



Final Report

Energy Subsidies

Energy costs, taxes and the impact of government interventions on investments



EUROPEAN COMMISSION

Directorate-General for Energy
Directorate A — Energy Policy
Unit A4 — Economic Analysis and Financial Instruments

*European Commission
B-1049 Brussels*

Final Report

Energy Subsidies

Energy costs, taxes and the impact of government interventions on investments

In association with:



And involving:



CONTRACT DETAILS

European Commission, DG ENERGY UNIT A.4

Study on energy costs, taxes and the impact of government interventions on investments in the energy sector

Service request ENER/2018-A4/2018-471

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Luxembourg: Publications Office of the European Union, 2020

PDF/Volume_01 ISBN 978-92-76-23131-8 doi: 10.2833/546611 MJ-03-20-636-EN-N

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Abbreviations

€bn	billions of euros
€/cap	euro per capita
€/MWh	euro per megawatt hour
CAGR	Compound annual growth rate
CHP	Combined Heat and Power
EC	European Commission
EII	Energy-intensive industries
ETD	European Union Energy Taxation Directive of 2003
ETS	Emissions Trading System
EU	European Union
EUA	European Union allowance
FFS	Fossil Fuel Subsidies
FiP	Feed-in premiums
FiT	Feed-in tariffs
LCOE	Levelized cost of energy
MS	Member States
RES	Renewable energy sources
RO	Renewable obligations

1 Introduction

1.1 Objectives

The aims of this task are to provide an analysis of the evolution of the energy subsidies in the EU27 since 2008 and a comparison with non-EU27 G20 countries. We have also provided a detailed inventory that will be used for methodological support to the EC in future reporting on energy subsidy accounting and Member States' policy measures addressing the phasing-out of inefficient fossil fuel subsidies. Chapter 2 analyses the evolution of energy subsidy amounts across several dimensions: their purposes, including the energy efficiency related subsidies, the energy carriers and sources, their categories and instruments, and the economic sectors. Chapter 3 provides a cross-country benchmarking with the EU27 and the G20 countries.

1.2 Methodology

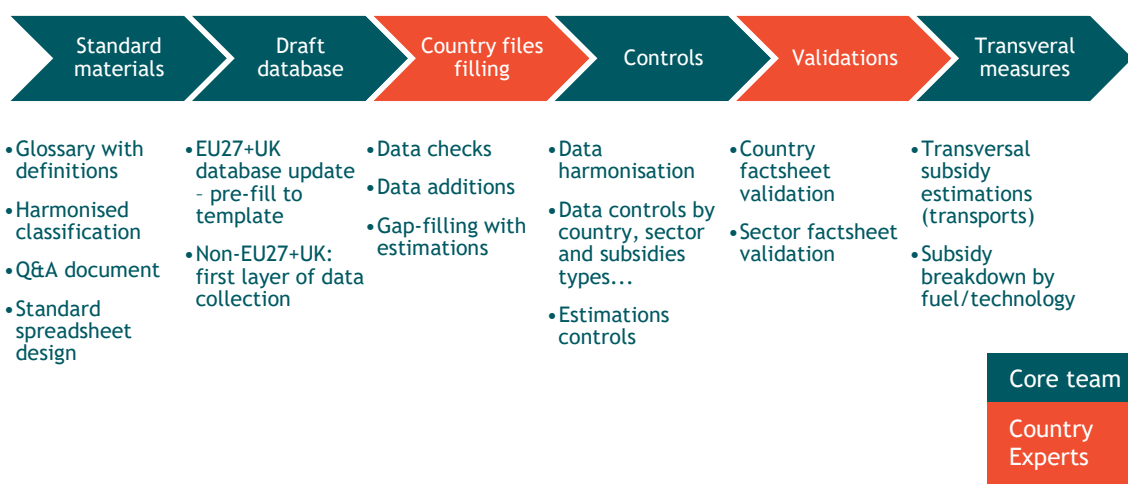
1.2.1 Scope

Subsidy data collected covers all energy sources, products and carriers, as well as all economic sectors from 2008 to 2018. The study covers subsidy data comprising various forms of monetary transfers from public entities to private (direct transfers, tax expenditures) as well as regulatory economic mechanisms and schemes that result in cross-subsidies.

1.2.2 Summary of approach

Figure 1-1 provides an overview of the process implemented during the study to collect, control and harmonise subsidy data that have been assembled in a single database (later called “inventory”).

