energy-intensive companies. The tax base of natural gas, excluding natural gas fired CHP, was around 13,600 TJ in 2018, of which around 5,000 TJ were eligible for the tax refund for energy-intensive companies, and the share of building-specific heating and transport was around 2,400 TJ.

addition, the use of fuels is fully exempt from tax in electricity production, as electricity is taxed as a final product, and in many industrial processes.

From the perspective of cost-effective emissions reductions, the different taxation of energy uses is justified due to their different carbon leakage risks. The tax levels applicable to separate heat production in keeping with the general tax model can already be considered quite high for installations in the emissions trading sector. This means that taxing CHP at a lower rate than separate heat production is well-founded, taking into account the carbon leakage enabled by the electricity market. For technical reasons, CHP consumes less fuel than when corresponding amounts of electricity and heat are produced separately. In the interest of energy and resource efficiency, favouring CHP over separate production is consequently justified. It is not clear, however, that the current reduction is specifically optimal.

Tax treatment of different fuels and electricity

Due to the general structure of energy taxation, fuels are treated equally in taxation, with the exception of peat, biogas and biomass fuels. Biogas and biomass fuels are exempt, while the peat tax is very low compared to other fossil fuels. Energy taxation incentives for the use of peat, biogas and biomass fuels have been increased significantly in the 2010s, as the general energy tax levels for machinery and heating fuels have gone up while peat, biogas and bio-based fuels have remained either exempt or subject to lower taxes. From the perspective of cost-effective emissions reductions, the level of incentive created by tax exemptions or reductions is questionable.

The low tax level for peat has been justified by security of supply and competitiveness in relation to imported fossil fuels and by the fact that without it, the price of timber used as forest industry raw material would increase, and timber material would end up being used in energy production instead of peat. The consequence of this would be carbon leakage in the form of increased forest harvesting in the land use sector, or forest industry production relocating to other countries with cheaper raw materials. This view is underpinned by the assumption that the use of biomass fuels for energy would remain categorically exempt from tax. This does not need to be the case, however, as it is also possible to impose energy taxes on biomass fuels. The use of timber material for energy could also be taxed to encourage its use as raw material. Timber material is currently not eligible for the subsidies available for electricity produced with wood chips, and in energy taxation, tall oil is taxed at the level applied to heavy fuel oil[81] to encourage its use for purposes other than energy production.

[81] The tax on tall oil is thus higher than what the energy tax structure would require.

From the narrow viewpoint of cost-effective emissions reductions, it is thus difficult to find unarguable justifications for fuel tax exemptions granted as an exception to the general tax structure. In cases where a limited supply of raw materials causes carbon leakage to other sectors, on the other hand, stronger tax incentives than those provided by the general tax model for these fuels may be considered justified.

In addition to incentives that guide the use of fuels, the different tax treatment of energy products and electricity is a key factor. In the future, electrification of heat production may prove a cost-effective way of reducing emissions also in the emissions trading sector. Until now, the marginal source of electricity production has mainly been fossil or biomass fuels. Consequently, the taxation of electricity consumption has been based on climate and environmental policy criteria aimed at promoting energy savings and energy efficiency, and thus ultimately reducing emissions. However, the marginal source of electricity production may be increasingly emission-free in the future, which may reduce the importance of electricity tax for reducing emissions.

2.5.2 Energy policy objectives

The three main objectives of energy policy are security and continuity of supply, competitive energy prices for businesses and consumers, and sustainable energy generation in terms of the climate and the environment. Energy taxation as a policy instrument has an effect on all these objectives. The carbon dioxide component of the general energy tax structure takes into account emissions from combustion and life-cycle emissions; in other words, it assigns values to fuels based on the life-cycle reduction in emissions that can be achieved by using them. Tax levels, on the other hand, have an impact on competitive energy prices. The impact of energy taxation on the security and continuity of energy supply is indirect in the sense that it boosts the effect of other policy instruments and the ongoing energy transition.

Continuity of supply mainly refers to ensuring that the required quality of energy is available at the right time in normal conditions. The continuity of electricity supply is linked to the uninterrupted operation of the distribution network and ensuring a balance between the supply and consumption of electricity. The continuity of supply of distribution networks is ensured by targets set for distribution network operators in legislation. Regarding the power balance of electricity, adequate electricity production capacity and reliable import capacity play a key role. The low market price of electricity and the increase in variable electricity production have reduced the electricity generation capacity that can be controlled in the electricity market. As they are weather dependent, wind and solar power bring unpredictability to the availability of electric power. Condensing power production capacity has already been phased out in practice, and a significant share of CHP production will be replaced by separate heat production. The current energy tax structure includes a subsidy for CHP, providing an incentive to maintain electricity generation capacity.

The taxation of heating fuels has an impact on the profitability of CHP plants, even if the fuels used for electricity production are exempt from tax. If higher taxes are imposed on fossil fuels, this may speed up the decommissioning of electricity production capacity at CHP plants. As non-combustion heat production options are partly still undergoing development or the possibilities of using them depend on local heat sources, CHP may be replaced by the combustion of wood chips in bioboilers.

Peat is typically used in fuel blends together with wood chips. Increasing the tax on peat would affect the mutual competitiveness between peat and wood chips. A higher tax on peat would improve the plant's ability to pay for wood. Locally, it would mean that replacing a larger share of peat with wood chips would pay off. This, in turn, has an impact on the continuity of fuel supply. The shelf-life of the chips is limited, and they cannot be stored from one year to the next.

Security of supply refers to society’s ability to maintain the basic economic functions required for ensuring people’s livelihood, the overall functioning and safety of society, and the material preconditions for military defence in the event of serious incidents and emergencies. To prepare for potential disruptions in the supply of imported energy, imported fuel stocks corresponding to the normal consumption of five months are maintained. Most of these comprise state emergency stocks, which Finland is also obliged to maintain under EU laws and international agreements (IEA). In practice, the security stockpiling of natural gas takes the form of replacement fuels, for example light fuel oil. Coal is stored near power plants. The declining trend in the use of fossil fuels, which is partly also due to their taxation, will have an impact on the size of the security stocks. This should be addressed when considering the objectives of security of supply in the future.

2.5.3 Fiscal objectives

Chapter 2.3 dealt with the actual development of energy tax revenues and projections based on current legislation until 2030. The projections indicate that nominal energy tax revenues will go down by about EUR 0.6 billion in the 2020s. A projection extending until 2030 obviously involves significant uncertainties. The rate at which the electrification of transport will take place and the energy efficiency will improve in the 2020s is particularly uncertain. On the other hand, fuels used for energy production, which account for approx. EUR 0.3 billion, are not particularly important from the perspective of general government finances even at present, and the tax revenues generated from them will continue to decrease. The tax revenues accrued from electricity are expected to go up along a moderate increase in electricity consumption. While it is possible to make up for the decreasing energy tax revenues by increasing energy taxes and expanding the tax base, maintaining the fiscal importance of energy taxation compared to other tax revenues still is challenging at the moment, as unlike the tax bases of income and value added taxes, the energy tax bases do not keep up with the rate of nominal economic growth. On the one hand, this is due to the fact that energy taxes in Finland are unit taxes, which do not change in nominal terms without a specific decision to increase taxes; on the other hand, the growth of energy tax bases does also not follow real-term economic growth. The structure of taxation is also defined by the Energy Taxation Directive, which thus imposes certain restrictions on increasing tax revenues. These challenges are discussed in section 2.2.1.

Even if the use and production of energy became completely emission free, taxing them could be justified from the fiscal point of view. Minimising the impacts of energy taxation to avoid fiscal incentives for making choices between fuels and technologies could be justified for purely fiscal reasons. The optimal level of energy taxation depends, among other things, on the behavioural and income distribution effects of energy taxation in relation to other taxation. As energy consumption is often rather inflexible, energy taxation potentially constitutes a good source of tax revenue[82]. On the other hand, a higher tax will exacerbate distortions of taxation: a tax that is high compared to the tax exempt price of energy may result in significant deadweight losses even in conditions of low price flexibility. It is possible that, if electricity production is cheaper and emission free in the future, taxing economic operators' electricity consumption may have a more negative impact on economic productivity[83], among other things.

[82] For example, Ramsey's model is based on the idea of minimising deadweight losses. Commodities whose equilibrium is greatly changed by the tax should be taxed at a lower rate than those whose equilibrium changes little. On the other hand, the Ramsey model relies on rather specific assumptions (such as no income differences, 0 cross-elasticity between commodities), which are not actually realistic.
[83] On the other hand, it is anything but certain that electricity prices would be lower in the 2020s than in the 2010s.

2.5.4 Competitiveness and employment

Energy taxation consists of levying taxes on both consumption and companies' intermediate production inputs. If the use of intermediate inputs does not have negative external effects and consumption can be taxed, economic theory does not consider the taxation of intermediate products necessary[84]. If there are no negative external effects, the taxation of intermediate products undermines economic efficiency by guiding operators to cut down on the use of intermediate products in production. This is the conventional take of economic theory on why it is justified to tax companies at lower levels than households for their energy consumption. The structure of energy taxation partly reflects this approach, even though no explicit line has been drawn between business and household use in Finland[85]. For example, the tax levels for commercial transport are reduced, as the tax level for diesel is lower. Reduced tax rates for large economic sectors, which are defined as tax expenditures in Finland, have similar features. Rather than applying to all businesses, however, such expenditures as a reduced tax rate for electricity are limited to industry, mining, data centres, greenhouses and other agricultural sectors.

In the international context, taxing energy-intensive companies at a lower level than other businesses has its grounds. Taxes affecting energy prices may potentially undermine the operating conditions of energy-intensive companies competing in international markets, especially if the costs of alternative production methods are high. Unlike other excise duties or VAT, energy taxes thus affect the costs of the export industry. On the other hand, energy taxation is only one of the factors affecting the price of energy, and additional factors with a key impact on a company's international competitiveness include the prices of other inputs, productivity and taxation of companies' profits[86] as well as other indirect economic factors.

When we assess the impacts of energy taxation on the competitiveness of Finnish production, it is justified to distinguish between short-term and long-term competitiveness. In the short term, the relative success of Finnish production in the international market is influenced by the relative feasibility of production, which in turn is affected by the relative costs of production inputs between countries. Changes in

[84] See Mirrlees et al. 2011, Chapter “6. Taxing goods and services”. https://www.ifs.org.uk/publications/5353
[85] On the other hand, the Energy Taxation Directive defines minimum tax rates at different levels for business and non-business use.
[86] Laukkanen, M., Maliranta, M., 2019. Yritystuet ja kilpailukyky. Publications of the Government´s analysis, assessment and research activities 2019:33. http://urn.fi/URN:ISBN:978-952-287-736-9

energy taxation can thus have short-term impacts on production levels and unemployment.

In the long term, the national pay level can be expected to adapt, which is why energy taxation can be presumed to have a long-term impact mainly on the structure of national production. Energy taxes that are high compared to other countries could have a negative impact on the structure of Finnish production and income level if this resulted in production associated with high value added and a high pay level moving abroad. On the other hand, it is possible that stronger environmental policies would contribute to the development and uptake of new technologies, which could also improve the competitiveness of some sectors in the long term[87].

As discussed in section 2.2.5, energy tax rates in Finland are generally high by international standards. On the other hand, the reduced electricity tax and tax refunds for energy-intensive companies have kept the energy tax burden of the export industry at a low level.

In addition to direct costs, energy taxation can also have an indirect impact on the competitiveness of industry, for example through the prices of transport services. On the other hand, while it may be difficult for industrial companies to pass on direct or indirect costs to product prices, the cost may eventually be passed on to other inputs, as a result of which the final impact on the competitiveness of industry may be minor. In addition to the pay level, the price of timber is an example of a production input that absorbs costs when the demand for wood is high in proportion to its supply potential.

2.5.5 Social and regional perspectives

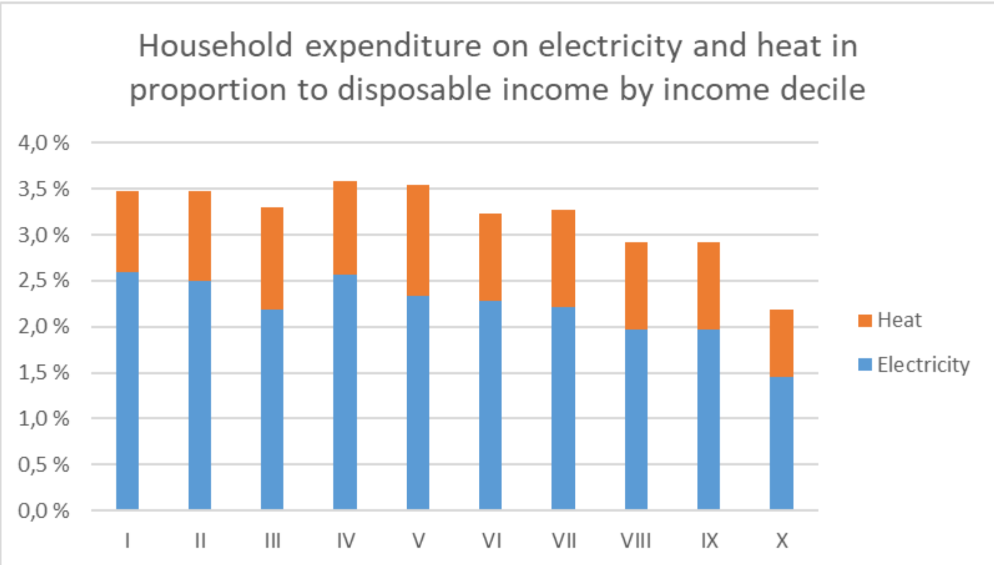
Electricity and heating

Figure 35 shows households' expenditure on electricity and heat in proportion to disposable incomes. The relative expenditure on electricity is the lowest in the highest income classes at approx. 1.5%. Those in the lowest four deciles spend approx. 2.5% of their income on electricity, and electricity taxation can thus be regarded as somewhat regressive. The expenditure on heat in proportion to income is more even than in the case of electricity. The highest decile's expenditure on heat in proportion to

[87] The Government´s analysis, assessment and research activities are currently conducting a project titled Green Actions - The impacts of climate policy on employment (VITO), which examines the impacts of climate policy on employment, competence needs and professional structures.

income is only slightly lower than that of the other deciles. As heating costs, the figure takes into account direct costs related to heating (heating fuels, district heating, the share of heat in the hot water charge) and the share of heating in building maintenance charges. The figure does not factor in the possible impacts of heating costs on those living in rented accommodation or the owners of rented dwellings, as the impacts are unclear in this respect. On the one hand, the impact of heating costs on rents in the free market has not necessarily been very significant, as the rent level of these dwellings has not been determined on a cost basis, especially in the growth centres of Southern Finland where the supply of dwellings has been affected by other constraints. On the other hand, heating costs may have played a more significant role in the rent of partially cost-based rents, such as rents for interest-subsidised housing. In addition, it should be noted that the lowest income households mainly rely on different social benefits. As these benefits are mainly linked to consumer prices, a rise in the consumer prices of energy contributes to offsetting the impact of energy costs on the lowest income households through index-linked benefits.

Figure 35. Households' expenditure on electricity and heat in proportion to their disposable income. Sources: Statistics Finland, Ministry of Finance.



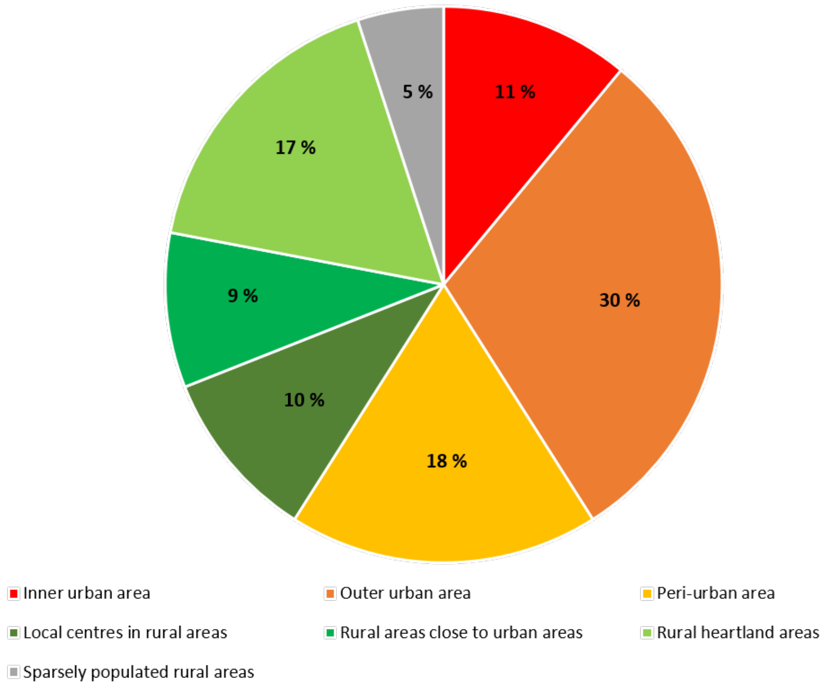
The examination by income decile does not necessarily bring up all the relevant social policy impacts, however. In principle, it is possible that energy taxation would have a clearly more negative impact on individual households whose housing-related energy costs differ from the average consumption of their income decile. Low-income households dependent on oil heating have been a particular cause for concern, as their possibilities of moving away from oil heating have been considered poor. However, it should be noted that oil heating costs are mainly incurred by owner-occupiers, and that the disposable monetary income of low-income owner-occupiers after housing costs is significantly higher than that of low-income households in rented housing. The median disposable income of a low-income household living in an owner-occupied dwelling after housing costs is approx. EUR 10,100 a year, compared to approx. EUR 6,500 for a household living in rented housing. Comparisons of the wealth levels of low-income households also suggest that households living in owner-occupied dwellings regarded as low-income in terms of their monetary income have clearly more wealth than those living in rented housing. For those living in owner-occupied housing with the lowest income, the median net value of the dwelling they own is approximately EUR 86,500; this figure is EUR 55,000 in the lowest and EUR 132,000 in the highest quartile, while the total net wealth of those living in rented housing is as low as approx. EUR 16,500 even in the highest quartile.

While these figures do not provide direct information on the incomes, wealth and housing costs of owner-occupiers living in an oil-heated house, we may assume that they give an indication of the relative position of households with oil heating, as oil-heated houses are mainly single-family houses, and the incomes, wealth and housing costs of the households living in them can be assumed to be higher than average for other owner-occupiers.

As part of the Government´s analysis, assessment and research activities, a project was launched in early 2020 which examines the impacts of climate policy on income distribution using an aggregate model. Its preliminary findings indicate that the effect of the Government Programme objectives of reducing the electricity tax, removing energy tax refunds for energy-intensive companies, and increasing the tax on heating fuels is very small. The report will be completed in autumn 2020.

It is estimated that there are 150,000 oil-heated single-family houses in Finland. In terms of their geographical distribution, on average more oil is used to heat single-family houses in urban areas than in rural areas according to Statistics Finland data. On the other hand, more wood is used on average in rural areas, and oil heating accounts for a smaller proportion of the heating costs than in urban areas. Figure 36 shows that while houses heated with oil are found in all areas, their proportion is the highest in outer urban areas. An action plan for phasing out oil heating is currently being prepared by a working group of public servants coordinated by the Ministry of the Environment.

Figure 36. Geographical distribution of oil-heated houses. Source: Statistics Finland.