Figure 1-1 Data collection process



The process comprises six steps to a) develop a detailed data collection template, b) pre-populate it for each country with data from the former inventory and transversal sources, c) send the templates to country experts for updating with data from national sources, d) conduct data quality controls, e) develop dashboards to ensure cross-country validation, and f) complement the inventory by inserting subsidy data estimated by the core team.

Subsidy amounts have been converted to 2018 euros to allow comparisons across years. Data have been arranged in the following categories to allow for analytical work:

- Purpose: support to energy demand, support to energy efficiency, support to industry restructuring, support to infrastructure, support to energy production, support to R&D.
- Subsidy category: direct transfers, tax expenditures, under-pricing of goods/services, and income or price supports;
- Subsidy instruments;
- Energy sources, products and carriers;
- Economic sectors;
- Sources of financing.

Note on data quality and exhaustiveness

Data sources and data control process are presented in detail in annexes. However, when dealing with comparisons between European and non-European G20 countries, the readers must keep in mind that data maturity is unequal between these two zones. Indeed, the current study is the third of this kind for the EU, which ensures a certain level of robustness and exhaustiveness of the data. However, this is the first study run by the EC covering subsidy data in non-European countries, which has implied significant endeavours by the project team to identify data sources, collect and control the information gathered. However, the maturity of data is not as high as that of the European countries, especially the exhaustiveness of the data coverage is unequal between European and non-European countries. Therefore, comparisons must be taken with caution.

2 Energy subsidies

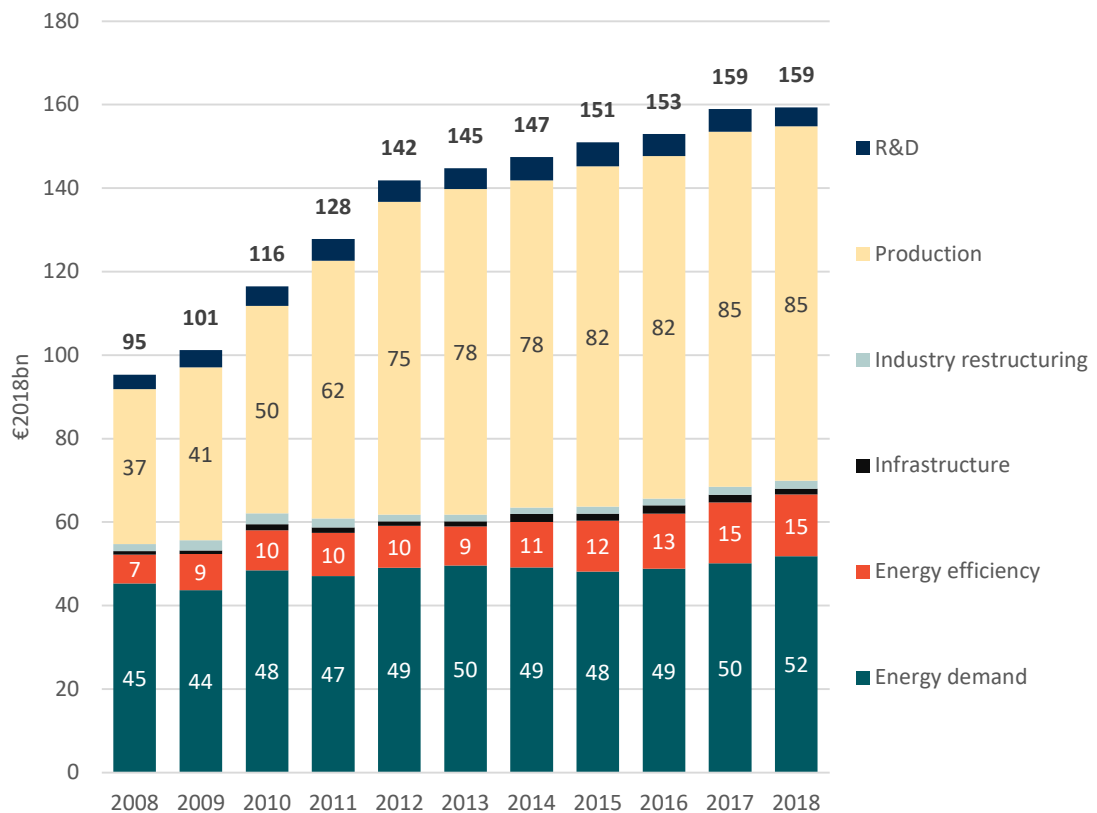
The scope of this report includes all EU27 MS and the G20 countries, covering the timeframe from 2008 to 2018. All values (unless otherwise indicated) are in euros of 2018 (real values). Most of the data presented in billions of euros in real terms, noted €2018bn.

2.1 Subsidies by purpose

Over the 2008-2018 period, the overall energy-related subsidies in the EU27 MS have increased by 67%, or (+€64bn) from €95bn to €159bn in real terms (€2018). Subsidies for energy production are the main contributor to this trend recording a €48bn hike (+130%), from €37bn to €85bn. Most of this amount has been directed to the production of electricity, of which renewables through FiT and FiP schemes have benefited most.

Meanwhile, subsidies supporting energy consumption have increased by 14% to €52bn (+€6.5bn), while those for infrastructure, for industry restructuring and RD&D remain marginal at 5% together, although they have increased by 31% since 2008. The subsidies for energy efficiency represented 9% of the total amount in 2018 even though they have increased by more than 114% over the last 11 years from €7bn to €15bn.

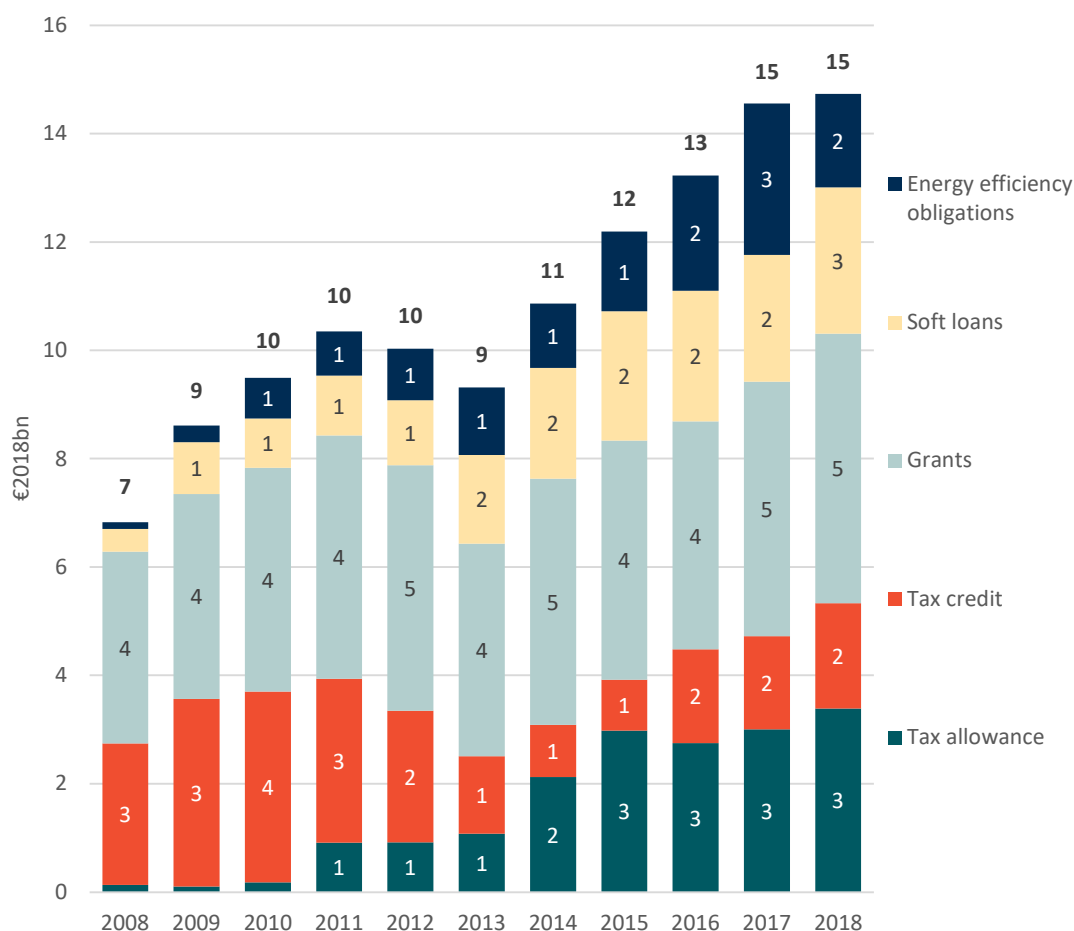
Figure 2-1 Energy subsidies by purpose in the EU27 (2008-2018, €2018bn)