As we can see in Figure 37 produced by Finnish Energy, there were major regional differences in the use of district heating and CPH fuels related to it in 2018[88]. The highest proportion of peat use was recorded in South Ostrobothnia. A project titled Energy tax subsidies and cost-effective security of supply[89], which was completed in autumn 2019, found that coal and natural gas were used the most in large cities in the Helsinki Metropolitan area as well as in Turku, Tampere and Lahti. Of these cities, Turku had already increased the proportion of wood fuels in 2018, and new plants were being built in Lahti and Vantaa to significantly increase the use of wood fuels in these cities' heat production. Investment projects were also being planned in Helsinki, Espoo and Tampere to increase the share of wood fuels in energy production. The use of peat, on the other hand, was set to decrease in the next few years, facilitated by new plant investments in Tampere, Oulu and Pori.

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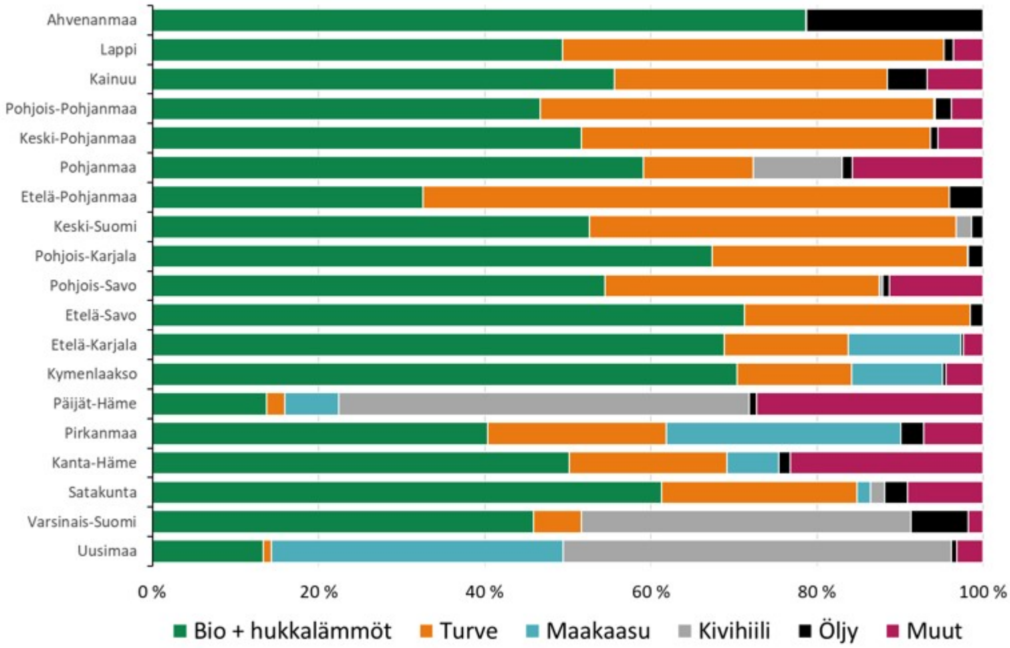
88 Finnish Energy, Kaukolämpötilasto 2018, https://energia.fi/files/3936/Kaukolampo_2018.pptx
89 Wahlström, J., Kaskela, J., Riikonen, J., Hankalin, V. 2017. Energiaverotuet ja kustannustehokas huoltovarmuus. Publications of the Government´s analysis, assessment and research activities 2017:56. https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/161852/56_19_Energiaverotuet_ja_kustannustehokas_huoltovarmuus.pdf?sequence=1&isAllowed=y

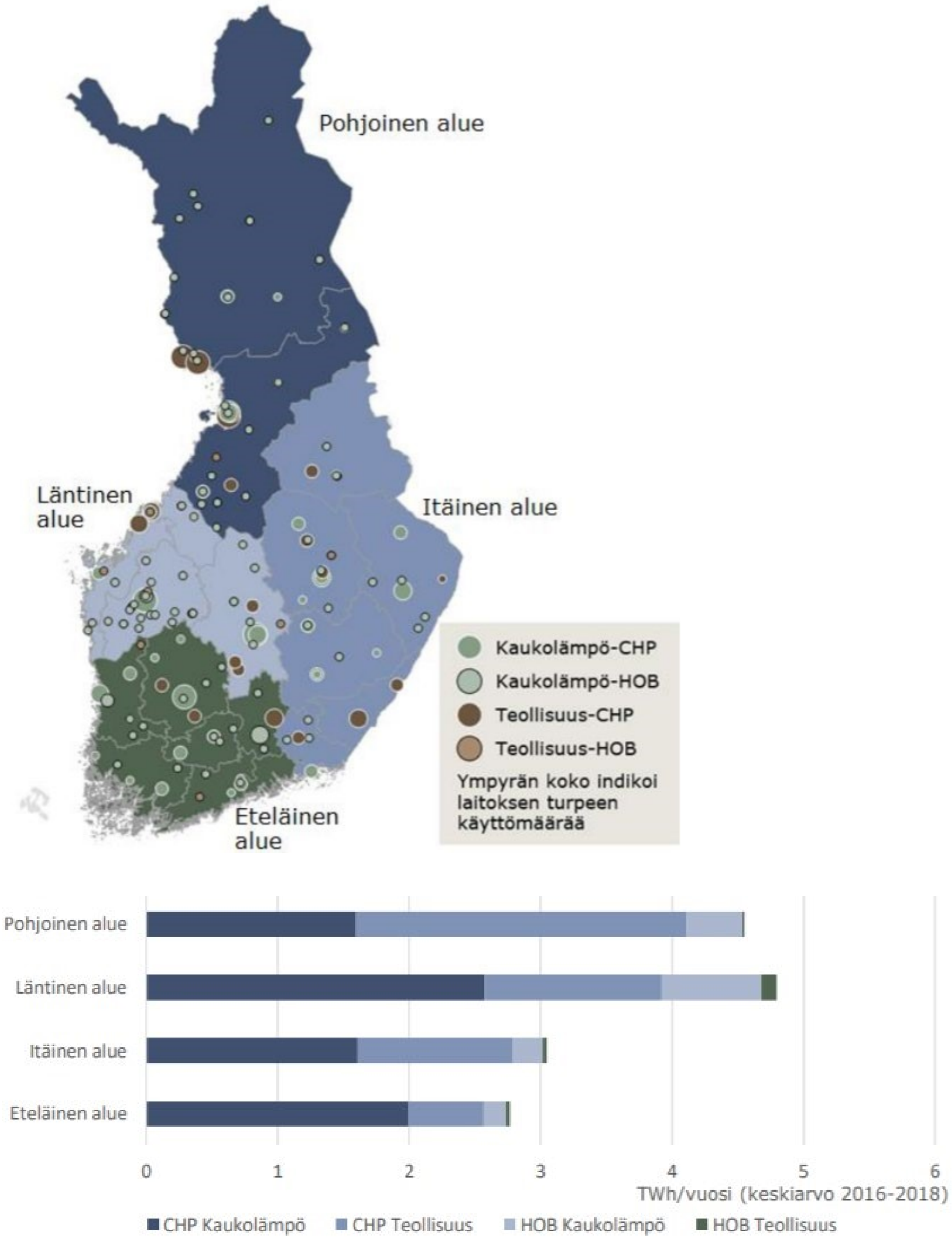
Figure 37. Fuels for district heating and electricity produced in CHP plants by region in 2018 (in Finnish). Source: Finnish Energy, District heating statistics 2018.



See Figure 38 for a map of energy plants using peat as described in AFRY's report[90] broken down by type of plant. The size of the circle on the map indicates the amount of peat used by the plant. The use of peat by region and plant type is shown below the map. Cogeneration in district heating plants and industrial installations accounts for the majority of peat consumption in all regions. In the western and northern regions, peat is used significantly more than in the eastern and southern ones.

[90] Afry Management Consulting Oy. 2020. Selvitys turpeen energiakäytön kehityksestä Suomessa. Raportti työ- ja elinkeinoministeriölle 8/2020. https://afry.com/sites/default/files/202008/tem_turpeen_kayton_analyysi_loppuraportti_0.pdf

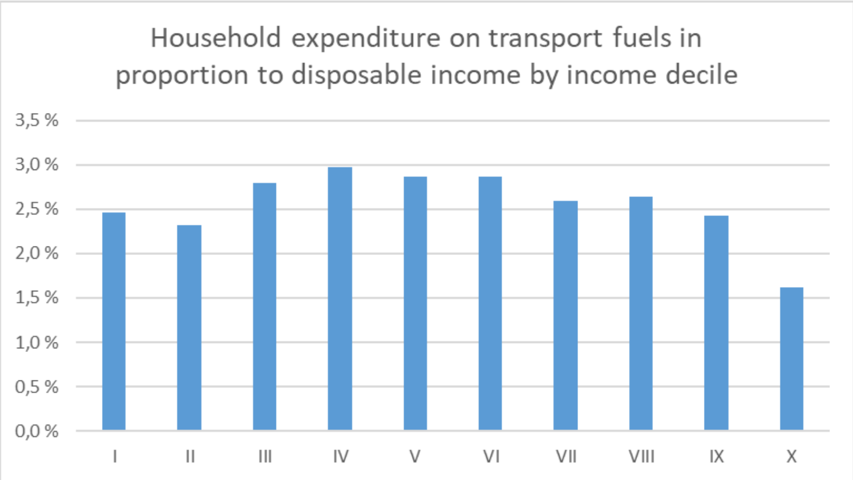
Figure 38. Map of energy plants using peat by type of plant and peat consumption by region and type of use (in Finnish). AFRY: Report on the development of peat use in Finland.



Transport

Figure 39 shows household expenditure on transport fuels in proportion to disposable income by income decile based on Statistics Finland's Household Budget Survey 2016. The middle income deciles spend 2.9%, the lowest decile 2.5% and the highest decile 1.6% of their available income on transport fuels. The Figure does not account for the indirect impacts of fuels on the prices of transport services and other commodities. In the light of this analysis, the taxation of transport fuels cannot be regarded as particularly regressive as a whole.

Figure 39. Household expenditure on transport fuels in proportion to disposable income. Sources: Statistics Finland, Ministry of Finance.



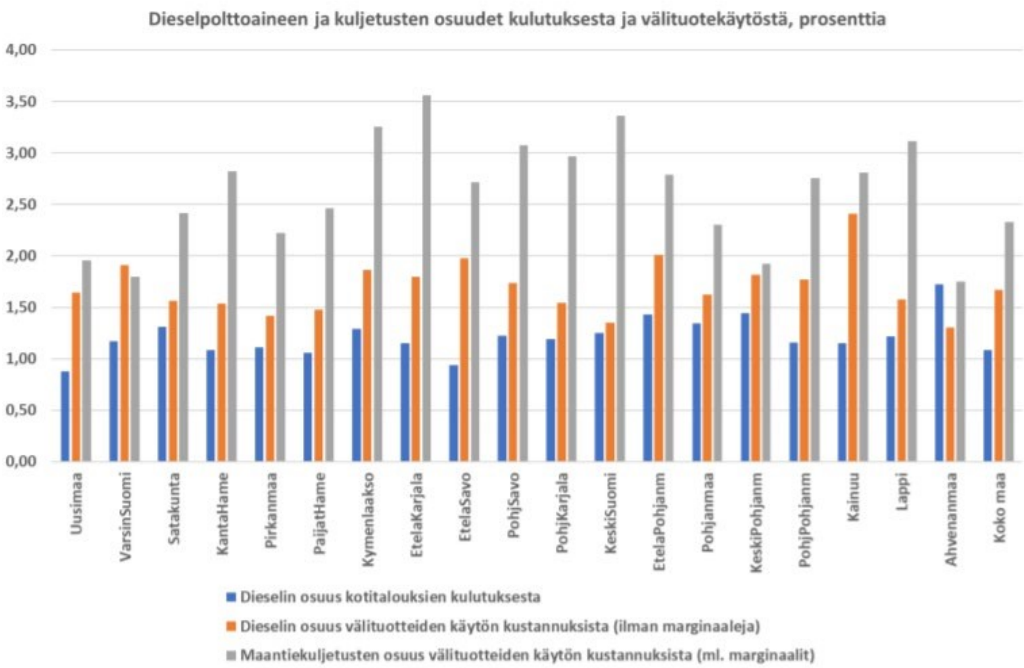
According to a research project which assessed the impacts of the tax expenditure for diesel[91], indications can be found in research literature that the demand for transport fuels would be less flexible among those with a low income and in sparsely populated areas; in other words, these households do not react as strongly as others to price changes. From this perspective, an increase in transport fuel taxes could put additional strain on low-income and rural residents.

According to the same report, there are clear differences in diesel use between regions, which are reflected on the impacts of the diesel tax on different regional economies. Diesel accounts for 1.5% to 2.0% of intermediate consumption in most

[91] Honkatukia, J., Keskinen, P., Ruuskanen, O-P., Villanen, J. 2020. Dieselin verotuen vaikutusten arviointi. Publications of the Government´s analysis, assessment and research activities 2020:4. http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/162031/VNTEAS_2020_4.pdf

regions. The proportion of diesel in consumer demand is slightly lower, varying from 0.9% in Uusimaa to 1.5% in South Ostrobothnia. Figure 40 examines the proportion of diesel in household consumption and intermediate consumption of businesses, excluding transport margins. The Figure also shows the proportion of road transport in intermediate consumption. As we can see in the Figure, diesel accounts for 1.5% to 2.0% of intermediate consumption in most regions. The proportion of diesel in consumer demand is slightly lower, varying from 0.9% in Uusimaa to 1.5% in South Ostrobothnia.

Figure 40. Proportions of diesel fuel and transport in consumption and intermediate consumption (in Finnish). Source: Assessing the impacts of the tax expenditure for diesel fuel http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/162031/VNTEAS_2020_4.pdf.



A more thorough examination of the viewpoints discussed in this section is currently being carried out by a separate working group.

2.5.6 Structure of energy taxation

Tax components

The basic premise of taxing fuels based on their energy content and greenhouse gas emissions can be considered justified, as it enables the coordination of fiscal and emission policy objectives.

Compared to the allowance price, the price of a carbon dioxide tonne on which taxation is based can be seen as high in the case of both transport and heating fuels. Judging by the difference between the pre-tax prices of biofuels and fossil fuels, however, the cost of the imputed emissions reduction in the effort sharing sector achieved by using biofuels remains considerably higher than the CO_2 t price applied in taxation. As biofuel prices go up, the carbon dioxide tax together with the penalty fee associated with the biofuel distribution obligation can lead to highly inefficient calculated emissions reductions in the effort sharing sector.

The additionality of biofuel use is associated with significant uncertainties due to land use changes and a limited raw material base, which have been partly addressed in the Renewable Energy Directive (REDII)[92]. The Directive determines the greenhouse gas emissions reductions for energy products, excluding greenhouse gas emissions from land use change. Under the Directive, biofuels can be considered sustainable if they achieve a 65% reduction in greenhouse gas emissions at minimum. Considering that the typical emissions reductions achieved with liquid biofuels according to the Directive are around 90% at the highest, the current differentiation of the CO_2 tax reduction for biofuels considered sustainable (0%, 50%, 100%) can be regarded as excessive.

The REDII Directive aims at reducing the negative impacts of indirect land use changes resulting from biofuel use by limiting the share of so-called food and feed crops-based fuels in the Member States' transport energy consumption. In addition, efforts have been made to curb the demand for raw materials whose supply is considered too limited by setting the maximum share of biofuels produced from waste cooking oil and animal fats from rendering to 1.7% of transport energy consumption when calculating the achievement of the target for renewable transport energy. The Directive also sets a minimum level for so-called advanced biofuels and biogas for transport, for the part of which the indirect negative impacts on land use were

[92] Renewable Energy Directive II, Directive (EU) 2018/2001 of the European Parliament and of the Council on the promotion of the use of energy from renewable sources. https://eur-lex.europa.eu/legal-content/FI/TXT/?uri=CELEX:32018L2001

considered to be less strong and the raw material base less limited. To enforce the Directive, a restriction on food and feed crop-based fuels applicable to individual distributors and a minimum obligation related to emerging biofuels with an additional fine for non-compliance were added to the Act on the Distribution of Biofuels[93]. Taking into account the high prices of biofuels and even higher penalties for non-compliance with the obligation to distribute them, the distribution obligation will determine the total amount of liquid biofuels and the proportion of advanced biofuels. The carbon dioxide tax linked to life-cycle emissions is thus also not expected to affect the share of liquid biofuels in the future. While the CO_2 tax linked to life-cycle emissions is currently not seen as having a crucial incentive impact regarding liquid biofuels, it may come to play an essential role for biogas.

As a whole, the Finnish tax structure can be considered effective and, especially by international comparison, pioneering in terms of environmentally-related taxation, technology neutrality and the use of objective criteria.

Taxation of biogas

Chemically, both natural gas and biogas are mainly composed of methane (CH4), and the main difference between them is the origin of the gas. Biomethane refers to purified biogas supplied into a network. Gas is mostly taxed when it is released for consumption from the gas transmission network or, in the case of liquefied natural gas, from a tax warehouse. The tax is paid by the transmission system operator or the tax warehouse operator. Biogas is also produced outside the grid. This ‘off-grid’ gas is often not transferred to gas networks or converted into liquefied biomethane.

Biomethane can also be released for consumption through a gas transmission or distribution network. In this case, the gas network contains a gas blend of fossil and bio-based methane of a varying composition. Because of their different tax treatment, a distinction must be made between fossil and bio-based methane in taxation. At present, the tax exemption for biomethane is based on metering the amount of biomethane supplied into the network. In this process, the part of the gas blend mainly consisting of fossil natural gas is converted into biogas for accounting purposes. On average, this tax model works correctly in the national closed system.

The tax exemption for biogas involves a number of unsolved issues. Firstly, biogas is tax exempt in Finland, whereas it is an excisable product under the Energy Taxation Directive. Finland has not undertaken a State aid procedure to apply for a tax

[93] The obligation related to advanced biofuels exceeds the minimum level of the Directive, however, and does not currently contain biogas.

exemption for biogas. The tax exemption for biogas also raises the problem of competition neutrality between different biofuels and operators, as liquid biofuels produced from similar sustainable raw materials, or those included in the double counting scheme, are taxed in keeping with the energy tax model.

Finland could apply for a State aid authorisation for subsidising biogas by fiscal means, such as a tax exemption. The preconditions for obtaining an authorisation include ensuring that the aid does not constitute overcompensation. In order to avoid overcompensation, the aid must be monitored and regularly reported on to the Commission. The authorisation may only be granted for a fixed term. However, the simultaneous use of a tax expenditure and the biogas distribution obligation is not possible. The only situation in which a State aid procedure will not be needed is imposing a tax on biogas and promoting its use by other means. The imposition of a tax would clarify the situation and increase the predictability required by operators, as the uncertainty caused by temporary exemptions continues and is emphasised whenever a fixed-term exemption period ends.

The transmission connection between the Finnish, Estonian and Latvian gas networks, which was deployed at the beginning of 2020, and its expansion to the rest of Europe in 2022 is another question to be solved. The transmission connection enables the supply of not only natural gas but also biomethane, which is mixed with natural gas in the network, to Finland. This is already happening, and liquefied biomethane has also been imported into Finland. As tax discrimination of imported products is prohibited, the same tax levels and procedures must be applied to imported and Finnish biogas. If Finnish biogas is exempt from tax, the exemption must also be extended to imported biogas. In the current model this means that the tax expenditure is also passed on to biogas produced abroad. A heavier administrative burden may also not be imposed on imported biogas than biogas produced in Finland. If the tax exemption for Finnish biogas were based on a certificate issued to the biogas producer, for example, the same benefit would also have to be conferred on the basis of a certificate issued in another country.