2.1.1 Subsidies for energy efficiency

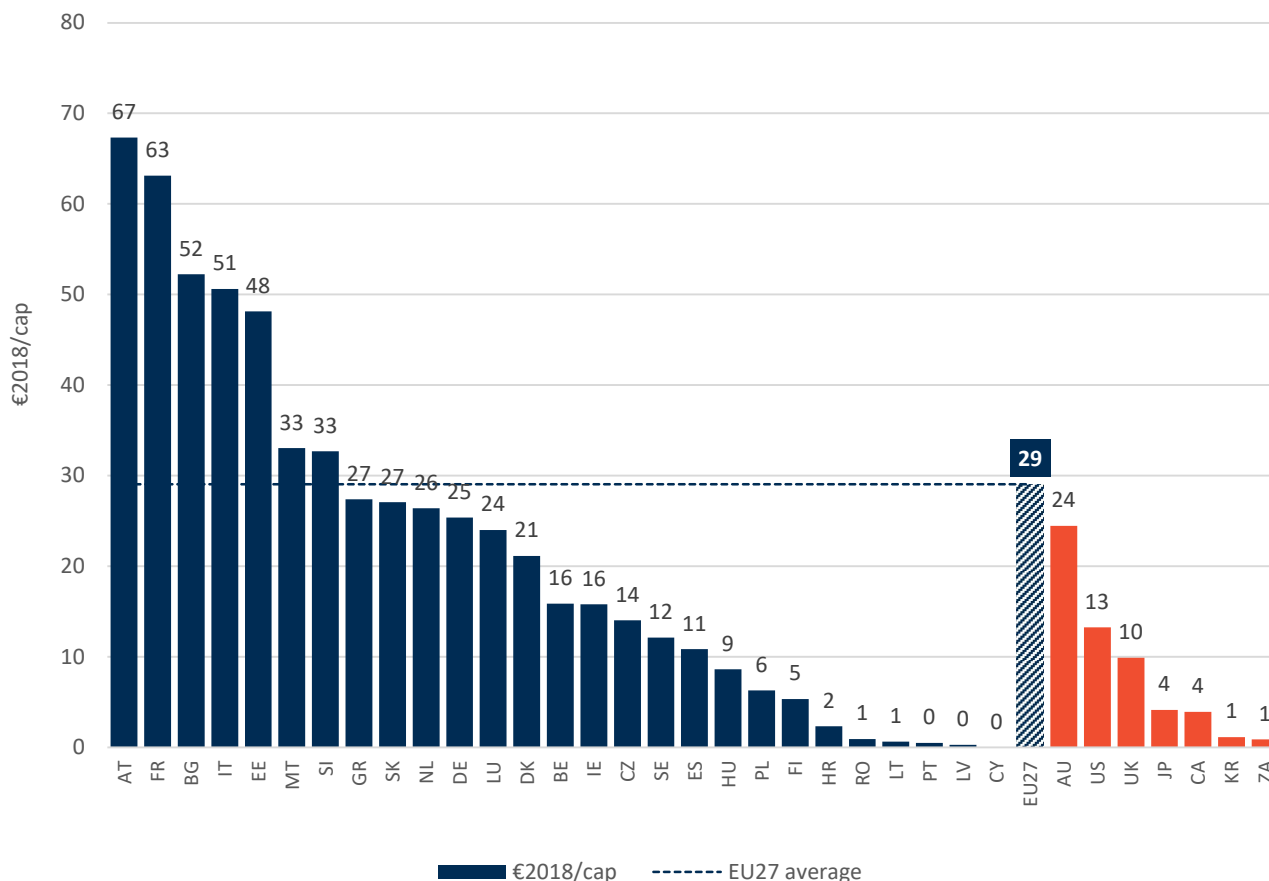
Subsidies for energy efficiency from public institutions are mainly provided in the form of **tax expenditures** reaching €5.3bn in 2018, i.e. 36% of the subsidies for energy efficiency (Figure 2-2), with significant amounts recorded in France (€3.2bn) and Italy (€1.9bn) in 2018. Public bodies also provided €5bn of **grants** in 2018 (34% of the subsidies) driven by building retrofit policies in the residential sector (€2.2bn in 2018, including €0.6bn earmarked for low-income households) and for business (€1bn in 2018). Italy and France also contributed significantly to the noticeable increase of subsidies through their respective **energy efficiency obligation schemes** that have both been reformed in recent years triggering white certificate price increases, thereby providing important incentives for energy efficiency (€1.1bn for Italy and €0.5bn for France in 2018). The observed increase of the total amount of cross-subsidies provided to end-consumers (and supported by energy companies) under these market-based schemes is highly dependent on the price that is itself determined by the supply and demand for certificates, as well as by the regulatory environment, i.e. the annual energy efficiency targets set by public institutions. Therefore, the level of cross-subsidization under these schemes will also vary in the upcoming years. Finally, the increase in subsidies given as **soft loans** is primarily due to the fact that Germany has expanded its “CO₂ building restoration programme and incentive programme for energy efficiency” from €0.2bn to €1.9bn eleven years later.

Figure 2-2 Subsidies for energy efficiency in the EU27 (2008-2018, €2018bn)



Overall, three countries, namely France (29%), Italy (21%) and Germany (14%), represent two thirds of the subsidies on energy efficiency in the EU27. However, when analysing the amounts of subsidies per capita (and without funds provided by the EU) (Figure 2-3), Austria stands out with the largest level of subsidies with €67/cap, followed by France (€63/cap) and a group countries composed of Bulgaria (€52/cap), Italy (€51/cap) and Estonia (€48/cap), whereas Germany ranks eleventh (€25/cap).

Figure 2-3 Per capita energy efficiency subsidies in 2018 in the EU27 and non-EU G20 countries (€/cap)



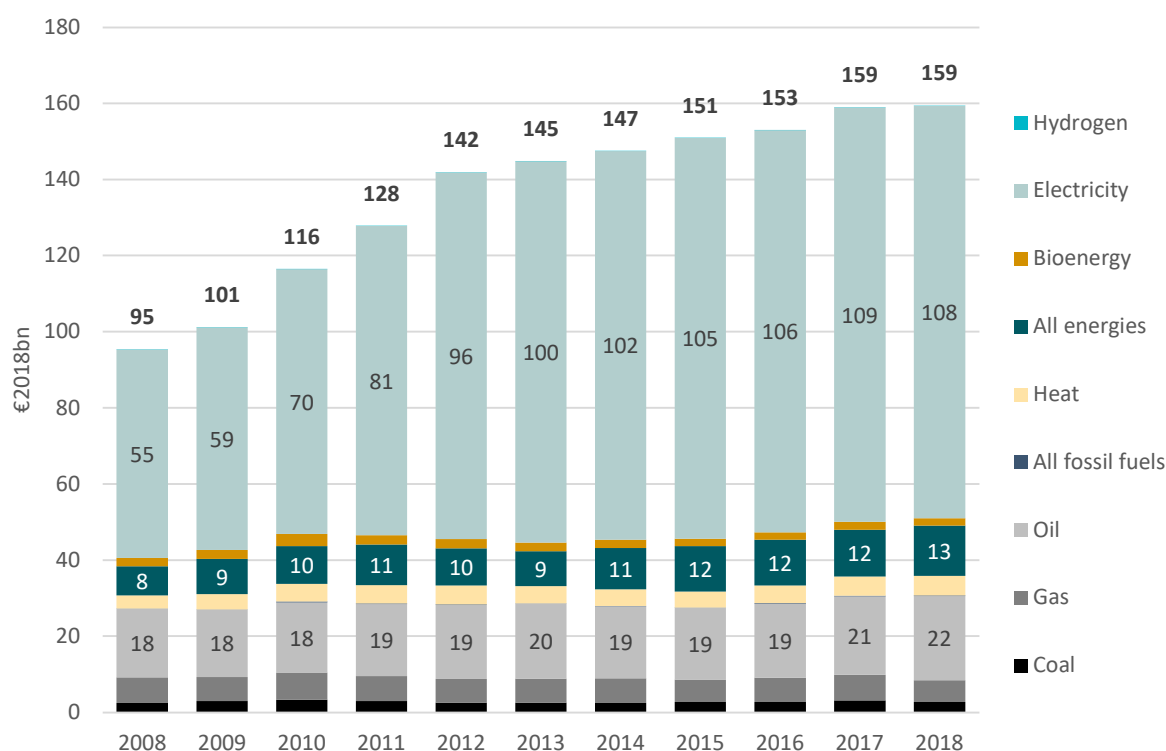
Average per capita subsidies for energy efficiency in the EU27 as a whole reached €29/cap in 2018, which is the highest level recorded in this study as Australia ranks 16% below the EU average with €24.5/cap, followed by the USA (€13/cap) and the UK (€10/cap)¹. Generally, the higher income countries provide the highest level of per capacity subsidies for energy efficiency.