The Government Programme notes that biogas will be included in the scope of the distribution obligation. The tax exemption and the obligation to distribute biogas are overlapping policy instruments. If biogas is included in the distribution obligation of transport biofuels, it must be taxed in compliance with the EU State aid rules. Under the Energy Taxation Directive, biogas must be taxed both in transport and heating use. With the current tax levels and in keeping with Finland's general environmentally-related energy tax system, this would account for about one third of the tax levied on natural gas, for example.

The so-called biogas working group of the Ministry of Economic Affairs and Employment addressed the promotion of biogas use extensively in its report. As one possibility of promoting biogas, the report mentions extending the distribution obligation to biogas, which would mean taxing biogas in line with the environmental model. The report also proposed that the combined effects of the distribution obligation and taxing biogas be examined. A report commissioned by the Ministry of Economic Affairs and Employment from AFRY on extending the distribution obligation to gas is about to be completed. According to the preliminary results of this report, introducing a distribution obligation and levying a tax on biogas would be a workable solution for promoting biogas use in transport, as it was estimated that including biomethane in the scope of the distribution obligation would create clear value added for it, thus accelerating investments in its production and use in HGVs.

Some of the biogas is produced on a small scale and often intended for use on the farm that produces it. Levying a tax from these small plants would create an administrative burden on both the authorities and the operators, and taxing these plants would thus not be appropriate. Additionally, the volumes of gas produced at small plants are relatively low, and the costs are high compared to large-scale production. This is why taxing such plants would not be justified.

Energy tax refunds for agriculture

Under the Act on Tax Refunds for Agriculture, tax refunds for fuel use are limited to light and heavy fuel oil and biofuel oil used in agriculture. Of imported fossil fuels, the refund does not apply to such fuels as natural gas, LPG or coal. In compliance with the EU State aid rules and the aid scheme under which tax refunds are available for agriculture, agriculture should have a level playing field, and the current practice of limiting the refund to certain fuels does not meet this requirement.

Professional greenhouses can purchase electricity directly at the reduced category II tax rate, unlike other agricultural enterprises, which are forced to apply for similar aid as an energy tax refund. In addition, professional greenhouses currently eligible for the energy tax refund for agriculture may apply not only for the refund of energy tax for agriculture but also for the tax refund for an energy-intensive company, whereas other agricultural enterprises cannot. Parliament has issued a statement[94] in which it requires that the Government investigate the neutrality of the excise duty refund

[94] Parliamentary reply EV145/2017 vp- HE 138/2017 vp. https://www.eduskunta.fi/FI/vaski/EduskunnanVastaus/Sivut/EV_145+2017.aspx

system for agricultural energy products for the part of different fuels. The report was to take into account the increasing use of LPG and liquid biogas in agriculture.

If the provisions of the Electricity Tax Act on tax refunds, under which excise duty refunds paid on application will not be paid if the refund amount is less than EUR 330 were also applied to agriculture, the number of applicants eligible for refunds would have been reduced by 32% in 2019. In that case, a total of EUR 31.6 million of refunds would have been paid, reducing the amount of the refunds by more than EUR 2 million. Expanding the eligibility for refunds to natural gas and LPG used in agriculture would have little impact on the general government finances as, according to information provided by the Natural Resources Institute Finland, the volumes of LPG and natural gas used in Finnish agriculture are very low. Energy-intensive greenhouses are currently also eligible for tax refunds for natural gas and LPG.

Mobile machinery

Both fuel oil used in mobile machinery and heating oil are taxed at the same level applicable to light fuel oil. The quality of the motor oil, and often also heating fuel oil, is similar in practice to the quality of diesel oil used as a transport fuel. Despite their names, which describe their different uses, all three products are middle distillates of the oil refining process. The calculated tax expenditure for motor oil used in mobile machinery is currently one of the largest energy tax expenditures, as it is defined in relation to the motor fuels used in cars, trucks, buses and vans. In practice, the reference level thus is the theoretical tax level for diesel oil in transport use excluding the tax expenditure granted to it, or over 85 cents per litre, while the tax on light fuel oil is currently less than 25 cents per litre. The Energy Taxation Directive lays down the same, relatively low minimum tax level for fuel oil used in heating and machinery, and even allows tax exemptions in certain situations. The minimum tax level for diesel oil in transport use is almost sixteen times the level applied to heating and motor oil under the Directive. Almost all EU Member States have introduced different reduced rates for uses in various mobile machines compared to the tax level for transport diesel.

Similarly to light fuel oil used in heating, the fuel oil used in mobile machinery that is subject to a lower tax rate is dyed red, and a common EU marker is used to distinguish this product from diesel for transport, which is subject to a higher tax. Setting the tax on fuel oil used in mobile machinery to a different level than the tax on transport diesel or light fuel oil used for heating would result in significant difficulties related to taxation and supervision. These and other impacts of the change, for example on the distribution of fuels and their use in a large but sparsely populated country, could not be examined in more detail within the framework of the working group’s mandate.

3 Consultations

3.1 General information about the consultations

During the working group’s term, four consultations were organised. Invitations to the consultations were extended to researchers, NGOs and other key stakeholders, or 15 parties in total. Questions related to realising the Government Programme objectives and developing energy taxation were attached to the invitation to consultation, which the participants could consider in advance and which it was particularly hoped that they could provide answers for. In addition, a written statement was requested from all parties. Eight parties took part in a written consultation organised between 25 May and 8 June 2020. While the group’s work was in progress, some other parties were additionally consulted.

In the course of the group's work, an open survey was also available on the web service otakantaa.fi between 10 February and 10 March 2020. In this survey, respondents were asked to contribute their opinions on the direction and way in which energy taxation should be developed. The survey contained five questions, which were largely the same as the ones posed in the consultations. Responses were received from 27 parties: 6 individuals, 7 companies and 14 NGOs, associations and other organisations. An e-mail interview was also conducted with experts in mining activities (10 parties).

Participants in the consultations generally found developing energy taxation an important part of providing an incentive for using lower-emission options in energy production as well as in terms of the electrification of society and attaining the carbon neutrality target. As a whole, a wide range of different, often conflicting measures were proposed, depending on the background of the issuer of the statement. For most, reducing the electricity tax in category II to the minimum level permitted by the EU as soon as possible was a key measure. At the same time, many proposed fuel tax increases and/or eliminating tax expenditures in order to achieve the emissions targets. Ideas of the suitable timeline for removing tax expenditures, in particular, varied greatly.

3.2 Details of consultations

In the consultations, lowering category II electricity tax to the minimum level allowed in the EU was generally seen as a key measure in the reform of energy taxation in order to promote lower-emission options in energy production and to accelerate the electrification of society. To a large extent, the participants found that category II electricity tax should be lowered as soon as possible, preferably from the beginning of 2021, and some believed that the first phase of eliminating energy tax refunds for energy-intensive companies should be carried out at the same time. Some considered that, if it coincides with reducing the level of the industrial electricity tax, the removal of energy tax refunds for energy-intensive companies will accelerate the electrification of industries. Some felt that lowering category II electricity tax would also speed up the utilisation of waste heat. The participants also pointed out that the abolition of energy tax refunds should be carried out in stages, guaranteeing a reasonable transition period for operators, as the refund is significant for some of them. Elimination of the tax refund would erode the competitiveness of fuel-intensive companies, even if the electricity tax were set at a lower level. Some statements and participants in the consultations noted that the importance of the energy tax level paid by energy intensive industries depends on a number of factors, such as the competitive situation and cost structure. The abolition of the tax refund can be expected to steer investment decisions away from fossil fuels, in particular towards replacing natural gas and coal with biomass. It was also pointed out in the consultations that the decline in tax revenues resulting from reducing category II electricity tax to the EU minimum would exceed the savings in energy tax refunds.

The participants noted that the elimination of tax expenditures for fossil fuels (CHP, peat, agriculture) and increases in taxes on fossil fuels can contribute to achieving the emissions reduction targets. In addition, controlled phasing out of peat in energy production can be achieved through taxation (by combining the higher price of emission allowances with taxing fuels used for heat production on the basis of their carbon dioxide emissions) while providing the necessary compensations to operators. The harmonisation of fuel taxes and removal of energy tax refunds would have a positive impact on the central government's tax revenues compared to the current level until 2030. Later, fossil fuels will have been replaced by other energy sources and the tax revenue will decrease.

It was pointed out in the consultations that tax incentives must be technology and competition neutral for different forms of energy. If the objective is to use taxation as a climate policy instrument, all fuels should be taxed equally based on their life-cycle carbon dioxide emissions. It was also noted in the consultations that the taxation of heating fuels is an overlapping instrument with emissions trading, and each tax increase will reduce the impact of emissions trading further. Increases in fossil fuel taxes improve the relative competitiveness of zero-emission heating solutions (including waste heat). Imposing higher taxes on district heating production is not justified as a starting point. If this is done, the excise duty on fossil fuels should be increased. Consultation participants noted that the tax expenditure for CHP mainly affects energy produced from coal and natural gas. Plans for replacing coal motivated by the prohibition of coal use have already been made, and investments are going ahead. The elimination of the tax expenditure for CHP will reduce energy production with natural gas, in particular. One participant in the consultations pointed out that the method in which the EUR 100 million tax increase is implemented will not significantly affect the competitive position of different fuels. If the increase takes the form of a higher carbon dioxide tax, it will mostly affect the use of coal. In the current situation, a higher energy content tax would improve the position of CHP compared to the separate production of heat with fossil fuels. The removal of the energy content tax expenditure for CHP will significantly erode the competitiveness of CHP in comparison to separate production. If the tax expenditure coefficient (0.9) were no longer applied, the impacts would be greater on coal.

Consultation participants to a large extent believed that the Government Programme goal of transferring heat pumps and data centres generating heat for district heating networks to category II electricity tax should be realised as soon as possible, preferably from the beginning of 2021. Participants mainly found, however, that the reduction of electricity tax on heat pumps and data centres should also apply to heat pumps and data centres more extensively, rather than only those producing heat for district heating networks referred to in the Government Programme. One participant felt that the electricity tax reduction should only be targeted at adjustable heat pumps connected to a district heating network in order to promote sectoral integration. It was also proposed that those heat pumps and data centres from which heat is recovered should be transferred to category II electricity tax. While the heat cannot always be supplied to the district heating network, it can however be utilised, for example in greenhouses. Consultation participants additionally proposed that all data centres, regardless of their size, and industrial class heat pumps should be transferred to industrial energy tax category II. The taxation of data centres should also be harmonised, extending the requirement of waste heat exploitation to all heat recovery. One participant found that data centres in excess of 5 MW should remain in electricity tax category II without any additional conditions, and that data centres of less than 5 MW connected to a district heating network should be transferred to electricity tax category II. Consultation participants noted that the electricity tax reduction should apply not only to heat pumps and data centres producing heat for district heating networks but also to electricity used by the pumps transmitting heat and geothermal power plants. Geothermal heat solutions are based on transferring heat from the ground through heat exchangers to the district heating network without the assistance of heat pumps. Building-specific ground heat pumps, which can participate in the demand response market of electricity through remote control, should qualify for the same electricity tax reduction. When it comes to improving the efficiency of waste heat recovery, as the most important steps were regarded lowering the electricity tax on heat pumps and reducing category II electricity tax to the minimum level (investments). District heating networks should be open to all producers of waste heat in the same way as the electricity or gas network.

Regarding the Government Programme reference to mines, industry representatives pointed out that in view of their industrial activities, mines should not be in the same electricity tax category as households. The most important instrument for reducing the carbon footprint of mines is cutting down on fossil fuel use by electrifying their operations. A transfer to the higher electricity tax category or an increase in the electricity tax would hamper this development. The situation of electrification in mining operations and issues affecting it came up in an e-mail interview. The mine type has a significant impact on the possibilities of electrification, and an electricity tax increase would hit the hardest a mine with advanced electrification. In relative terms, the proportion of electric energy is the highest in an underground mine with advanced electrification which, for example, uses electric mine hoisting. Electric energy plays the smallest relative role in an open mine where diesel-powered drilling equipment and forklifts are used. Crushing and grinding are the single largest energy user in mining. Mine transport by stone trucks is becoming electric, and other mining machines and equipment have also made progress in this respect. The development of batteries improves the mobility of electrical equipment, which is why electrification is expected to advance along with improvements in battery technology, as electric machines are equally agile as fuel-powered ones. Battery capacity, charging speed and ease of replacement are key factors in the transition to battery use, and improvements in these aspects will promote it. Frequent changes in tax treatment were considered a problem as mining is a long-term activity, and predictability of costs is important in assessing the ultimate profitability of a mining project and various propulsion options.

Consultation participants suggested that the tax expenditure for peat should be phased out and the taxation of peat aligned with other fuels which produce climate emissions. It was also felt that emissions trading is a sufficiently effective instrument for guiding peat use. A higher tax should not be imposed on peat, and the status of peat should be maintained to support the security of supply in the Finnish energy sector. An effort will be made to mainly replace peat with biomass, in which case an adequate supply of biomass will become a challenge. It was also noted that reducing or abolishing the energy tax refund for agriculture would jeopardise Finland’s security of supply. The objectives of the road map of sustainable taxation should primarily be achieved by focusing on reducing the use of imported fossil fuels in any reforms.

It was also suggested in the consultations and statements that, in order to improve the competitiveness of recycled materials and to promote the circular economy, the recycling industry (industrial manufacturing and processing of recycled materials), should be treated similarly to other industries and transferred to electricity tax category II. The industrial classification which underpins the determination of electricity tax categories should be updated. Of the current industrial classes, particularly class 38320, Recovery of sorted materials, should be comparable to Manufacturing (class C). In further work, a more detailed analysis should be carried out to establish which other circular economy activities should also be transferred to electricity tax category II and how the industrial classification should be interpreted in practice.

In the survey conducted on the Otakantaa.fi portal, respondents were asked to contribute their views of the best way to carry out the removal of energy tax refunds for energy-intensive companies and the reduction in electricity tax to the EU minimum in electricity tax category II. Several respondents said it is essential to guarantee a sufficient transition period to minimise adverse effects on the business sector and to allow time for the necessary investments. For some, a sufficient transition period means 10 years, whereas for others it is three years. Several respondents found that the tax level in electricity tax category II should be reduced as soon as possible and preferably from the beginning of 2021. Some respondents believed that the energy tax refunds should be abolished simultaneously with reducing the electricity tax and as soon as possible. Others pointed out that companies whose main energy source is not electricity may face a significant increase in their tax burden, despite the lower electricity tax. Some of the energy tax refunds continue to directly support the use of fossil fuels, and this shortcoming must be addressed as soon as possible to achieve climate targets and to speed up the deployment of renewable energy sources.

The survey respondents were also asked how the Government Programme reference to reduced tax expenditures for combined heat and power production and higher heating fuel taxation increasing tax revenues by a total of EUR 100 million over the electoral term should be implemented and what the balance between reducing tax expenditures and increasing taxes should be. Some respondents felt that the subsidy for CHP should not be reduced or abolished completely. CHP is an important driver of energy efficiency in Finnish society, and the lower tax is not a subsidy. If the EUR 100 million increase in tax revenues is only achieved by changing the tax expenditure for CHP, this will target natural gas use in practice. Natural gas based electricity generation capacity is important for the reliability of the electricity system. Some responses pointed out that the subsidy for CHP should be phased out to enable adaptation. Others noted that the subsidy should be removed with a reasonably short transition period and that fuel taxes should be increased moderately. It was also maintained that emphasising higher taxes on heating fuels, taking their carbon dioxide emissions into account, would be a better way of carrying out the change. Some respondents also suggested that the tax on all fossil fuels and peat should be increased steadily, following the current division into energy content and emission components. In this case, the incentive effect of the tax would affect all heating based on fossil fuels rather than only larger cities, in which the residents do not have similar possibilities of replacing their heating systems as, for example, households using oil heating. Some respondents said that the current fiscal instrument already directs investments away from using fossil fuels.

The respondents were asked about the best way of handling the reduction in electricity tax for heat pumps and data centres that produce heat for district heating networks. In general, respondents pointed out that heat pumps and data centres should be transferred to the lower electricity tax category II as soon as possible, preferably from the beginning of 2021. Heat recovery, waste heat use, heat storage and geothermal heat use should be promoted at a particularly fast rate. Some suggested that the reduction in electricity tax should apply not only to heat pumps and data centres producing heat for district heating networks but also to electricity consumed by pumps used to transmit heat and geothermal power plants. The lower electricity tax rate should apply to energy companies which produce and sell energy to customers through a district heating network, a regional network or building-specific (decentralised) energy production. Some respondents also stated that the benefits obtained from transferring data centres to this category should be examined further. For example, it should be determined if the use of waste heat from a data centre could be a condition for the data centre being eligible for the lower electricity tax. Some respondents claimed that the eligibility of data centres for the lower electricity tax category should extend to data centres of all sizes, and the current 5 MW limit should be dropped. It was also suggested that not only consumption but also the eco-efficiency, cost-effectiveness and environmental friendliness of the data centre should be applied as criteria for tax reductions. The tax reduction should be accompanied by a requirement to use emission-free energy in data centres.

The survey contained a separate question about the utilisation of waste heat and what could be done to promote its more wide-spread use. Great potential was generally seen in the utilisation of waste heat. Some respondents found that cost-effective utilisation of waste heat is part of the basic activities of a modern energy company. Others pointed out that transferring large heat pumps generating heat for district heating networks to a lower electricity tax category and lowering the tax to the EU minimum would be key actions. By identifying uses for waste heat and through cooperation between potential companies, many more uses could be found in addition to district heating. The possibilities of making the use of waste heat from a data centre a condition for the data centre’s eligibility for the lower electricity tax category should be investigated.

As other issues that should be taken into account in the development of energy taxation were mentioned providing companies with a sufficient transition period during which the necessary investments can be made when realising the Government Programme objectives as well as addressing the neutrality and equality of taxation and paying sufficient attention to security of supply. Additional costs incurred by industry should be kept as low as possible, and the changes should not increase companies' administrative burden. Some of the respondents argued that the current policy instruments are adequate. Others suggested that the relationship between the energy content tax and the carbon dioxide tax should be adjusted, emphasising the carbon dioxide tax and reducing the energy content tax. Phasing out the tax expenditure for peat should be part of the energy tax reform. Natural gas is the most climate-friendly fossil fuel, and its distribution infrastructure offers a platform for both increasing biogas use and possible power-to-gas solutions, which is why its role should be carefully examined. Peat, on the other hand, is a domestic fuel which is easy to store, and thus maintaining it as part of the energy palette would be important in terms of security of supply. It was also noted that when drafting the reform, the rebound risk should also be addressed, which means that reducing the level of category II electricity tax would lead not only to a reduction in other energy use but also an increase in electricity consumption. In addition, compatibility with other climate and energy policies and aid systems should be assessed (such as subsidising biomass). Some respondents suggested that bringing any increase in greenhouse gas emissions resulting from the use of biomass for energy within the scope of energy taxation should be investigated.

4 Proposals and their impacts

4.1 Government Programme intentions related to energy taxation and the possibilities of realising them

The Government Programme does not take a stand on the timeline for carrying out the proposed energy taxation reform or the order in which the changes should be carried out. It is important to note that, since the proposed energy tax changes are partly overlapping and interconnected in different ways, the order in which the changes are implemented will affect their magnitude and their impacts on central government finances. Therefore, the changes to energy taxation discussed in sections 4.1 and 4.2 have only been examined on the basis of the assumptions set out in the sections, and it should be noted that a different timing or order of implementation could lead to somewhat different outcomes in terms of how much the energy taxes must be increased and how energy tax expenditures will change.