2.2 Subsidies by energy carrier

Since 2008, energy subsidies have mainly been directed to the power sector, which has captured 68% of the total, and around €108bn in 2018, double the amount recorded in 2008 (€55bn, Figure 2-4). Subsidies provided to non-electricity carriers have increased at a much lower rate (+26%, +€10.5bn) since 2008.

¹ In the case of benchmark with non-European G20 countries, the reader must keep in mind the note on data quality and exhaustiveness on p8.

Figure 2-4 Subsidies by main fuels and carriers in the EU27 (€2018bn, 2008-2018)



The figure below shows the allocation of the financial support by energy carrier. The amounts corresponding to heat and electricity have been re-allocated to their energy source based on the national energy balance^{2,3}. Once this reallocation is implemented, we find that fossil fuel subsidies poured by the EU27 MS have stagnated (-2%) at around €50bn since 2008 which is not in line with the EU27 commitment made in 2009⁴ to phase out fossil fuel subsidies, a commitment that was reasserted in November 2016⁵. Renewable technologies form the bulk of subsidies, reaching €73bn in 2018, which represents an additional €51bn compared to 2008. However, since 2013 we notice that the growth has slowed down (see more detailed analysis under the section

Schemes supporting the development of renewables). Subsidies to nuclear, mainly for decommissioning purposes, remained stable at around €3bn since 2008⁶.

² The remaining amounts corresponding to “All energies” and to “Electricity” correspond to the tax expenditures directed to electricity that could not be re-allocated to specific energy sources.

³ Free EUA ETS granted to power plants and industrial sites are allocated under the “all energies” category, while allowances for aviation and refinery have been allocated to oil, and therefore fossil fuels.

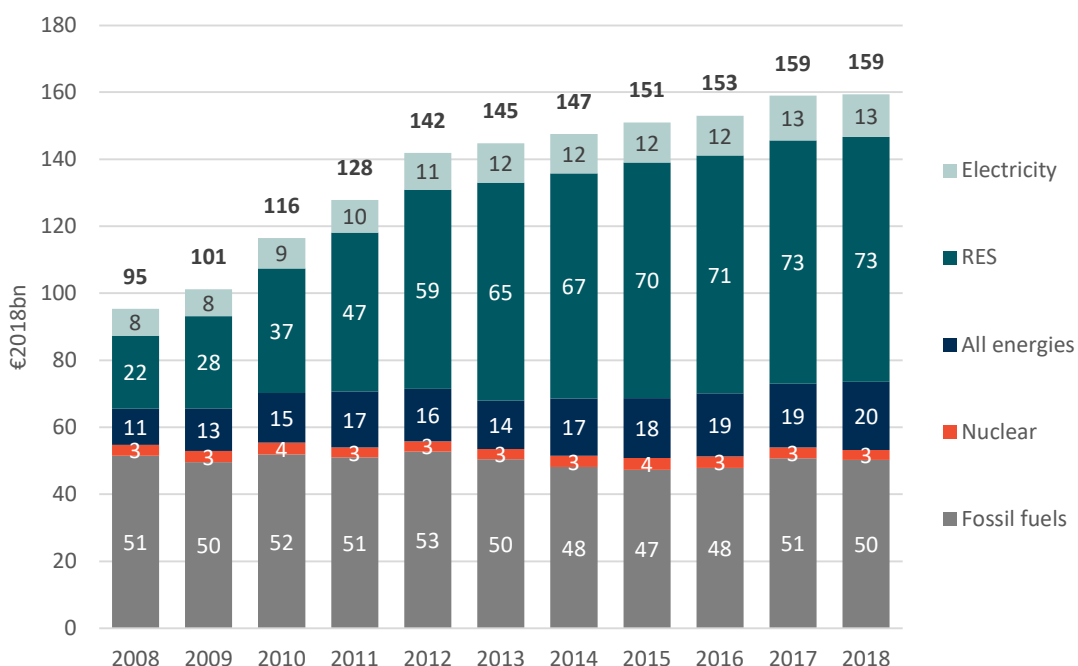
⁴ The communiqué mentions the G20 members “To phase out and rationalize over the medium term inefficient fossil fuel subsidies while providing targeted support for the poorest”, G20 Pittsburgh Leaders Declaration, September 2009. Available at: <https://www.oecd.org/g20/summits/pittsburgh/G20-Pittsburgh-Leaders-Declaration.pdf>

⁵ The Clean Energy For All Europeans mentions that “this package is also stepping up EU’s action in removing inefficient fossil fuel subsidies in line with international commitments under G7 and G20 and in the Paris Agreement. The remaining but still significant public support for oil, coal and other carbon-intensive fuels continues to distort the energy market, creates economic inefficiency and inhibits investment in the clean energy transition and innovation.”