4.1.1 Heating fuels and CHP

The Government Programme notes that reduced tax expenditures for combined heat and power production and higher heating fuel taxation will increase tax revenues by a total of EUR 100 million over the electoral term. The Vuosaari climate conference also adopted the policy of implementing this measure from the beginning of 2021.

The Government Programme additionally states that, as part of the overhaul of energy taxation, the necessary changes to the taxation of peat will be assessed so that the 2030 peat targets can be achieved. It must also be ensured that timber material does not end up incinerated. In this section (4.1.1), peat is discussed together with other heating fuels. Any additional increases affecting peat alone are dealt with later in section 4.2.1.

The tax on heating fuels can be increased by adjusting the energy content tax and/or the carbon dioxide tax. The subsidy for CHP can be cut by reducing the tax expenditures granted under the current legislation, or the EUR 7.63/MWh reduction in the energy content tax, which in technical terms has been implemented through a provision which grants a 100% reduction of the energy content tax. In addition, the subsidy can also be reduced by abolishing the rule whereby the taxable fuel volume used for heat production in CHP is calculated by multiplying the heat released for consumption with the coefficient 0.9, thus reducing the heat amount on which the tax is based by 10%. In addition, the revenue impact of the tax increase is influenced by other energy tax legislation, the most essential aspect of which is energy tax refunds for agriculture and energy-intensive companies. These refunds reduce the net yield of the tax increase, which means that in order to achieve a certain additional yield, the gross tax increase must be greater.

Other options for increasing the tax on heating fuels and reducing the tax expenditure for CHP include:

a. Increasing the energy content tax only
b. Increasing the CO_2 tax only
c. Removing the tax reduction and 0.9 calculation rule for CHP only
d. Increasing both the energy content tax and the carbon dioxide tax, abolishing the 0.9 calculation rule in CHP.

In all of these examples, the tax on peat is increased as indicated by the tax model, similarly to other fuels. The tax expenditure for CHP currently corresponds to the full amount of the energy content tax. None of these examples increase the tax reduction in absolute terms, however, and if the energy content tax is increased, the tax burden on CHP will also grow correspondingly. In these examples, the 0.9 calculation rule was chosen as the primary means of reducing the tax expenditure for CHP. This tax expenditure is subject to the normal EU State aid rules and notification procedures, which nevertheless were not applied in practice when the expenditure was introduced. This is why the calculation rule has shortcomings relevant to the Union law, and dropping it is thus also justified. In addition, unlike a tax reduction in the form of a lower energy tax, this tax expenditure applies to all taxable energy use in CHP, including peat consumption.

In all of these examples, it is presumed that any other legislation will remain unchanged. For example, this means changes to the amounts of energy tax refunds for agriculture and energy-intensive enterprises. The measures have been scaled to produce an EUR 100 million increase in the central government's tax revenues in net amounts when examined statically and when the increased tax refunds are taken into account, with the exception of option c), in which an increase of EUR 78 million in tax revenues can be achieved through the cited measures. As the tax on peat is low, it is currently not eligible for a tax reduction in CHP use. Consequently, no tax increase on peat is foreseen in option c), and its taxation will only be affected by the removal of the 0.9 calculation rule. However, as the tax on fuels competing with peat would be increased, the necessary additional tax revenues in model c) could be achieved by such means as an additional increase in the tax on peat.

In options a) and b), only one or the other of the two tax components will be increased, without making changes to the tax expenditure granted to CHP as a lower tax rate. It would also not be allowed to increase while the energy content tax is increased, but the current 0.9 calculation rule would be maintained. In option c), changes are only made to tax expenditures for CHP. In option d), the price of a CO_2 t used to calculate the tax levels is increased from EUR 53 to EUR 55, and the remainder of the increase will take the form of a higher energy content tax. In option d), part of the additional tax revenue will also be accrued by abolishing the 0.9 calculation rule for CHP, as in option c). At the current tax levels, the calculation rule corresponds to a tax reduction of EUR 23 million. In other words, the increases in tax levels are lower on average in options c) and d). In addition to the tax increases, however, the effective tax burden on CHP would increase by 11%, as the taxable fuel amount would increase as the 0.9 calculation rule is eliminated. See Table 4 for the options and their estimated[95] impacts by sector.

[95] The estimate is based on calculations made using the energy statistics of Statistics Finland and the Finnish Tax Administration’s data on the accrual of energy tax revenues.

Table 4. Examples of optional ways of implementing the tax increase for heating fuels and CHP.

	Tax level in 2020 €/MWh	Share of tax base (GJ) in 2020	Option a) €/MWh	Option b) €/MWh	Option c)* €/MWh	Option d)* €/MWh
Light fuel oil	27,53	0 %	+3,1	+2,8	+0,0	+2,4
Light fuel oil CHP	17,25	0 %	+3,1	+2,8	+0,0	+2,4
Light fuel oil sulphur-free	24,88	40 %	+3,1	+2,8	+0,0	+2,4
Light fuel oil sulphur-free CHP	17,25	0 %	+3,1	+2,8	+7,6	+2,4
Biofuel oil	24,88	0 %	+3,1	+2,8	+0,0	+2,4
Biofuel oil R	16,43	0 %	+3,1	+1,4	+0,0	+2,1
Biofuel oil T	7,98	1 %	+3,1	+0,0	+0,0	+1,8
Biofuel oil CHP	17,25	0 %	+3,1	+2,8	+7,6	+2,4
Biofuel oil R CHP	8,80	0 %	+3,1	+1,4	+7,6	+2,1
Biofuel oil T CHP	4,17	0 %	+3,1	+0,0	+3,8	+1,8
Heavy fuel oil	24,52	1 %	+3,1	+2,8	+0,0	+2,4
Heavy fuel oil CHP	16,89	1 %	+3,1	+2,8	+7,6	+2,4
Coal	29,17	0 %	+3,1	+3,5	+0,0	+2,6
Coal CHP	21,54	13 %	+3,1	+3,5	+7,6	+2,6
Natural gas	20,65	8 %	+3,1	+2,1	+0,0	+2,3
Natural gas, CHP	13,02	11 %	+3,1	+2,1	+7,6	+2,3
LPG	21,79	3 %	+3,1	+2,3	+0,0	+2,3
LPG CHP	14,16	0 %	+3,1	+2,3	+7,6	+2,3
Tall oil	24,52	1 %	+3,1	+2,8	+0,0	+2,4
Peat	3,00	21 %	+3,1	+3,7	+0,0	+2,6

Sectoral impacts, EUR million

	Option a)	Option b)	Option c)	Option d)
Taxes paid by industry	*27*	*25*	*21*	*26*
*Energy tax refund for energy-intensive companies (in-house use) ***	*-12*	*-11*	*-14*	*-12*
Industry total	**15**	**14**	**7**	**14**
Construction	**13**	**11**	**0**	**10**
Transport	**6**	**5**	**0**	**4**
Taxes paid by agriculture and forestry	*12*	*11*	*0*	*9*
*Energy tax refund for agriculture ***	*-8*	*0*	*0*	*-5*
Agriculture and forestry, total	**3**	**11**	**0**	**5**
Other mobile machinery	**4**	**4**	**0**	**3**
Building-specific heating	**22**	**19**	**0**	**17**
Taxes paid by the district heating sector	*46*	*46*	*80*	*56*
*Tax refund for energy-intensive companies for purchased heat ***	*-9*	*-9*	*-10*	*-9*
District heating sector, total	**37**	**37**	**70**	**47**
Yhteensä	**100**	**100**	**78**	**100**

*The tax burden on combined production (CHP in the table) will increase more than indicated in options c) and d), as the tax base will grow by 11% once the 0.9 coefficient is eliminated

**The refund will increase unless adjusted simultaneously, which will drive the need to increase taxes

Whether the increase will target the energy content tax or the carbon dioxide tax is primarily relevant to the tax treatment of different fuels but, through energy tax expenditures, also on how the tax increase affects different sectors, as we can see when comparing options a) and b). Taking the taxation of CHP into account, the carbon dioxide tax component currently accounts for about three quarters of the tax on heating fuels. The fuels that an increase in the carbon dioxide tax would hit the hardest are coal and peat (provided that the peat tax is increased in keeping with the energy tax model), while natural gas would be affected less. The increase in the carbon dioxide tax will also affect biofuel oil less (or not at all). Biofuel oil currently accounts for a small proportion of the tax base. The change to taxation will have no impact on the consumption of biofuels or, in this respect, CO_2 emissions, as the pre-tax price of biofuels is significantly higher than the price of fossil fuels. This is why, regardless of the method in which the increase is brought in, the price of biofuels including the tax would still be higher than the price of fossil fuels. In addition, the volume of biofuels will be determined by the distribution obligation, also in the case of heating fuels in the future. Increasing the energy content tax is thus a more sustainable solution in the fiscal sense over the medium and long term. Targeting the increase at the carbon dioxide tax would also reduce tax revenue in the future due to the anticipated trends in the consumption of other heating fuels. The use of coal for energy will be phased out by 1 May 2029. Operators who phase out coal faster than this, or by the end of 2025, will additionally be eligible for investment support amounting to EUR 90 million in 2020–2023, which will contribute to eroding the tax base of coal and reducing future tax revenues from the carbon dioxide tax compared to the energy content tax. In line with the Government Programme objective, the use of peat for energy would be at least halved by 2030.

Due to the development of the energy tax base, which is mainly positive from the environmental perspective, a tax increase of EUR 100 million at the beginning of 2021 would not produce an additional yield of an equal amount in the longer term. The tax revenues are expected to drop as early as in 2023, at maximum by around 15% in option c) and at minimum around 8% in option a), purely due to the development of the current tax base. It is important to take this into account when we consider increasing the energy taxes to generate permanent additional tax revenues.

When analysed by sector, options a) and b) mainly differ for the part of agriculture. Under the current legislation, an amount corresponding to the energy content tax on light and heavy fuel oil and biofuel is refunded to agriculture, and without a legislative amendment, energy tax refunds for agriculture would increase, mainly for fossil light fuel oil, depending on how much of the increase is allocated to the energy content tax.

Option c) would only affect tax expenditures for CHP, and it would thus target the district heating sector and industry. In option d), abolishing the 0.9 calculation rule for CHP also places an additional burden especially on these sectors. It is also essential to note that the tax burden on industry and the district heating sector would increase significantly more without the tax refund for energy-intensive companies, which totals EUR 20 to 25 million in the options presented here. The tax refund for energy-intensive companies benefits the district heating sector, as energy taxes included in the price of purchased heat are taken into account when calculating refunds for companies using heat. Without the energy tax refund for agriculture and energy-intensive companies, the target of additional tax revenue of EUR 100 million would be achieved with a 20% to 30% lower increase in tax levels.

As the Table above shows, significant amounts of light fuel oil are not used in CHP. This is why option c) would have less effect on light fuel oil. Consequently, this option would be the least helpful in achieving the Government's goal of phasing out oil heating by the early 2030s. The phasing out of oil heating is being prepared by an informal working group led by the Ministry of the Environment, the proposals of which are not yet available. At this stage we can already estimate, however, that in order to phase out oil heating, a number of measures in different sectors will be required. This package of measures can be expected to include tax increases and cutting the subsidies for heating fuels.

The options also differ in their effects on the costs incurred from different forms of heating. See Table 5 below for a comparison of the estimated impacts of the options on the average annual costs of district heating and oil heating:

Table 5. Impacts of the options on district heating and oil heating costs.[96]

	Option a)	Option b)	Option c)*	Option d)
District heating, single-family house, 18 MWh	EUR/year	EUR/year	EUR/year	EUR/year
	EUR 33	EUR 33	EUR 70	EUR 43
District heating, high-rise building, 7.5 MWh	EUR 14	EUR 14	EUR 29	EUR 18
Oil heating, single-family house, 18 MWh	EUR 82	EUR 74	EUR 0	EUR 64

* the range of option c) is EUR 78 million, other options EUR 100 million

It is important to note, however, that the increase in district heating costs varies significantly depending on the fuels used to produce the heat and, as described in section 2.5.5, regional differences between fuels used for district heating and CHP in connection with it are major. In the large cities of Southern Finland, for example, the increase in costs may even be double the average.

The working group proposes that the EUR 100 million tax increase on heating fuels be implemented from the beginning of 2021 using option d).

The working group draws attention to the fact that the current tax expenditure for CHP contributes to reducing taxation in the emissions trading sector, which is the most susceptible to carbon leakage, compared to the current taxation in the effort sharing sector. It also supports the availability of an adequate supply of electricity in the current situation. While this expenditure instrument may not have been optimal in terms of its structure or level, its existence can still be justified. This is why the

[96] An efficiency ratio of 0.85 was used for both in the calculation.

working group finds that a stronger reduction in the subsidy for CHP, in addition to eliminating the 0.9 calculation rule, is not justified at this stage.

4.1.2 Mining

The Government Programme notes that mines will be transferred to category I electricity tax and removed from the scope of the industrial energy tax rebate system. The last time mines were in electricity tax category I was in 2015–2016. The removal of energy tax expenditures for mining is expected to increase energy tax revenues by about EUR 7 million and reduce tax refunds by about EUR 2 million[97]. This would mean a net increase of approx. EUR 9 million in energy tax revenues.

The working group proposes that energy tax expenditures for mining be eliminated from 2021.

4.1.3 Electricity tax and tax refunds for energy-intensive companies

In the context of energy taxation, the Government Programme notes that emissions guidance in energy production will be increased by abolishing the industrial energy tax rebate system and by reducing category II electricity tax towards the minimum rate allowed by the EU in a cost-neutral manner during a transition period. At the Vuosaari climate conference, the Government later adopted the policy of reducing the industrial electricity tax to the EU minimum in a cost-neutral manner and abolishing the energy tax refund scheme. Both measures are to be implemented step by step, starting in 2021.

In 2019, the approx. 180 companies eligible for the tax refund for energy-intensive companies paid a total net amount of approximately EUR 100 million in energy taxes (for electricity, the heating fuels used by them or heat purchases), taking into account

[97] Commissioned by the Ministry of Finance, the Tax Administration conducted a survey addressed to mining operators on the amount of electricity used in mining between 2014 and 2019. The survey findings indicate that the electricity consumption of mining is approx. 450 GWh, which accounts for one third of the electricity consumption at mining sites reported by Statistics Finland. This difference is probably explained by the fact that mining sites consume a significant amount of electricity in activities which are not included in the definition of mining. According to Statistics Finland's statistics on energy use in manufacturing, electricity accounts for almost 90% of the energy used in mining.

a tax refund of approx. EUR 230 million. When examining the effective level of the industrial electricity tax, it should be noted that even now, the energy tax refund reduces the electricity tax significantly. The energy tax refund for large industrial undertakings exceeds 80%, which means that the effective electricity tax can currently be less than 0.15 cents/kWh and, at its lowest, nearly 0.10 cents/kWh. The tax system reform would lower category II electricity tax to the level 0.05 cents/kWh.

In addition to reducing the level of category II electricity tax and abolishing tax refunds, the Government Programme also contains the goals of removing mines from the scope of the industrial energy tax rebate system and higher taxation on fuels for mobile machinery and heating fuels. The effects of abolishing the tax refund and reducing category II electricity tax are examined below assuming that taxes on machinery and heating fuels will be increased by EUR 100 million (as in option d) and that energy tax expenditures for mining will be abolished at the beginning of 2021. As a result of these policy changes, the combined impact on general government finances of reducing the industrial electricity tax and abolishing tax refunds will be less negative by approx. EUR 22 million[98] than without the changes[99].

Abolishing tax refunds and reducing category II electricity tax to the EU minimum would be almost cost-neutral in the short term, taking the other changes discussed above into account[100]. The energy tax burden of companies eligible for the tax refunds for energy-intensive companies would increase by about EUR 46 million, while the tax burden of industry, greenhouses and data centres not eligible for the refunds would be reduced by about EUR 47 million. To ensure that agriculture is treated equally, however, a precondition for reducing category II electricity tax for greenhouses to the EU minimum will be an increase of 0.64 cents per kilowatt-hour in energy tax refunds for other agricultural sectors. This will increase the annual refund amount by some EUR 6 million and mean that the change will have a slightly negative effect on general government finances. One option would be transferring greenhouses to the higher electricity tax category and abolishing the current electricity tax refund. The increase in the energy tax refund for agriculture could also be prevented by making a corresponding reduction in the refund of energy tax on fuels.

[98] If we only look at reducing the electricity tax, as compared to abolishing energy tax refunds, this would be the cost of reducing the electricity tax from a cost-neutral level to the EU minimum.
[99] An increase of EUR 100 million in the tax on machinery and heating fuels will increase energy tax refunds by about EUR 21 million. Removing the eligibility of mining for energy tax expenditures will reduce tax revenues from category II electricity tax by about EUR 3 million and energy tax refunds by about EUR 2 million.
[100] This calculation is underpinned by data on industrial energy consumption for 2018.

See Table 6 for the impact of this measure on the energy tax burden of companies eligible for the tax refund for energy-intensive enterprises by main industry. In absolute and relative terms, the energy tax burden would increase most in the forest industry, food industry and chemical industry. In other sectors, the impacts would be minor when examined at the sectoral level. However, there are major differences between individual companies within sectors.

Table 6. Energy tax burden of companies eligible for a tax refund and changes to their burden by main industry.

Main industry	Energy tax burden before the change, EUR million	Energy tax burden after the change, EUR million	Change in energy tax burden, EUR million	Change in energy tax burden, in proportion to value added	Change in energy tax burden, in proportion to turnover
Mining	3	3	0	0.0%	0.0%
Greenhouse cultivation	2	2	0	0.0%	0.0%
Chemical industry	19	29	10	0.6%	0.1%
Metal industry	15	15	0	0.0%	0.0%
Forest industry	47	69	22	0.5%	0.1%
Food industry	12	24	12	0.9%	0.2%
Other industry	5	7	1	0.2%	0.0%
Total	104	150	46	0.5%	0.1%

While the impacts of the changes are moderate at industry level, there are considerable variations in the tax burden between individual companies. This variation is described in Table 7 by classifying companies eligible for tax refunds according to the change in their energy tax burden in euros and the change in proportion to turnover.

Table 7. Companies eligible for a tax refund classified by change in their energy tax burden.

Change in energy tax burden, EUR million		Number of companies	Change in energy tax burden, in proportion to turnover, %		Number of companies
Tax burden will increase by	> 1	14	Tax burden will increase by	> 2	9
	0.5 – 1	17		1 – 2	9
	0.25 – 0.5	16		0.5 – 0.999	17
	0 – 0.25	62		0 – 0.499	74
Tax burden will decrease by	0 – 0.25	55	Tax burden will decrease by	0 – 0.499	54
	0.25 – 0.5	8		0.5 – 1	7
	> 0.5	9		more than 1	11

In euro amounts, the tax burden of the 15 largest losers would increase by around EUR 44 million[101]. The tax burden of the 15 largest winners, on the other hand, would decrease by around EUR 14 million in absolute terms. See Table 8 for the changes in the tax burden of these 15 largest losers and winners in euro amounts in proportion to turnover[102]. Of these companies, the average increase in the tax burden of the five largest losers is approx. 2.2% in proportion to turnover. The average increase in the tax burden of the following five companies is 0.7% in proportion to turnover. The average decrease in the tax burden of the five largest winners is approx. 0.4% in proportion to turnover.

Table 8. Changes in the tax burden of the 15 companies eligible for tax refunds faced with the greatest increase and decrease in their tax burden in proportion to turnover. The companies have been ranked based on the change in their energy tax burden in proportion to their turnover.

	15 greatest increases	15 greatest decreases
Average for companies 1 to 5	2.2%	-0.4%
Average for companies 6 to 10	0.7%	-0.2%
Average for companies 11 to 15	0.1%	-0.1%

[101] In proportion to current energy taxes, the increases in the energy tax burden in relative terms would be high for these companies, between 40% and 350%, which is naturally due to their currently very low energy tax burden.
[102] The increase in the net tax burden has been examined in proportion to turnover alone, as the value added of individual companies may have strong annual fluctuations, and exceptional corporate structures may affect the determination of the value added.

As, including the agricultural sector, there are tens of thousands of companies falling within the electricity tax category II not eligible for the tax refund for energy-intensive companies, reducing category II energy tax would benefit a large number of companies. Unlike the electricity tax paid by companies eligible for large tax refunds, which already was low due to the tax refunds, the effects of reducing the level of category II electricity tax would be significant on companies that have received smaller refunds or not been eligible for refunds. Data centres in tax category II would be among the greatest individual winners. The change would also benefit smaller industrial companies, which have not reached the threshold of EUR 50,000 set for the refund for energy-intensive companies but which will now receive the full benefit of the lower electricity tax.

The tax burden resulting from the use of industrial heating fuels after the change would depend on which energy source is used to produce the heat and on whether the production takes place in a separate or CHP plant. To the extent that industrial thermal energy would be produced in CHP plants or using peat or biomass, the effective tax level for industrial heating fuel use would be significantly lower than the levels in the tax model for heating fuels, even after the tax refund has been abolished. On the other hand, insofar as industrial thermal energy is generated separately using other fuels rather than peat or biomass, the effective tax level for industrial heating fuel use would rise to the level foreseen in the tax model.

In 2018, greenhouse gas emissions from fuels consumed by the industrial companies eligible for the tax refund were estimated to be approx. 2.7 Mt, also including emissions from electricity production in CHP plants. If these fuels fell into disuse or they were replaced with zero-emission forms of energy production as a result of the abolition of tax refunds and the lowering of category II electricity tax, Finland's national greenhouse gas emissions could consequently be reduced by no more than 2.7 Mt over the long term. It is unlikely, however, that the potential substitute energy production would be completely emission free when examined at the national level. It is also likely that the current price level of emissions trading and its potential increase will in themselves reduce the industrial use of fossil fuels over the long term. This is why the emissions reductions achieved by means of this measure are likely to be significantly lower than the theoretical potential discussed above. It should also be noted that the long-term impact of the tax reform on public finances will be more negative than the estimated short-term static effect as the use of taxable fuels eligible for a refund declines.

Options for the transition period

The transition period for abolishing tax refunds for energy-intensive companies and reducing category II electricity tax can be perceived as a set of interlinked choices. Firstly, it must be decided how quickly category II electricity tax should be reduced to the EU minimum and energy tax refunds abolished. The sooner category II electricity tax is reduced and energy tax refunds abolished, the sooner the emissions reduction incentive for industries will be strengthened, and the higher the tax burden on companies using taxable fuels will be. On the other hand, this also means that the tax burden of electricity-intensive companies eligible for tax refunds and industrial companies, greenhouses and data centres not eligible for the refund will decrease faster.

Secondly, it must be decided how the tax refunds for energy-intensive companies will be reduced during the transition period. In the current formula, the tax refund amount can be adjusted by changing the refund rate of 85%, the threshold value of 0.5%, or the company’s contribution of EUR 50,000, or any combination of these measures can be used. The effects on different companies will depend on which parameters are changed. A lower refund percentage would steadily reduce the tax refund for all companies eligible for it and increase the marginal tax on the excisable energy product used by the company at each consumption level entitling the company to the tax refund. An increase in the threshold value would, on the other hand, reduce the refund amount in proportion to the company's value added, and the increase in the tax burden would affect the most energy-intensive companies somewhat less during the transition period. The tax refund for energy-intensive companies was the most recently adjusted at the beginning of 2012, at which time eligibility was expanded by reducing the threshold value from the earlier 3.7% to 0.5%. Increasing the absolute amount paid by the company would affect small companies eligible for the refund proportionately more. Since the current company contribution of EUR 50 000 can be considered sufficient to ensure the administrative efficiency of the refund process, increasing this contribution is not considered an appropriate means of reducing the refund.

Consequently, there is a wide variety of options for the timing and implementation methods of the transition period for the reduction in electricity taxes and abolishment of tax refunds. See Table 9 for three alternative transition period models, and Table 10 for their impacts. The basic assumption in each model is reaching approximate cost neutrality from the perspective of central government finances and ensuring that the effective electricity tax paid by companies would not increase from the current level during the transition period. The assumed transition period is the current central government spending limits period ending in 2024[103]. The calculations are accrual based[104].

Table 9. Three models for transition period measures.

MODEL 1	Electricity tax category II, cents/kWh	0.69	0.45	0.33	0.15	0.05
	Tax refund threshold value	0.5%	0.5%	0.5%	0.5%	0.5%
	Refund percentage	85%	77%	69%	43%	0%
	Marginal electricity tax paid by those eligible for the refund, cents/kWh	0.1035	0.1035	0.1023	0.0855	0.05
MODEL 2	Electricity tax category II, cents/kWh	0.69	0.1	0.075	0.05	0.05
	Tax refund threshold value	0.5%	0.5%	0.5%	0.5%	0.5%
	Refund percentage	85%	25%	20%	10%	0%
	Marginal electricity tax paid by those eligible for the refund, cents/kWh	0.1035	0.075	0.06	0.05	0.05
MODEL 3	Electricity tax category II, cents/kWh	0.69	0.1	0.075	0.05	0.05
	Tax refund threshold value	0.5%	3.7%	3.7%	3.7%	3.7%
	Refund percentage	85%	85%	55%	25%	0%
	Marginal electricity tax paid by those eligible for the refund, cents/kWh	0.1035	0.1	0.075	0.05	0.05

[103] As before, the models take into account the EUR 100 million tax increase on heating fuels and the abolishment of energy tax subsidies for mining.

[104] The central government budget is cash based rather than accrual based, and due to timing factors, the changes will be reflected in the central government budget as one-off deficits during the transition period. The lowering of the electricity tax will reduce cash-based tax revenues immediately in 2021, whereas the reduction of the refund amount will reduce the central government's cash-based expenditure in most cases with a delay of one year as the refund is paid retroactively.

Table 10. Transition period impacts of the three models. Changes in net energy tax revenues consist of a reduction in electricity tax revenue and a reduction in tax refunds.

		2020	2022	2023	2024
		Change compared to initial situation, EUR million			
MODEL 1	Companies eligible for tax refunds	6	12	29	46
	15 largest losers in absolute terms	5	9	23	44
	Enterprises not eligible for tax refunds	-20	-30	-42	-53
	(including agriculture) Energy tax revenues, net	-14	-19	-14	-8
MODEL 2	Companies eligible for tax refunds	37 32	36	39	46
	15 largest losers in absolute terms	-49	34	38	44
	Enterprises not eligible for tax refunds	-13	-51	-53	-53
	(including agriculture) Energy tax revenues, net		-16	-15	-8
MODEL 3	Companies eligible for tax refunds	36 26	37	38	46
	15 largest losers in absolute terms	-49	32	37	44
	Enterprises not eligible for tax refunds	-14	-51	-53	-53
	(including agriculture) Energy tax revenues, net		-14	-16	-8

In model 1, category II electricity tax would be reduced and the energy tax refund decreased by lowering the refund rate (currently 85%) as quickly as possible, without increasing the effective electricity tax of the companies currently eligible for the refund. Model 1 would only increase the net tax burden of energy-intensive companies more noticeably towards the end of the transition period, and the electricity tax paid by industrial companies, greenhouses and data centres not eligible for the refund would decrease at a relatively steady rate. The effective electricity tax paid by the companies eligible for the refund would decrease no later than towards the end of the transition period. The change envisaged in model 1 would only increase the net energy tax burden of the 15 companies facing the greatest increase more noticeably towards the end of the transition period, as the electricity tax reduction is no longer sufficient to compensate for a sharper decrease in the refund rate of these companies.

In model 2, a front-loaded decrease in category II electricity tax towards the minimum level allowed by the EU would take place, and the energy tax refund would be reduced by lowering the percentage refunded. In this model, the effective electricity tax level paid by companies eligible for the refund would decrease relatively steadily, while in the case of non-eligible companies, the level would decrease rapidly. Model 2 would result in a front-loaded increase in the energy tax burden of energy-intensive companies, with a rapid reduction in the refund rate. At the same time, the energy tax burden on industrial companies not eligible for the refund would decrease rapidly.

In model 3, a front-loaded reduction in category II electricity tax towards the minimum level allowed by the EU would take place, and the energy tax refund would be reduced by increasing the threshold value and reducing the refund rate as well as removing electricity taxes from the scope of the refund. Compared to model 2, the key difference would concern the group of companies with continued eligibility for the energy tax refund. In model 3, energy-intensive companies would receive a larger energy tax refund, thus offsetting the growth rate of these companies' energy tax burden. Refunds would only be paid to approximately 30 companies after the first year in model 3, whereas refunds after the first year would be paid to about 160 companies in model 1 and to 75 companies in model 2.

Lowering category II electricity tax to the EU minimum and abolishing the tax refunds for energy-intensive companies in a cost-neutral manner is one of the key measures in the Government's energy tax reform. The working group based its analysis on solutions in which, while the effective electricity tax level of companies eligible for refunds would not increase during the transition period, the transition period would be more or less cost-neutral for central government finances. The purpose of the transition period is to give companies time to adapt to the change. From these starting points, **the working group finds** that a transition period extending until 2024, as in model 1, would be a balanced solution that would already encourage industry to reduce emissions in the near future while still giving the companies hardest hit by the reform time to adapt. Industries subject to category II energy tax but not eligible for the tax refund for energy-intensive companies would also benefit from the measure relatively soon.

The working group notes that the tax refund for energy-intensive companies has mainly relieved the tax burden of industries in the emissions trading sector, which has enabled the application of higher general tax levels and thus stronger tax incentives in the effort sharing sector.

4.1.4 Heat pumps and data centres

The Government Programme notes that heat pumps and data centres generating heat for district heating networks will be transferred to category II electricity tax. The Vuosaari Climate Conference adopted the policy of striving to implement this measure from the beginning of 2021. The conference noted that the measure's compliance with

Union law would have to be ascertained. Data centres of over 5 megawatts already are in electricity tax category II.

The working group's assignment stated that issues related to this matter would be examined separately, and the findings would be addressed in the working group's efforts as far as possible.

The Government Programme entry is associated with the utilisation of waste and surplus heat in a broader context, and thus the objective of switching to non-combustion technology in heat production. Taking heat pumps into account in the energy taxation of CHP is also relevant to this issue. These questions have been examined by an informal working group of the Ministry of Finance, the Ministry of Economic Affairs and Employment and the Tax Administration. Several studies on waste heat, its amounts and its usability due for completion in autumn 2020 are underway.

This has proven a complex issue in terms of availability of information, technical feasibility and achieving the objective of the measure alike.

Firstly, it emerged in the course of the group’s work that a more accurate analysis is needed of whether only limiting this measure to data centres and heat pumps connected to district heating networks is justified in terms of environmental, energy and industrial policy objectives.

Secondly, the information currently available on the amount, sources and potential of waste heat in different situations is not sufficient for an impact assessment and the working group’s conclusions.

Thirdly, the real-life situations are highly divergent, which is why the impacts of the measure on different actors also differ, and the technical feasibility of legislation in different cases should also be ensured. For example, no ready-made definitions are available for a district heating network, a heat pump and district heat, and these concepts must be defined for taxation purposes.

Fourthly, a State aid authorisation and possibly also a unanimous decision of the Council are needed for the tax reduction for heat pumps. Launching a specific EU procedure will only be possible once the model selected for the measure and its technical implementation method have been chosen and an impact assessment of the proposed measure has been completed.

It should be remembered that the electricity tax paid by large data centres will decrease at the same rate as category II electricity tax.

The working group proposes that the investigation of the issue be continued separately, ensuring that it will be completed in February 2021. The EU authorisation procedure will be initiated at the beginning of 2021, or earlier if the report discussed above has been completed. The idea is that the change can be applied from the beginning of 2022. However, if the process progresses faster than anticipated, the measure can be introduced in 2021.

4.1.5 Demand response of electricity

The Government Programme notes that demand flexibility incentives will be promoted, for example through dynamic electricity taxation. This issue has been investigated by the Ministry of Economic Affairs and Employment's Smart Grid Working Group[105]. Due to the many problems associated with it, the Group was not in favour of introducing a dynamic electricity tax. A key principle of the Smart Grid Working Group was that the demand response incentive should come from the market. It concluded that a dynamic electricity tax artificially strengthens the electricity price signal, complicates customers' electricity purchases, increases the price risk and costs of sellers and customers, and may bind elasticity to a specific marketplace.

The Smart Grid Working Group also found that the model would require an overhaul of the tax system, make it more difficult to anticipate tax revenue accrual and complicate tax processes. According to the reports commissioned by the Smart Grid Working Group, the model is also fraught with challenges related to such aspects as fairness, predictability and complexity.

The working group shares the Smart Grid Working Group's view and does not support the introduction of a dynamic electricity tax.

[105] Pahkala, T., Uimonen, H., Väre, V.2018. Joustava ja asiakaskeskeinen sähköjärjestelmä; Älyverkkotyöryhmän loppuraportti. Työ- ja elinkeinoministeriön julkaisuja 33/2018. http://um.fi/URN:ISBN:978-952-327-346-7

4.1.6 Taxation of electricity storage and pumped storage stations

The Government Programme notes that the double taxation of electricity storage will also be abolished for pumped storage stations and smaller batteries.

The taxation of electricity storage was reformed at the beginning of 2019 to eliminate double taxation, and more precise regulation on the definition of auxiliary supplies of electricity production will enter into force on 14 September 2020. Under this definition, the electricity consumed by pumped storage stations will be regarded as having been consumed by tax-exempt auxiliary supplies.

All measures referred to in this Government Programme entry have thus been implemented.

4.1.7 Tax increase on transport fuels

The Government Programme notes that taxation of fossil fuels will be increased by EUR 250 million over the electoral term in line with the forecast rise in consumer prices.

The increase of taxes on transport fuels referred to in the Government Programme entered into force on 1 August 2020.

4.1.8 Taxation of waste incineration

The Government Programme notes that a tax on energy and carbon dioxide emissions from waste incineration will be investigated in order to promote a circular economy.

A project of the Government’s analysis, assessment and research activities on influencing the impacts of waste incineration on the circular economy and the climate with various policy instruments is underway and will be completed in autumn 2020. The project also examines the taxation of waste incineration as a policy instrument.

4.1.9 Abolishing the tax expenditure for paraffinic diesel oil

The Government Programme notes that a working group will be appointed to draw up, by the budget session of autumn 2019, a proposal for deductions of EUR 100 million at the 2023 level concerning business subsidies.

A working group on business subsidies appointed by the Ministry of Economic Affairs and Employment to implement the Government Programme objective proposed phasing out the tax expenditure for paraffinic diesel oil. A government proposal on the abolition of this expenditure is to be submitted to Parliament in connection with the budget proposal for 2021, and its first phase is to enter into force on 1 January 2021.

4.1.10 Total of tax changes proposed by the working group for 2021

Regarding those Government Programme objectives that still remain to be implemented, the working group proposes that the changes related to heating fuels and CHP, mining, category II electricity tax as well as the tax refunds for energy-intensive companies be implemented in 2021. These changes are summed up in Table 11 below on the basis of the proposals and assumptions discussed above. The Table only presents the changes to be implemented in 2021, and it should be noted that the measures related to category II electricity tax and the tax refund for energy-intensive enterprises take place over several years. The Table shows the changes at the annual level and on accrual basis. Rather than accrual based, the central government budget is cash based, and this is why only about five sixths of the revenue will be accrued in 2021. The impacts of changes to appropriations will mainly be seen with a delay of one year, as the refunds are paid retrospectively.

Table 11. Impacts of the changes on central government finances.

Accrual based change at yearly level in 2021	Tax revenues (revenue) EUR million	Tax refunds (appropriation) EUR million
4.1.1 Heating fuels and CHP	125	25
4.1.2 Mining	7	-2
4.1.3 Electricity tax and tax refunds for energy-intensive companies	-97	-82
Total	**35**	**-59**
Central government finances in total	**94**	

The Government Programme entries will affect all tax expenditures relevant to energy taxation, and thus also the business subsidies listed in various reports and environmentally harmful subsidies. Above all, this is due to the fact that the tax changes will affect the reference levels defined as the benchmark system of tax expenditure calculation. As a whole, tax expenditures will consequently increase. As noted in section 2.1.10 of this report, from this perspective the use of tax expenditures that describe the taxation structure to directly define business subsidies or environmentally harmful subsidies is highly problematic. The estimates of specific tax expenditures are not commensurate or otherwise comparable, in addition to which the overall analysis is also complicated by the fact that the expenditures are interlinked, and thus increasing one expenditure may either reduce or increase another one. In real terms, the increase in tax expenditures may exceed the increase in tax revenues ensuing from the underlying tax change.

The increased tax on heating fuels will reduce the tax expenditure for light fuel oil used in mobile machinery and natural gas used in transport; however, this reduction will be clearly smaller than the increase due to the higher tax imposed on transport fuels as from 1 August 2020. For the time being, tax expenditures for tax-exempt wood-based fuels and waste incineration will increase. The change proposed in this section will not affect the tax expenditure for peat. The tax expenditure for CHP will be reduced as set out in the proposal regarding the 0.9 calculation rule. Energy tax refunds for both energy-intensive companies and agriculture will increase.

The reduction of category II electricity tax will increase the difference between it and the higher electricity tax category, and thus also the tax expenditure for industry and greenhouses. The tax expenditure for data centres will also increase for the same reason. To ensure the equal treatment of greenhouses and other agricultural sectors, this will also result in an increase in the energy tax refund for agriculture. The energy tax refund for energy-intensive companies will be abolished over a transition period, which will also remove a significant tax expenditure. The working group proposes that tax expenditures for mining, which take the form of both transfer to the lower electricity tax category and tax refunds, be abolished already in 2021.

In proportion to households' disposable income, the direct effects of the tax increases would be moderate and fairly evenly distributed between the income deciles before index-linked benefits are taken into account, although in the highest income decile, the impact would be somewhat smaller than in the other deciles. For individual households, the impact of the tax increase will be higher than the average for the income deciles, but an increase in index-linked benefits associated with the tax increases would compensate the lowest-income households for the change.

The tax changes proposed above will not have a significant impact on the regional effects of energy taxation. Regarding CHP, the most significant impacts of the tax changes will affect the large cities on the southern coast. In addition, impacts on building-specific oil heating will be emphasised in urban areas.

4.2 Further proposals for attaining Government Programme goals and other development of energy taxation

The working group's assignment included not only fulfilling the Government Programme objectives but also assessing other possible development needs of the current energy tax system. In addition to the general development of energy taxation, the working group assessed any needs for changes from the perspectives of achieving the emissions reduction targets and sustainable development of central government finances.