European Commission, “Clean Energy for all Europeans” package, (COM(2016) 860), November 2016. Available at: <https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/COM-2016-860-F1-EN-MAIN.PDF>

⁶ EU funds provided by the European Bank for Reconstruction and Development (EBRD) for decommissioning of the nuclear reactors of Kozloduy (KIDSF, Bulgaria), Bohunice (BIDSF, Slovakia) and Ignalina (IIDSF, Lithuania) have been excluded from this study. Information on these funds are available at: <https://www.ebrd.com/what-we-do/sectors-and-topics/nuclear-safety/kozloduy.html>; <https://www.ebrd.com/what-we-do/sectors/nuclear-safety/bohunice.html>; and, <https://www.ebrd.com/what-we-do/sectors/nuclear-safety/ignalina.html>.

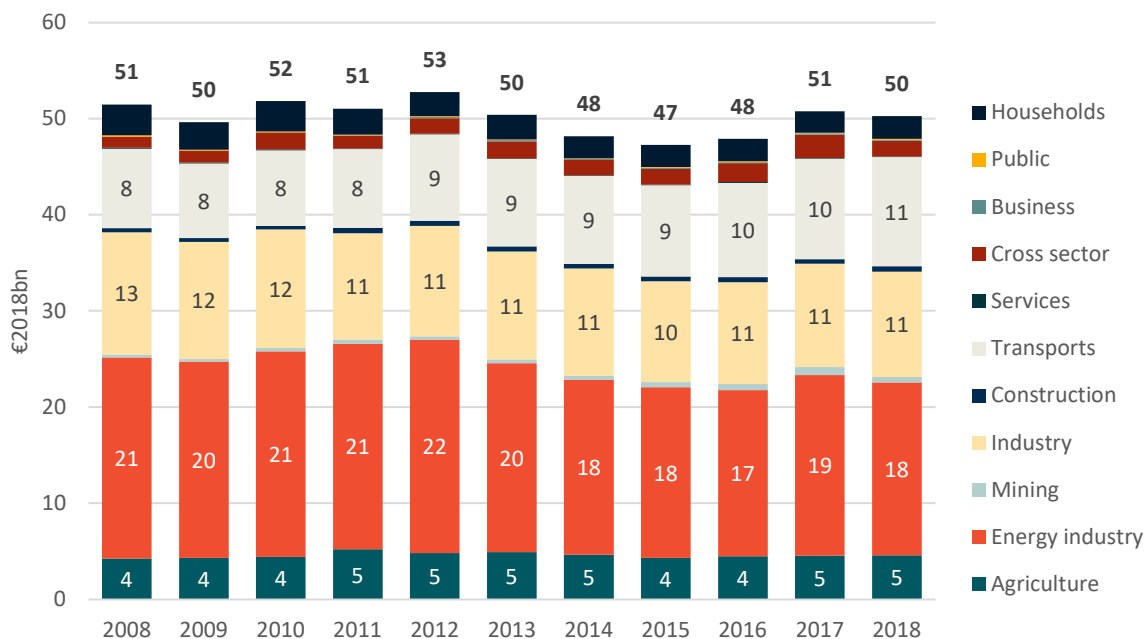
Figure 2-5 Subsidies by main energy carrier in the EU27 (€2018bn, 2008-2018)



2.2.1 Fossil fuels subsidies

The energy sector received €18bn of fossil fuel subsidies in 2018 (36% of the total), of which €8.5bn came from FiT, FiP, RO and producer price support schemes for producing electricity from CHP burning fossil fuels and €5.5bn from tax expenditures. As Figure 2-6 shows, transports and industry both received around €11bn of fossil fuel subsidies, followed by agriculture (€4.6bn), almost entirely provided in the form of tax expenditures.

Figure 2-6 Fossil fuel subsidies in the EU27 by economic sector (€2018bn, 2008-2018)



When we analyse the subsidy amounts by country (Figure 2-8), we note that Germany has been the largest provider of fossil fuel subsidies in absolute terms with €12.2bn in 2018, followed by France

(€10.9bn), Italy (€5.8bn), Spain (€4.7bn), Belgium (€3bn), Greece, Ireland and Poland (€1.8bn each). However, trends vary across countries (Figure 2-7). Indeed, Germany records a €2.7bn decline over the period driven by a sharp reduction of subsidies to compensate the coal mining industry for the difference of domestic costs and the world price of coal (-€1.2bn since 2008) and Italy reduced its support to fossil fuels by €2.6bn since 2008, thanks to the reduction of FiT payments (CIP6) for CHP burning fossil fuels. Conversely, fossil fuel subsidies have grown in France by €4.1bn driven by new and growing excise tax expenditures and a growing cost of its equalisation system and in Poland by €1.3bn mainly due to support to its coal industry.