The emissions reduction targets in the effort sharing sector are highly ambitious, and especially in this sector, energy taxation plays a key role in ensuring that emissions can be cut cost-effectively. Significant additional measures in energy production and use, also in the emissions trading sector, will be required to attain the Government Programme's climate policy objectives regarding carbon neutrality in 2035. The changes associated with Government Programme implementation go in the right direction but clearly not far enough from the perspective of both the targets set for the effort sharing sector and the carbon neutrality target.

In order to achieve the Government's target of carbon neutrality in 2035, versatile measures will be needed, of which energy taxation is only one. Implementing some of the energy taxation measures as soon as possible is appropriate, whereas others can be implemented in the medium term, and yet others even later. Setting a target for the measures and including the actions needed to attain the target and their implementation schedule in tax legislation will be the key. This will create a predictable and gradual path to more stringent fiscal measures aiming to reduce emissions. This will allow operators to prepare in advance and, on the other hand, the measures can be adjusted on the basis of the experience gained.

4.2.1 Energy taxation structure and tax expenditures

In the working group's opinion, the general principle of taxing fuels based on their energy content and greenhouse gas emissions can be considered justified, as it enables the reconciliation of fiscal objectives with energy efficiency and emission policy objectives. Emphasising the carbon dioxide tax component can be regarded as fairly balanced solution at the current overall tax level for heating fuels.

Technologies related to energy production and consumption and the relevant legislation are advancing rapidly. **The working group finds it important** that the structure of energy taxation and the tax expenditures included in it be assessed on a regular basis to ensure that the structure is as effective as possible from the perspective of the objectives and thus includes as few inappropriate or costly tax incentives as possible.

The level of energy taxation has gone up in recent years, and the structure has become more complex. This is why **the working group draws attention** to the need to ensure that the tax authorities have sufficient resources for assessing the impacts of tax changes and supervising tax compliance.

The structure of energy taxation should support the achievement of the Government's climate policy objectives at the lowest possible financial cost. Consequently**, the working group proposes** the following changes to tax expenditures, in addition to the ones discussed above.

Energy tax expenditure for agriculture

Farmers and greenhouses are eligible for a tax refund for agriculture, which is paid for electricity, light and heavy fuel oil and biofuel oil. Electricity can be supplied to greenhouse cultivations directly at category II tax level if it can be metered separately. Other agricultural sectors receive the difference between the electricity tax categories as an energy tax refund for agriculture. Over 35,000 operators apply for the refund, and the subsidy amounts granted to them are relatively small (more than a half of the beneficiaries receive a refund amount between EUR 50 and 500 each year). From the perspective of cost-effectiveness, a subsidy paid as a tax refund is not appropriate. Additionally, the subsidy is currently not neutral, as it does not cover all fuels, such as natural gas, LPG and coal, which are fossil fuels used for similar purposes as the fuels eligible for the refund. According to the Natural Resources Institute Finland's statistics, the use of these fuels in agriculture is limited, however.

Professional greenhouse cultivations are also eligible for the energy tax refund for energy-intensive companies. Other agricultural sectors are not eligible for this subsidy, and the scheme has thus not treated companies equally in fiscal terms. This has not been particularly significant in practice, however, due to the criteria of the tax refund system for energy-intensive enterprises – especially as a very large amount of energy must be used to attain the lowest threshold value for a refund, or EUR 50,000 – and it is unlikely that farms other than greenhouse companies, such as livestock or crop farms, would have been eligible for refunds. As the system of tax refunds for energy-intensive enterprises is abolished, greenhouses would pay the tax on energy products to the same extent as other forms of agriculture, which currently are not eligible for tax refunds for energy-intensive companies.

The working group proposes that the energy tax refund for agriculture would be phased out in the effort sharing sector. Lowering the price of fossil fuels is not in keeping with the environmental objectives, and this is why the energy tax refund for agriculture should also be dropped, for example on a similar schedule as the tax refund system for energy-intensive companies. However, the electricity tax for agriculture would remain in the lower category II, which will be reduced to the EU minimum level. From now on, the reduction in electricity tax for greenhouses and other agricultural sectors would take the form of a direct tax reduction. This change would be carried out as soon as possible, however giving operators enough time to arrange for the metering required for the direct electricity tax reduction. Lowering the electricity tax to the EU minimum (EUR 0.5/MWh) would reduce the annual energy tax burden on greenhouses and other agricultural sectors by a total of EUR 9 million.

Abolishing the energy tax refund scheme for agriculture as proposed by the working group would increase the energy tax burden on agriculture by EUR 21 million at the current tax levels, mainly for the part of fossil fuel oil. In net terms, the annual energy tax burden on agriculture would thus increase by approximately EUR 12 million. As the energy tax refund for agriculture and greenhouses is part of the support package for the agricultural sector, **the working group finds** that a separate report should be produced on the effects of its abolishment and the needs to adjust other measures for agriculture resulting from it. These changes could include support for separate metering of electricity and measures promoting low-carbon farming, such as additional support for renewable energy investments or others that encourage the use of renewable energy in agricultural and greenhouse production.

Taxation of peat

In section 4.1.1, which deals with the tax increase of EUR 100 million on heating fuels, the working group proposes that the tax on peat be increased to an equal level with other heating fuels. This will not reduce the tax expenditure for peat, however.

When assessing the tax treatment of peat, one of the energy policy principles was that coal should not replace peat in energy use. The goal of phasing out coal in energy use has been laid down in an act, under which this process will have been completed by 1 May 2029 at the latest. Consequently, it would be justified to time the full abolition of the tax expenditure for peat to take place later than this. One of the concerns associated with a rapid reduction in the use of peat for energy production has been that it might be substituted with tax exempt timber material, which could be used as raw material for the sawmill, plywood, paper or pulp industry. A high tax on peat would thus improve energy producers' ability to pay for wood which, on the other hand, would be restricted by the competitiveness of district heating and other production options.

According to the findings of a report commissioned by the working group on peat from AFRY, the Government's objective of halving the use of peat is highly likely to be realised, unless the price of emission allowances drops to a very low level, or as low as EUR 20 per t CO_2.

To ensure that the emissions reduction target is attained and as part of eliminating subsidies for fossil fuels, **the working group proposes** that the tax expenditure for peat be also phased out. The first step towards reducing the expenditure should be taken in 2021 by increasing the tax on peat by EUR 1.5 per MWh in addition to what is set out in section 4.1.1. The expenditure would subsequently be decreased further by increases of EUR 1.5 per MWh in 2022 and 2023. At this point, the tax on peat would amount to approx. EUR 10 per megawatt hour, which would correspond to less than one third of the tax level for peat in the environmentally-related model in separate heat production and less than a half of the tax on CHP. The proposed tax increase is not expected to affect the order in which coal and peat are used, as coal remains a more expensive alternative. The AFRY report referred to above also discussed the impact of the peat tax and emission allowances on ability to pay for wood. It estimates that the price of an emission allowance will have a significantly greater impact on it than changes in the tax level.

Alternative sources of renewable energy are available for peat-fired district heating production, such as bioenergy, industrial-scale heat pumps and the utilisation of waste heat. The differences between municipalities in how and on what schedule alternative forms of heating can be utilised are great, however, which is why it is justified to carry out interim reviews while phasing out the tax subsidy. This will allow a period of adaptation for operators.

Taxing the use of timber material for energy, and thus directing it to further processing, would be an option for ensuring that it would not be used for energy generation. For example, tax at the same level as for heavy fuel oil is already imposed on tall oil in order to direct it to further processing rather than energy use.

The working group did not discuss the taxation of timber and the issues related to it in detail, and they should be examined separately. **In the working group's view**, the taxation should target other uses rather than forest-industry side streams and small-scale incineration of wood. This would mean that black liquor, sawdust, chippings, bark and waste wood as well as small-scale use of wood on farms and in single-family houses would be excluded from the tax regime. The working group notes in general that there are no obstacles arising from EU legislation to levying taxes on timber and that, if otherwise justified, it would be possible from the fiscal technique perspective.

Taxation of biogas

The current tax exempt status of biogas is problematic in terms of the Energy Taxation Directive, State aid regulation and competition neutrality, among other things. Tax exemptions for the biogas fraction in imported biogas and, in particular, imported gas blend, are not necessarily the optimal solution for domestic production. Levying a tax on biogas would contribute to ensuring that national tax expenditures would not be passed on to biogas produced and consumed elsewhere. In addition to the aforementioned problems directly related to taxation, levying a tax is a precondition for promoting biogas use by extending the distribution obligation to it. Imposing a tax on a gas blend is already extremely challenging in a situation where the blend contains two different methane components (fossil and renewable) subject to different tax levels.

In order to solve these problems, **the working group proposes** that, in keeping with the energy tax model, biogas be taxed at the same level as heating fuels in both transport and heating use. In practice, this would mean that it would only be subject to the energy content tax. The current tax procedure would continue until the changes enter into force.

Some of the biogas is produced on a small scale and often intended for use on the farm that produces it. Levying a tax from these small plants would create an administrative burden on both the authorities and the operators, and taxing these plants would thus not be appropriate. Additionally, the volumes of gas produced at small plants are relatively low, and the costs are high compared to large-scale production. This is why taxing such plants would not be justified. **The working group also proposes** that efforts be made to exclude sporadic and small-scale biogas production from the tax regime, mirroring the current procedure for small-scale electricity production. In other words, biogas produced in a small plant and used by the producer would be exempt from tax. While biogas produced in a small plant could be transferred tax free to a natural gas transmission network, for example, the transmission system operator would have to pay tax on the biogas when it is released for consumption from the network. A low biogas tax in keeping with the energy tax model would enable a predictable future outlook for the sector. An effort would be made to carry out the change as flexibly as possible, bringing it into force in 2022.

4.2.2 Fiscal importance of energy tax revenues and maintaining emissions guidance

While energy taxes also have a fiscal role, attaining the objectives of an emissions-based tax structure will lead to a reduction in the tax base and, before long, tax revenues. As discussed in section 2.5.3 of this report, however, **the working group estimates** that there will be no significant reduction in tax revenues, at least not in the medium term. The most significant part of the tax revenues accrue from transport fuels, and it will take time before the electrification of the vehicle fleet can have a major impact on tax revenues. The second most significant item is the electricity tax, the tax base of which is expected to grow. Reducing the electricity tax in category II will not significantly alter its fiscal role, as the greatest part of the revenue from category II electricity tax is currently returned to companies in the form of tax refunds. The tax base of fossil fuels used for heat production is predicted to already decline significantly in the next few years, but the tax yield generated from them compared to other items is currently negligible from the perspective of public finances. Projections extending till 2030 nevertheless indicate that a reduction in excess of 10% in energy tax revenues is already possible. However, significant uncertainty is associated with the projection, especially with regard to the electrification of transport and the rate at which energy efficiency will improve.

Regular corrections for inflation in tax levels

As excise duties are determined in EUR per unit of energy and, in some cases, converted to a level per kilogram, tonne or litre to facilitate tax collection and make the tax levels easier to understand, they are unit taxes. Consequently, they are not linked to the general price level, disposable income or other changes in the value of money over time. This is why the level of taxation goes down in real terms in conditions of a positive inflation. At the same time, the share of energy tax revenues, and revenues from several other excise duties in the Budget, will decrease for this reason alone. Other tax revenue items, including VAT, earned income tax and corporate tax, keep pace with nominal economic growth, at least to some extent. The development of some energy tax levels in nominal and real terms is discussed in section 2.1.

In the current situation, there is no reason why the tax levels could not be maintained by means of regular decisions to increase taxes; in the case of heating fuels, tax increases have exceeded the rate of inflation, especially in the last ten years. Recent public debate, in particular, has nevertheless shown that changes to taxes made merely to maintain their level in real terms are also seen as tax increases and, when regular, as continuous tax increases. This is difficult in terms of communications and hampers political decision-making.

To meet the current emissions reduction objectives, targeted and possibly also general increases in energy taxes will be needed. From this perspective, it should be ensured that the level of energy taxation is not inadvertently reduced in real terms. In order to maintain environmental incentives and partly tax revenues, **the working group proposes** a policy of making regular adjustments to the level of energy taxation from now on. This could be done by linking tax levels to a specific index in the legislation, as in Sweden[106] and some other European countries, or by means of a resolution, in which case an agreed increase with the purpose of maintaining the level of taxation would be made, unless otherwise decided.

[106] Regeringskansliet. Beräkningskonventioner 2020; En rapport från skatteekonomiska enheten i Finansdepartementet.
https://www.regeringen.se/rapporter/2019/10/berakningskonventioner2020/

4.2.3 Promoting the circular economy through changes to electricity taxes

Promoting circular economy is one of the key objectives of the Government Programme which has been examined from different perspectives. Reports and stakeholders consulted by the working group pointed out that, in order to promote the circular economy, the recycling industry (industrial manufacturing and processing of recycled materials) should be treated similarly to other industries and transferred to electricity tax category II.

The working group believes that there are grounds for investigating this question further.

4.2.4 Taxation of e-fuels

Different types of e-fuels (renewable fuels of non-biological origin) may be an option in the transition to a low-carbon economy. These fuels are only expected to become more widespread in the 2030s. From the energy taxation perspective, it needs to be decided how the electricity consumed to produce e-fuels and the final products, or the actual e-fuels, will be taxed.

As a point of departure, the production of e-fuels falls within the industrial category II electricity tax, in addition to which these operations are energy-intensive. This is why the decisions on the industrial electricity tax rate and the tax expenditure for energy-intensive industries will be followed when levying taxes on such production.

Taxes on e-fuels can be levied in keeping with the current energy tax model, provided that the energy content and life-cycle emissions of the products are determined. To avoid national solutions, this should be done at EU level. The criteria for reductions in greenhouse gas emissions achieved through e-fuels will be published by the end of 2021 as a Commission’s delegated act. These fuels must meet the criterion of 70% emissions reduction in comparison with fossil fuels.

The principles of energy taxation are laid down in the Energy Taxation Directive, which currently does not contain provisions on the taxation of hydrogen and e-fuels. The Commission intends to issue a proposal for a revision of the Directive by July 2021. It is likely that policies on key issues related to the taxation of e-fuels will be adopted in the context of this review.

The working group finds that the taxation of e-fuels does not require immediate changes to energy taxation, as the tax on electricity used in hydrogen production will be reduced to the EU minimum. Tax levels in keeping with the energy tax model should and can be defined for e-fuels as they enter the market and the Union legislation applicable to them is clarified.

4.2.5 Strategic stockpile fees and oil damage duties

The working group draws attention to the fact that the criteria for determining the strategic stockpile fee are currently not fully in line with the Excise Duty Directive. For this reason, the strategic stockpile fee and its determination criteria should be reviewed and amended, ensuring that they are compliant with EU legislation, by 2022.

Examining the oil damage duty was not actually part of the working group's mandate; however, this duty is collected on certain energy products. As this is a tax associated with energy products not compliant with the Excise Duty Directive, **the working group points out** that the oil damage duty should be brought in line with Union law, similarly to the strategic stockpile fee. On the other hand, the appropriateness of the duty is currently being assessed as part of the secondary compensation for environmental damage system (TOVA). The aim of this project led by the Ministry of the Environment is to create more comprehensive systems of secondary liability for environmental damage to prepare for managing environmental risks caused by oil and chemical accidents, for example, and to compensate for environmental damage and to take remediation measures when the liable party is insolvent or unknown, or cannot be reached. The project also examines the funding base of the system at large.

4.2.6 Proposed tax changes in total

In order to achieve the objectives of the Government Programme and to otherwise develop energy taxation, the working group proposes that refunds of energy taxes for agriculture be dropped for the part of fuels and that the tax on peat be increased in 2021. The changes are summed up in Table 12 below on the basis of the proposals discussed in this report and their underlying assumptions. The Table only contains those changes that would take effect in 2021. The energy tax refund for agriculture will be phased out, and it is proposed that tax increases for peat be continued. The Table shows the changes at the annual level and on accrual basis. Rather than accrual based, the central government budget is cash based, and this is why only about five sixths of the revenue will be accrued in 2021. The impacts of changes to appropriations will mainly be seen with a delay of one year, as the refunds are paid retrospectively.

Table 12. Impacts of the changes on central government finances.

Accrual based change at yearly level in 2021	Tax revenues (revenue) EUR million	Tax refunds (appropriation) EUR million
4.2.1 Agriculture	0	-5
4.2.1 Peat	14	4
Total	**14**	**-1**
Central government finances in total	**15**	

As the energy tax refunds for agriculture are eliminated, this means that a significant tax expenditure is also abolished. The tax expenditure for peat will be reduced. Both of these tax expenditures can also be considered environmentally harmful, as peat has a significantly lower tax level than other similar fuels or those that are less harmful for the environment, whereas the energy tax refunds for agriculture are almost exclusively paid for fossil oil products.

5 Appendices

Appendix 1: Available studies – summaries and conclusions

DEVELOPMENT OF EXCISE DUTIES ON ENERGY PRODUCTION IN FINLAND, an assessment of tax guidance from the perspective of the carbon neutrality target[107]

In March 2019, the Ministry of Finance commissioned a report aiming to assess how, by coordinating energy taxation, emissions trading and other climate policy instruments, Finland's transition to carbon neutrality by 2045 can be supported, attaining 95% emission-free energy production in 2040. The report examines the current state of regulation on emissions reduction instruments, the adequacy of the current tax structure and incentives and the effectiveness of other steering instruments as well as seeks to determine what the most cost-effective and efficient measures to reduce greenhouse gas emissions in the future would be. The report does not cover transport and transport taxation. The cited target of a 95% reduction in greenhouse gas emissions by 2040 does also not apply to greenhouse gas emissions from industrial processes. Nevertheless, emissions reduction measures and technologies for both transport and industry are included in the calculated estimates examining the impacts of changes to the taxation of alternative energy forms on emissions, the structure of energy supply and the central government's tax accruals.

Since this report was launched, the Government has set the more ambitious target of Finland being carbon neutral by 2035. The report was unable to factor in this higher target.

[107] Koljonen, T., Laukkanen, M., Ollikainen, M., Lehtilä, A., Eerola, E., Koreneff, G., Kyritsis, E., Lindroos, T., Ollikka, K., Pursiheimo, E., Rämä, M., Siikavirta, H. 2019. Energian tuotannon valmisteverotuksen kehittäminen Suomessa: Vero-ohjauksen arviointia hiilineutraalisuustavoitteen näkökulmasta. VTT Technology; No. 359. VTT Technical Research Centre of Finland.

The main conclusions of the report are the following:

The current measures will not be adequate to achieve the carbon neutrality target set for 2045, nor will they achieve 95% emission-free energy production by 2040. It should also be noted that the model calculations concerning the current measures were made in the real terms of 2019, working on the premise that corrections for inflation would also be made to the current tax levels. The greatest reductions in greenhouse gas emissions would be achieved by abolishing tax expenditures for fossil fuels. This would mean eliminating tax expenditures for peat, CHP and the use of fossil fuels in industry and agriculture.

In order for the goals of the report to be attained, not only the measures cited above but also other measures improving the efficiency of price as a policy instrument will be needed, such as increasing energy taxes for heat production or a sufficiently high price of emission allowances (higher than the level EUR 25/t CO2). The preconditions for achieving the target of 95% emission-free energy production will also include a gradual increase in fuel taxes or other policy instruments, such as a price floor in emission allowance trading.

If Finland eliminated tax expenditures for fossil fuels, central government tax revenues would increase in the medium term. Later, fossil fuels will have been replaced by other energy sources and the tax revenue will decrease.

By reducing electricity taxes for industry, trade, services and the agricultural sector to the EU minimum, only minor direct impacts on greenhouse gas emissions would be achieved, with a decrease of more than EUR 0.5 billion in central government revenues.

The models examined indicate that the abolition of the tax expenditure for peat would be an effective measure for reducing greenhouse gas emissions from energy production.

Energy tax as a policy instrument would efficiently reduce the use of fuels in agriculture and heating oil in buildings, and thus also greenhouse gas emissions.

While several fossil free methods are available for producing district heat, each one of them comes with a number of benefits and challenges that may also vary from one city to another. For example, significant uncertainty is associated with estimating the potential of using waste heat, which would require further studies.

ENERGY TAX SUBSIDIES AND COST EFFICIENT ENERGY SECURITY[108]

This report examined three tax expenditures for heating fuels and their impacts on the security of supply in the short and long term. The expenditures comprised a lower tax rate for peat, a lower tax rate for CHP, and a tax exemption for solid biomass. It also looked at the environmental and other societal impacts of the expenditures and alternative methods for maintaining security of supply. The impacts of tax expenditures were examined in 2020 and 2030.

In the short term (roughly one to two years), the abolition of the tax expenditure for peat would lead to reduced peat consumption and its replacement with both domestic and imported solid biomass. In the longer term (by 2030), the removal of the tax expenditure for peat would probably end peat use. While this would pose challenges to energy security, these challenges could be addressed by stockpiling solid fuel or light fuel oil. Similarly, the removal of the tax expenditure for CHP would lead to an early decommissioning of natural gas fired CHP capacity of around 500 MW. Elimination of the tax expenditure for biomass was not expected to support investments in biomass-fired CHP capacity.

Removing all tax expenditures would increase the production costs and consumer prices of district heat. Simultaneously, the relative competitiveness of consumer heat pumps would improve compared to district heating. Consequently, the removal of tax expenditures would accelerate the electrification of heating which, on the one hand, also is the goal. This could weaken the national balance of electricity supply and demand, setting challenges to the security and continuity of electricity supply.

Phasing out of the use of peat for energy would reduce emissions from domestic energy production. The elimination of the tax expenditure for solid biomass was assessed in a situation where an energy content tax would be imposed on solid biomass. The report assumed that, as the tax expenditure for solid biomass is removed, the tax expenditure for peat would also be eliminated. In this case, too, energy producers would seek to replace as much of their peat use as possible with biomass. Imposing an energy content tax on biomass would make investments in biomass-fired CHP slightly more profitable than separate production of heat in a large plant. This would probably not affect the realisation of investments in CHP either,

[108] Wahlström, J., Kaskela, J., Riikonen, J., Hankalin, V. 2017. Energy tax subsidies and cost efficient energy security. Publications of the Government´s analysis, assessment and research activities 2017:56.
https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/161852/56_19_Energiaverotuet_ja_kustannustehokas_huoltovarmuus.pdf?sequence=1&isAllowed=y

however, as these investments are also hampered by uncertainties regarding the availability of biomass.

The tax expenditure for CHP mainly benefits district heating networks with production plants fired by coal and natural gas. In the short term, the abolition of tax expenditures for CHP will not significantly affect the security of supply or the continuity of electricity supply, as significant changes in plant capacity or its use could not be made.

The removal of tax expenditures for CHP could lead to early decommissioning of approximately 500 MW of electricity generation capacity by 2030. This would have a negative effect on the continuity and security of supply of electricity, as electricity production based on natural gas is highly flexible. This finding is sensitive to the assumed prices of electricity, however, and at slightly higher electricity prices, the capacity of natural gas fired CHP could remain part of commercial production despite the tax change.

The removal of all tax expenditures would affect the price and competitiveness of district heat compared to building-specific heat pumps powered by electricity. The indirect impacts could thus include growing electricity consumption. The magnitude of the effect will depend on whether only one tax expenditure is removed, or several expenditures at the same time.

Deployment of new large-scale heat production technologies and the expansion of current operation could help reduce the need for imported biomass, especially in large district heating networks. The challenge of using large heat pumps lies in the availability of heat sources. While geothermal solutions and new sources of waste heat could enable cost-effective heat production on a significant scale in the 2020s, their development still involves technical and commercial uncertainties. The role of these techniques in district heat production in 2030 entails uncertainties in assessing annual fuel use amounts.

Waste heat in district heating systems.[109]

This report commissioned by the Ministry of Economic Affairs and Employment and Finnish Energy examines the framework of definitions for the utilisation of waste heat set out in the Energy Efficiency Directive and Renewable Energy Directive as well as

[109] Rämä, M., Klobut, K. 2020. Hukkalämpö kaukolämpöjärjestelmissä. VTT Technical Research Centre of Finland Ltd, VTT-CR-00340-20. https://energia.fi/files/4831/Hukkalampo_kaukolampojarjestelmissa_-_maarittely_ja_luokittelu_VTT_2020.pdf

potential waste heat sources, including descriptions and estimated temperature levels.

The summary of the report notes that even if the Directives may not be completely unambiguous, they show a clear intent to promote the use of waste heat.

According to the report, as a shortcoming from the Finnish perspective can be regarded the fact that the Directives ignore residential buildings as waste heat sources and, rather unexpectedly, define sewage as a renewable energy source rather than waste heat. The authors believe that the classification into renewable energy or waste heat is irrelevant in itself, and that both are desirable sources of heat for district heating production. In other words, the detailed definitions inform statistics and country-specific reporting rather than the development of the heating sector itself.

Report on the potential of waste heat and efficient heating[110]

In summer 2020, the Ministry of Economic Affairs and Employment commissioned a report on the amount of waste heat and its potential from AFRY Management Consulting. The findings of the report will be used for such purposes as assessments required under the Energy Efficiency Directive, which include a cost-benefit analysis of the possibilities of using efficient heating and cooling systems.

In its report, AFRY estimates the amount of waste heat that is currently already used as district heating, and the amount which is not currently used but which has potential for use in district heating or cooling. The report breaks down the sources of surplus heat using the division required under the Directive, however also extending the examination to plants smaller than the minimum size cited in the Directive. For each plant group, AFRY prepared an estimate of their number and the total waste heat generated by them (GWh/a).

The sources of surplus heat were itemised as follows:

a. thermal power plants (over 50 MW), CHP plants (over 20 MW and 10 to 20 MW),
b. waste incineration plants,
c. power and heat plants using renewable energy (over 20 MW and 10-20 MW),
d. industrial plants (over 20 MW and 5 to 20 MW); and
e. data centres (over 5 MW and 5 to 0.5 MW).

110 AFRY Management Consulting Oy. 2020. Report on the potential of waste heat and efficient heating, 9/2020.

The project used scenarios which examine the potential and cost-effectiveness of different technologies in the heating of buildings. The scenarios cover the period between 2020 and 2050.

The total amount of waste heat generated was estimated to be around 130 TWh, of which the amount of waste heat currently used for district heating is about 3 TWh. The potential of waste heat, the use of which would be technically feasible, was estimated to be about 35 TWh. AFRY notes in its report that this technologically feasible potential is, however, fraught with many challenges, including its financial profitability or business risks. In addition, it may not be possible to exploit the full potential simultaneously or fully, as the demand for district heating in the vicinity of waste heat sources is limited and subject to seasonal variations. From a technical point of view, the greatest potential for increasing waste heat use can be found in industrial and condensate plants. In practice, the recoverable potential of condensate plants consists of the waste heat potential of Loviisa nuclear power plant. At maximum, Loviisa power plant generates approx. 16 TWh of waste heat, a significant part of which could be utilised as district heating, but this would require substantial investments. The report puts the technically feasible potential of waste heat from industrial plants at about 15 TWh. Waste incineration plants condense around 0.5 TWh of waste heat in the environment. The greatest additional potential of CHP and heat plants producing district heat was found in the flue gases of biomass and peat fired plants. The report estimates that the total waste heat potential of these boilers is about 1.1 TWh. AFRY puts the total electrical power of data centres currently optimal for waste heat recovery at approx. 300 MW. With the full load hours of 6,000 h/a, this corresponds to heat production of approx. 2 TWh, most of which would be technically usable for district heating.

Carbon neutral Finland 2035 – Scenarios and impact assessments[111]

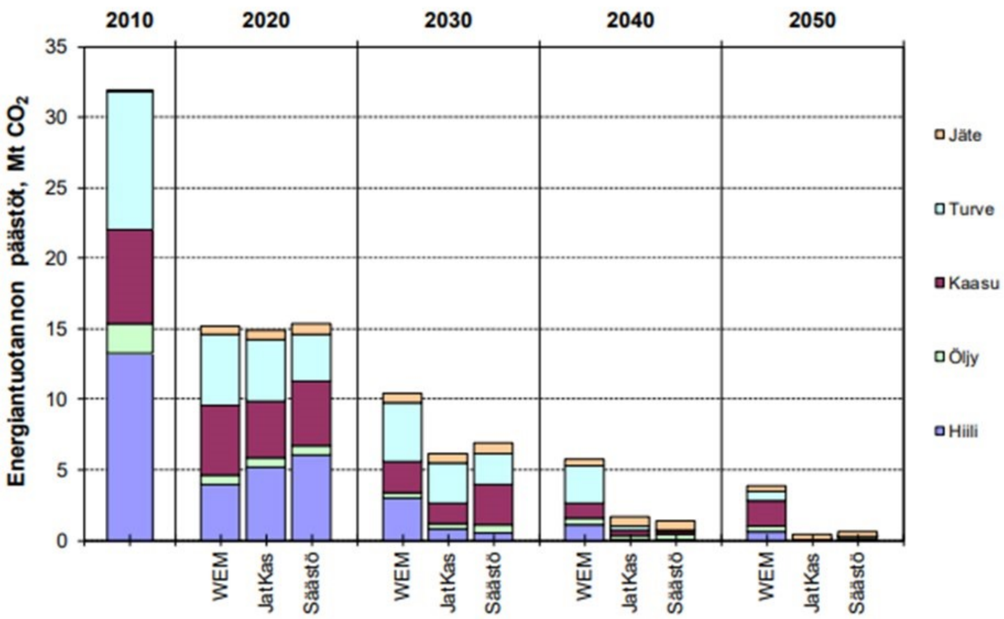
VTT Technical Research Centre of Finland and the Natural Resources Institute Finland worked out emission reduction trajectories for the long-term development of total emissions and sink development in the land use sector. The study underpinned the national long-term strategy (LTS) submitted to the European Commission in April 2020. A WEM (With Existing Measures) scenario was prepared to describe development based on the current policy measures, and two alternative trajectories were prepared for the development required to attain the carbon neutrality target for

[111] Koljonen, T., Aakkula, J., Honkatukia, J., Soimakallio, S., Haakana, M., Hirvelä, H., Kilpeläinen, H., Kärkkäinen, L., Laitila, J., Lehtilä, A., Lehtonen, H., Maanavilja, L., Ollila, P., Siikavirta, H., Tuomainen, T. 2020. Hiilineutraali Suomi 2035 - Skenaariot ja vaikutusarviot. VTT Technical Research Centre of Finland. VTT Technology, No. 366. https://doi.org/10.32040/2242-122X.2020.T366

2035 set out in the Government Programme: Continuous Growth and Savings scenarios. The differences in the emissions reductions between these low-emission trajectories are explained by the assumptions of technological advancement underlying the scenarios and, on the other hand, the assumptions related to the industrial structure and the structures of communities and the economy as a whole. Perhaps the most important technology-related assumptions are associated with the possibilities of using carbon capture and storage (CCS). Another significant difference lies in the initial assumptions concerning the development of the Finnish forest industry.

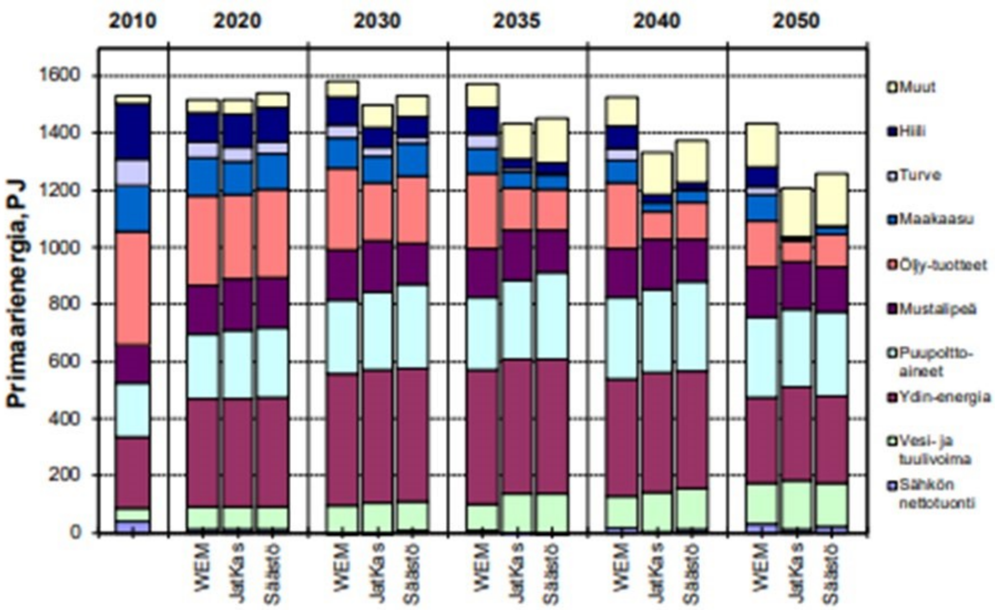
Due to the target of carbon neutrality, emissions from energy production decline considerably more sharply after 2030 in the low-carbon scenarios, falling below 2 million tonnes in 2040 in both (Figure 41). In the Continuous Growth scenario, emissions from energy production settle at 1.6 million tonnes, and in the Savings scenario at 1.4 million tonnes. In the Savings scenario, the assumed changes in energy taxes (removal of tax expenditures) have a particularly strong impact on peat use. As waste-based fuel accounts for 40% to 50% of the remaining emissions, emissions from actual fossil fuels and peat total less than 1 million tonnes, and they are fairly evenly divided between peat, natural gas and oil. In 2050, emissions from other fuels besides waste will be rather negligible.

Figure 41. Development of carbon dioxide emissions from energy production in different scenarios.



The use of fossil fuels and peat will decline significantly in all scenarios already by 2030, as their competitiveness will be eroded by the rising prices of emission allowances already included in the WEM scenario and the development of renewable energy technologies (Figure 42). In the low emission scenarios, the total consumption of mineral oil and coal, in particular, will decrease more strongly than in the WEM scenario already by 2030, whereas natural gas will still hold on to its position relatively well, thanks to existing infrastructure and production capacity.

Figure 42. Development in total procurements of primary energy by scenario.



The impact of energy tax refunds on manufacturing firm performance: evidence from Finland’s 2011 energy tax reform[112]

In their study on the effects of energy tax refunds (2019), VATT researchers (Laukkanen, M., Ollikka, K., Tamminen, S.) evaluated the impacts of the 2011 energy tax reform on the performance of manufacturing firms. In this reform, energy taxes were increased, and fuel taxation was partly linked to CO_2 emissions from combustion. In addition, the threshold value of eligibility for tax refunds for an energy-

[112] Laukkanen, M., Ollikka, K., Tamminen, S. 2019. The impact of energy tax refunds on manufacturing firm performance: evidence from Finland’s 2011 energy tax reform. Publications of the Government´s analysis, assessment and research activities 2019:32.
http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/161569/32_The%20impact%20of%20energy%20tax%20refunds.pdf?sequence=1&isAllowed=y

intensive company was lowered from the beginning of 2012: in the past, companies were eligible for the refund if the energy taxes were at least 3.7% of their value added; after the reform, however, energy taxes amounting to 0.5% of the value added have been sufficient for eligibility.

The purpose of the energy tax refunds is to support companies, in the hopes that this would be reflected in the ability of energy intensive firms to employ, invest and improve their international competitiveness. The study evaluated the achievement of this objective by comparing competitiveness, employee numbers and energy use between production plants that were eligible for the tax refunds in 2011–2012 and those that were not. As a control group, production plants in the same sector which the most closely resembled those eligible for tax refunds were sought. Competitiveness was assessed by measuring the plants' success based on their production volumes, turnover and value added.

In 2012–2016, the energy tax refunds accounted on average for 1% of the costs of companies that became eligible for refunds in 2011 and 2012. When energy intensity is measured as electricity consumption in proportion to total costs, there was little difference in the energy intensity between production plants that were or were not eligible for the refunds. In addition, the production value of plants eligible for the energy tax refunds in 2011–2012 developed less strongly in 2010–2016 than the value of non-eligible plants. The energy efficiency of production also showed a weaker development in eligible than non-eligible companies in 2011–2012. The conclusion made on the basis of the study's findings was that the tax refunds had no impact on the turnover, value added, wages, employee number or the development of energy consumption in the production plants eligible for the tax refunds. On the other hand, the tax refunds had a negative impact on the development of the value and energy efficiency of production.

Business subsidies and competitiveness[113]

Business subsidies mean financial aid that improves the financial position of a company, such as direct grants or tax subsidies in the form of more favourable tax treatment, in which case the business subsidy can be regarded as a reverse tax. Energy tax refunds are also included in business subsidies. In order to assess the extent of a tax expenditure, a reference point is needed. In many situations, the treatment of other companies provides a natural point of comparison. If the company in question is treated more favourably in taxation, the company's competitive position

[113] Laukkanen, M., Maliranta, M., 2019. Business subsidies and competitiveness. Publications of the Government´s analysis, assessment and research activities 2019:33. http://urn.fi/URN:ISBN:978-952-287-736-9

in the market will improve and the company will benefit financially. It is sometimes thought that this mainly applies to comparisons between companies operating in the same sector. However, the definition of the sector is often open to interpretation, and companies compete for customers across sectoral boundaries. Companies operating in different sectors also procure production inputs on the same factor of production market and thus compete with each other in this sense.

A lower electricity tax category can also be regarded as a business subsidy, but in this case the presence of the subsidy element is not unambiguous. According to economic theory, the electricity used by companies as an intermediate input should not be taxed at all if the negative externalities of electricity production have already been accounted for. On the other hand, as only certain sectors are entitled to the lower category tax, the more favourable tax treatment of these sectors provides them with an economic advantage which can be interpreted as a business subsidy.

A business subsidy can also take the form of regulation if public authorities influence the financial position of certain groups of companies, for example through under-priced licences or emission allowances. The burden of regulatory business subsidies on public finances can be measured as an alternative cost, or revenue not received due to lower pricing. Business subsidies are used in an effort to correct market failures, the most important ones of which are the externalities, which may be positive (technological development) or negative (pollution). While many countries use business subsidies to provide better operating conditions for companies, the equal treatment of sectors should be the basic premise, unless there are strong arguments for doing otherwise.

When it comes to competitiveness, the short-term price and cost competitiveness and long-term growth competitiveness should be examined separately. Suitable indicators for the performance of the national economy include long-term economic growth and, of its elements, the growth of total factor productivity, which are essential in order to improve the standard of living or increase welfare. Poor price and cost competitiveness can lead to excessive indebtedness of the national economy and increase unemployment, in other words disruptions in the external and internal balance of the national economy. Price and cost competitiveness make up a whole, the constituent elements of which include business subsidies received by companies and their total factor productivity (or efficiency of input use), price of labour and other factors of production, price of manufactured products and the taxation of profits. The success of export companies in the international market is important for the external balance of the national economy; if imports exceed export revenues, this drives the national debt up. In a small open economy such as Finland, the performance of export companies is also important for the internal balance, in which unemployment is close to its natural level and the general price level develops steadily. In international comparisons of profitability, it is important to take into account the whole consisting of regulation, aids, taxation and the prices of different inputs for production, in which the level of corporate tax paid by companies in different countries, for example, is significant.

More favourable tax treatment is not reflected directly on the profitability of companies. The elements of price and cost competitiveness are linked by economic mechanisms, which is why a reduction in the taxation of companies or an increase in the amount of business subsidies, for example, may also increase the price of inputs for production. In fact, the impact of business subsidies on price and cost competitiveness is smaller than the subsidy amount might indicate. The significance of business subsidies for the cost competitiveness of sectors can be assessed by comparing their amounts to the number of employees, labour costs and value added.

In total, the subsidies under scrutiny (innovation grants, other subsidies in the form of grants, emissions trading compensation and energy tax refunds) are the largest in the paper industry and the basic metal industry, where they represent a few per cent of the sector’s value added. In many sectors, this proportion was clearly below 1%. The study found that cost fluctuations explain a minor part of the export performance and change in employment, and such factors as the productivity of the company, the quality of management, research and product development, and product quality play a more important role.

Support for research, development and innovation should prioritise technology programmes aiming for radical innovations, which can be expected to create significant productivity impacts and technological expertise. It would be important to target business subsidies at projects that are promising in the business sense and in terms of the national economy and that might not otherwise go ahead due to the company's financial constraints. The focus should be increasingly shifted towards supporting indirect innovation policy, including basic research and education, which are underlying factors of technological development. This would create preconditions for innovations in a manner that drives the national economy’s productivity and growth.

Effects of abolishing the 50% reduction in the CO_2 tax on CHP[114]

At the time of commissioning of this study, the carbon dioxide tax on fuels for CHP was reduced by 50% with the aim of supporting the competitiveness of CHP and reducing overlapping policy instruments in the emissions trading sector. The purpose of the VTT study was to assess the impacts of a decision to steer CHP towards lower emissions by abolishing the CO_2 tax reduction in full. The VTT study found that, as a result of the impaired competitiveness of CHP, the tax change would result in a decline of CHP for district heating. The change would mainly affect the use of natural gas, but not the use of coal. Despite losing the tax benefit for combined heat production, CHP plants would still have an advantage of around 20% compared to separate heat plants, as the amounts of fuel to be taxed are defined differently for CHP plants and heat-only boilers. The study estimates that, as heat produced with natural gas at a CHP plant becomes more expensive, it would still be increasingly replaced by coal-fired separate heat production, for example, once the tax expenditure has been removed.

District heat would become clearly more expensive in the large cities of Southern Finland, its competitive position compared to other forms of heating would be weakened and, according to the estimate, it would be used less. Replacing district heating with heat pumps in the heating of buildings would have a negative effect on the electricity system, both by increasing the demand for electricity and by reducing the cogeneration of electricity. The variable costs of wood chips and peat are already competitive compared to coal or natural gas, which is why the tax change would not increase the use of chips or peat in multi-fuel power plants. However, all plants cannot use chips or peat for technical reasons.

The tax change would have little impact on self-sufficiency in energy, as the study estimates that the reduction in imported fossil fuels would be offset by an increase in imported electricity. Neither would it have an effect on physical self-sufficiency in energy (the share of imported energy in the total use of primary energy) which, at the current tax levels, will increase as a result of increased use of biofuels and renewable energy by 2030. Biomass could also be imported to large coastal cities from abroad, in which case imported biomass, which would be more expensive than coal, would lead to a negative impact on the trade balance. In the short term, the elimination of the tax expenditure for CHP would probably not provide an incentive for low-emission CHP. Instead, Finland's carbon dioxide emissions could even be increased by a shift

[114] Koreneff, G., Lehtilä, A., Hurskainen, M., Pursiheimo, E., Tsupari, E., Koljonen, T., Kärki J. 2016. Yhdistetyn sähkön- ja lämmöntuotannon hiilidioksidiveron puolituksen poiston vaikutukset. VTT-R-01173-16. https://www.vttresearch.com/sites/default/files/julkaisut/muut/2016/VTT-R01173-16.pdf

from CHP to separate heat production with fossil fuels. In more general terms, a locally targeted special action in the emissions trading sector will not necessarily reduce emissions at the EU level, as the EU emissions ceiling will not change, and any surplus allowances will be traded to other operators. The estimates are hampered by fluctuations in the production structure of district heating due to variations in the annual heating needs as well as the offer and price of fuels. In addition, many changes will take place in the production structure of district heat, such as a shift to district heating production based on renewable energy, which will reduce the tax base for energy taxes on CHP.

Flexible and customer-centred electricity system; Final report of the Smart Grid Working Group[115].

Among other things, this report discussed the possibility of introducing a dynamic tax linked to the price of electricity. Electricity tax is one of the excise duties on energy, which is paid on electricity released for consumption from the electricity grid. In other words, the tax amount is determined on the basis of electricity consumption, and it is collected by the network company in connection with the electricity network charge. Value added tax at 24% is also paid on electricity in keeping with the general tax rate. In consumers' electricity bills, the electricity tax and VAT account for about one third of the total costs of purchasing electricity. A fixed electricity tax based on the amount of energy consumed guides consumers towards energy efficiency. However, it does not guide them towards the most efficient behaviour based on the price signals of the electricity market from the perspective of the electricity system.

In a dynamic electricity tax model, the electricity tax would depend on the electricity price: the tax amount would be higher at a time when the electricity price is higher, and lower when the electricity price is low. This would artificially increase price fluctuations experienced by customers. The model would primarily aim for increased interest in elasticity in electricity consumption and the products and services associated with it. For customers, a variable electricity tax would be a major change associated with many open questions. For example, how does the tax change treat different customer groups? How could different customers protect themselves against changes in electricity taxes? To which price would the tax be tied so that it would be fair for everyone? Who would levy the tax? How can variable taxation be planned without increasing the tax accrual and thus the tax burden on customers? A dynamic electricity tax could also have different repercussions on the derivatives market. The study commissioned by the working group looked at models that could be used to

[115] Pahkala, T., Uimonen, H., Väre, V. 2018. Flexible and customer-centred electricity system; Final report of the Smart Grid Working Group. Ministry of Economic Affairs and Employment Publications, Energy 33:2018. http://urn.fi/URN:ISBN:978-952-327-346-7

implement dynamic electricity taxation and their impacts on customers. The study found that a dynamic electricity tax could reduce the tax burden on customers who are capable of elasticity in their electricity consumption. On the other hand, it would increase the tax burden on small customers, in particular, who cannot be flexible. Before introducing load control based on smart meter use as proposed by the working group, customers would have to make investments in flexible solutions. The study found that the initial investment for small customers would be approximately EUR 1,000. Linking the tax to the price of the day-ahead market would bind elasticity to this marketplace, reducing the offer of flexibility in others. The model would require an overhaul of the tax system, make it more difficult to anticipate tax accrual, and complicate tax processes. The study notes that the model involves a number of challenges related to such aspects as fairness, predictability and complexity.

The working group’s key principle was that the incentive for elasticity of consumption should come from the market. The group concluded that a dynamic electricity tax artificially strengthens the electricity price signal, complicates customers' electricity purchases, increases the price risk and costs of sellers and customers, and may bind elasticity to a specific marketplace. A tax linked to a specific marketplace could also reduce the interest of electricity users in that marketplace and thus reduce its efficiency. For these reasons, the working group did not support the introduction of a dynamic electricity tax.

REPORT ON THE DEVELOPMENT OF USING PEAT FOR ENERGY IN FINLAND[116]

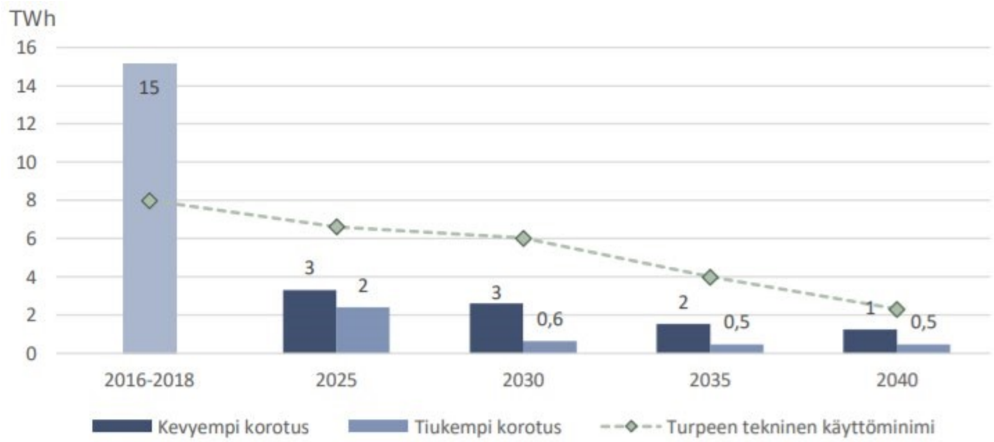
The report examined the current use of peat for energy and the development of peat use in Finland at different emission allowance price and peat tax levels with the aim of arriving at an understanding of market-driven development of peat use, investments in phasing out peat, and the significance of different tax levels.

The development of peat consumption was examined at two different tax levels (lower, higher) in three emission allowance price scenarios (low, baseline, high) using the AFRY’s boiler database. CO_2 emissions from peat combustion will decrease by at least 70% by 2030 in all scenarios, except in the low emission allowance price and lower tax increase scenario.

[116] Afry Management Consulting Oy. 2020. Selvitys turpeen energiakäytön kehityksestä Suomessa. Report to the Ministry of Economic Affairs and Employment 8/2020. https://afry.com/sites/default/files/202008/tem_turpeen_kayton_analyysi_loppuraportti_0.pdf

In the baseline and high emission allowance price scenarios, peat consumption will already decrease sharply by 2030 with the estimated smaller tax increase (peat tax EUR 6/ MWh). Figure 43 shows the development of peat use with the lower and higher tax increase in the baseline price scenario for emission allowances.

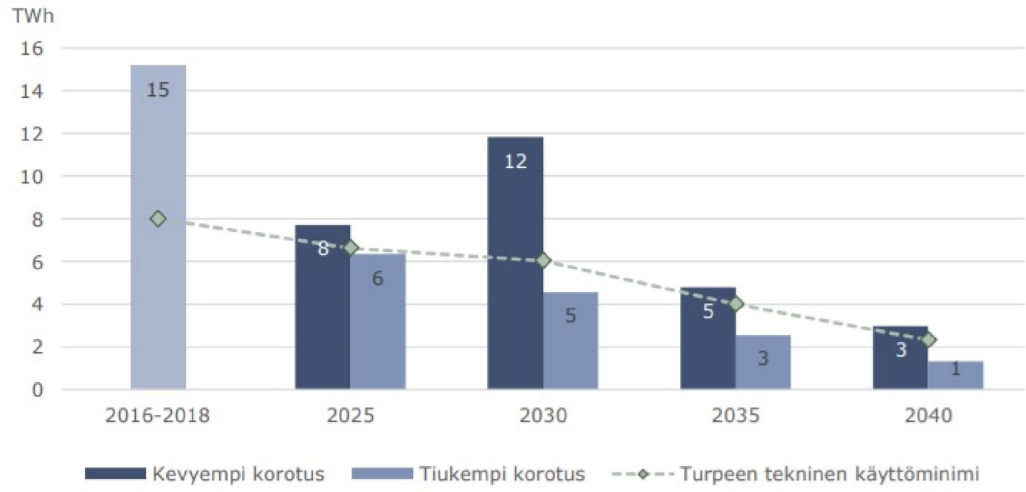
Figure 43. Development of peat use with a lower and higher tax increase in the baseline price scenario for emission allowances.



Huomio: Turpeen tekninen käyttöminimi kuvaa tilannetta ilman lisäinvestointeja olemassa oleviin kattiloihin.
Lähde: AFRY Management Consulting

In the low emission allowance price scenario, peat consumption would decline more slowly if the tax were not increased more, assuming that the average price of biomass would increase as much as in other scenarios. The low emission price scenario describes a situation in which the surplus in the emission allowance market would continue until 2030. If the emission allowance price were low, an analysis purely based on change in the competitiveness of fuels shows that the use of peat would not necessarily decline significantly by 2030 with lower taxation. However, this analysis does not account for such factors as the potential carbon neutrality targets of district heating producers and other goals for reducing peat use, nor local restrictions on the availability of peat. The combustion of biomass will remain cheaper for heat-only boilers in the emissions trading sector, which is why they will only use biomass also after 2030. See Figure 44 for the development of peat use with a lower and higher tax increase in the low emission allowance price scenario.

Figure 44. Development of peat use with a lower and higher tax increase in the low emission allowance price scenario.



Huomio:
1) Kuvassa on katkoviivalla esitetty turpeen tekninen käyttöminimi ilman lisäinvestointeja.
2) Matalalla päästöoikeuden hinnalla ja kevyemmällä turpeen veron korotuksella erot tuotantokustannuksissa biomassan ja turpeen välillä jäävät vähäisiksi etenkin CHP-laitoksilla (Kuva 33), jonka vuoksi turpeen energiakäyttö voi vaihdella merkittävästi esitetystä.
Lähde: AFRY Management Consulting

The rapid decline in peat use on commercial terms is based on the fact that using biomass is clearly cheaper than burning peat in plants in the emissions trading sector, despite the assumption that the price of biomass will increase moderately. If suitable heat sources are available, investments in heat pumps producing district heat are profitable and may partly replace fuel use. In other words, some peat use can also be replaced by non-combustion production; however, this study indicates that the tax level for peat will not have a decisive impact on the profitability of these investments.

Energy and electricity consumption of the ICT sector in Finland[117]

This study published by the Research Institute of the Finnish Economy in summer 2020 notes that the data available on data centres' key figures are scant and quite sporadic. The study reports that electricity consumption in the information sector was approx. 900 GWh in 2017, of which around one quarter, or more than 200 GWh, is used by the industrial class TOL 62-63, which includes data centres. The study of the Research Institute of the Finnish Economy points out, however, that the electricity consumption of data centres in the private and public sectors in statistics is included in the total figures of the sector where the company operates at the time, and is thus

[117] Hiekkanen, K., Seppälä, T., Ylhäinen, I. 2020. Research Institute of the Finnish Economy Report No 104. https://pub.etla.fi/ETLARaportit-Reports-104.pdf

not contained in the above figures. The study indicates that electricity consumption in the information sector grew by 13.9% between 2011 and 2017. Whereas data use increased by approx. 43% a year during this period in Finland, electricity consumption in the information sector only increased by 2.2% annually.

The study estimates that in addition to the 35 private data centres in the information sector listed on the Cloudscene website, there are dozens of data centres belonging to the public sector and companies in other sectors in Finland. The site reports that most Finnish data centres are located in Uusimaa, in addition to the ones found in Häme, Kainuu, Central Finland, Kymenlaakso and North Ostrobothnia.

Appendix 2: Excise duty tables

Table 13. Tax levels for liquid fuels[118].

EXCISE DUTY TABLE

Product	Product group	Energy content tax	Carbon dioxide tax	Strategic stockpile fee	Total
Petrol cents/litre	10	53.79	21.49	0.68	75.96
Small engine petrol cents/litre	11	33.79	21.49	0.68	55.96
Bioethanol cents/litre	20	35.30	14.10	0.68	50.08
Bioethanol R cents/litre	21	35.30	7.05	0.68	43.03
Bioethanol T cents/litre	22	35.30	0.00	0.68	35.98
MTBE cents/l	23	43.71	17.46	0.68	61.85
MTBE R cents/l	24	43.71	15.54	0.68	59.93
MTBE T cents/l	25	43.71	13.62	0.68	58.01
TAME cents/l	26	47.07	18.80	0.68	66.55
TAME R cents/l	27	47.07	17.11	0.68	64.86
TAME T cents/l	28	47.07	15.42	0.68	63.17
ETBE cents/l	29	45.39	18.13	0.68	64.20
ETBE R cents/l	30	45.39	14.78	0.68	60.85
ETBE T cents/l	31	45.39	11.42	0.68	57.49
TAEE cents/l	32	48.75	19.47	0.68	68.90
TAEE R cents/l	33	48.75	16.65	0.68	66.08
TAEE T cents/l	34	48.75	13.82	0.68	63.25
Biopetrol cents/l	38	53.79	21.49	0.68	75.96
Biopetrol R cents/l	39	53.79	10.74	0.68	65.21

[118] Government proposal to Parliament for Acts amending the Annex to the Act on Excise Duty on Liquid Fuels and section 5 of the Excise Duty Act HE 66/2019 https://www.finlex.fi/fi/esitykset/he/2019/20190066

Product	Product group	Energy content tax	Carbon dioxide tax	Strategic stockpile fee	Total
Biopetrol T cents/l	40	53.79	0.00	0.68	54.47
Ethanol diesel cents/l	47	16.23	14.38	0.35	30.96
Ethanol diesel cents/l R	48	16.23	7.90	0.35	24.48
Ethanol diesel cents/l T	49	16.23	1.42	0.35	18.00
Diesel oil cents/l	50	34.57	24.56	0.35	59.48
Diesel oil paraffinic cents/l	51	27.65	23.20	0.35	51.20
Biodiesel cents/l	52	31.69	22.51	0.35	54.55
Biodiesel R cents/l	53	31.69	11.26	0.35	43.30
Biodiesel T cents/l	54	31.69	0.00	0.35	32.04
Biodiesel P cents/l	55	27.65	23.20	0.35	51.20
Biodiesel P R cents/l	56	27.65	11.60	0.35	39.60
Biodiesel P T cents/l	57	27.65	0.00	0.35	28.00
Light fuel oil cents/l	60	10.28	16.90	0.35	27.53
Light fuel oil sulphur-free cents/l	61	7.63	16.90	0.35	24.88
Biofuel cents/l	62	7.63	16.90	0.35	24.88
Biofuel R cents/l	63	7.63	8.45	0.35	16.43
Biofuel T cents/l	64	7.63	0.00	0.35	7.98
Heavy fuel oil cents/kg	71	8.56	18.67	0.28	27.51
Jet fuel cents/l	81	57.49	23.33	0.35	81.17
Aviation gasoline cents/l	91	52.11	20.81	0.68	73.60
Methanol cents/l	100	26.90	10.74	0.68	38.32
Methanol R cents/l	101	26.90	5.37	0.68	32.95
Methanol T cents/l	102	26.90	0.00	0.68	27.58
Liquefied petroleum gas cents/kg	110	9.81	18.09	0.11	28.01
Liquefied biogas cents/kg	111	9.81	18.09	0.11	28.01
Liquefied biogas R cents/kg	112	9.81	9.04	0.11	18.96
Liquefied biogas T cents/kg	113	9.81	0.00	0.11	9.92

Table 14. Tax levels for heating fuels[119].

EXCISE DUTY TABLE 1

Product	Product group	Energy content tax	Carbon dioxide tax	Strategic stockpile fee	Total
Coal, coal briquettes, solid coal fuels EUR/t	1	52.77	147.81	1.18	201.76
Natural gas, EUR/MWh	2	7.63	12.94	0.084	20.654

EXCISE DUTY TABLE 2

Product	Product group	Energy tax	Strategic stockpile fee	Total
Electricity cents/kWh				
- tax category I	1	2.24	0.013	2.253
- tax category II	2	0.69	0.013	0.703
Tall oil cents/kg	3	27.51	0.00	27.51
Peat for combustion EUR/MWh	4	3.00	0.00	3.00

[119] Government proposal to Parliament on amending the legislation on energy taxation HE 191/2018 https://www.finlex.fi/fi/esitykset/he/2018/20180191

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