Figure 2-7 Fossil fuel subsidies by EU27 MS (€2018bn, 2008-2018)

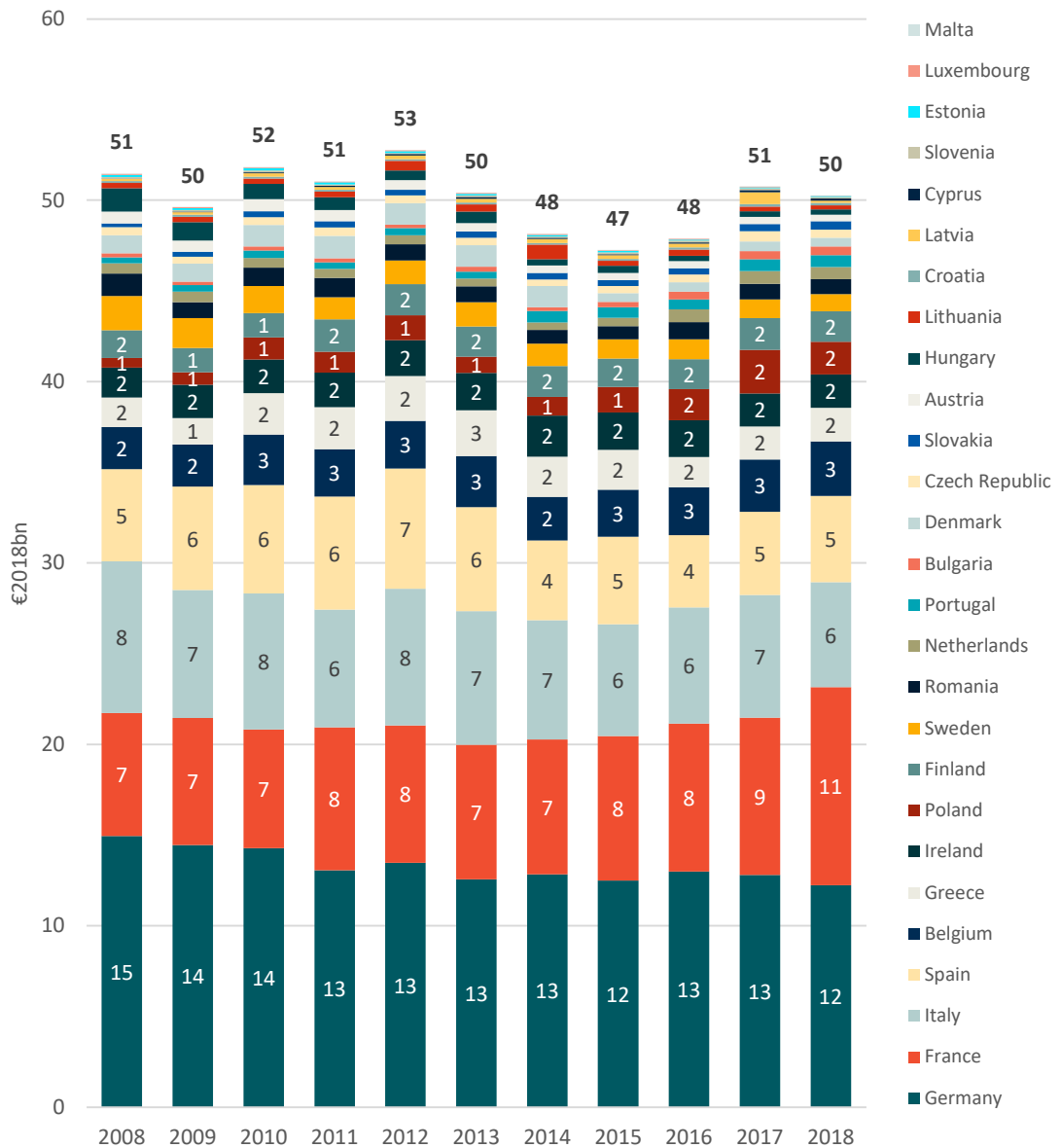


Figure 2-8 Fossil fuel subsidies per country in EU27 and non-EU G20 in 2018 (€2018)

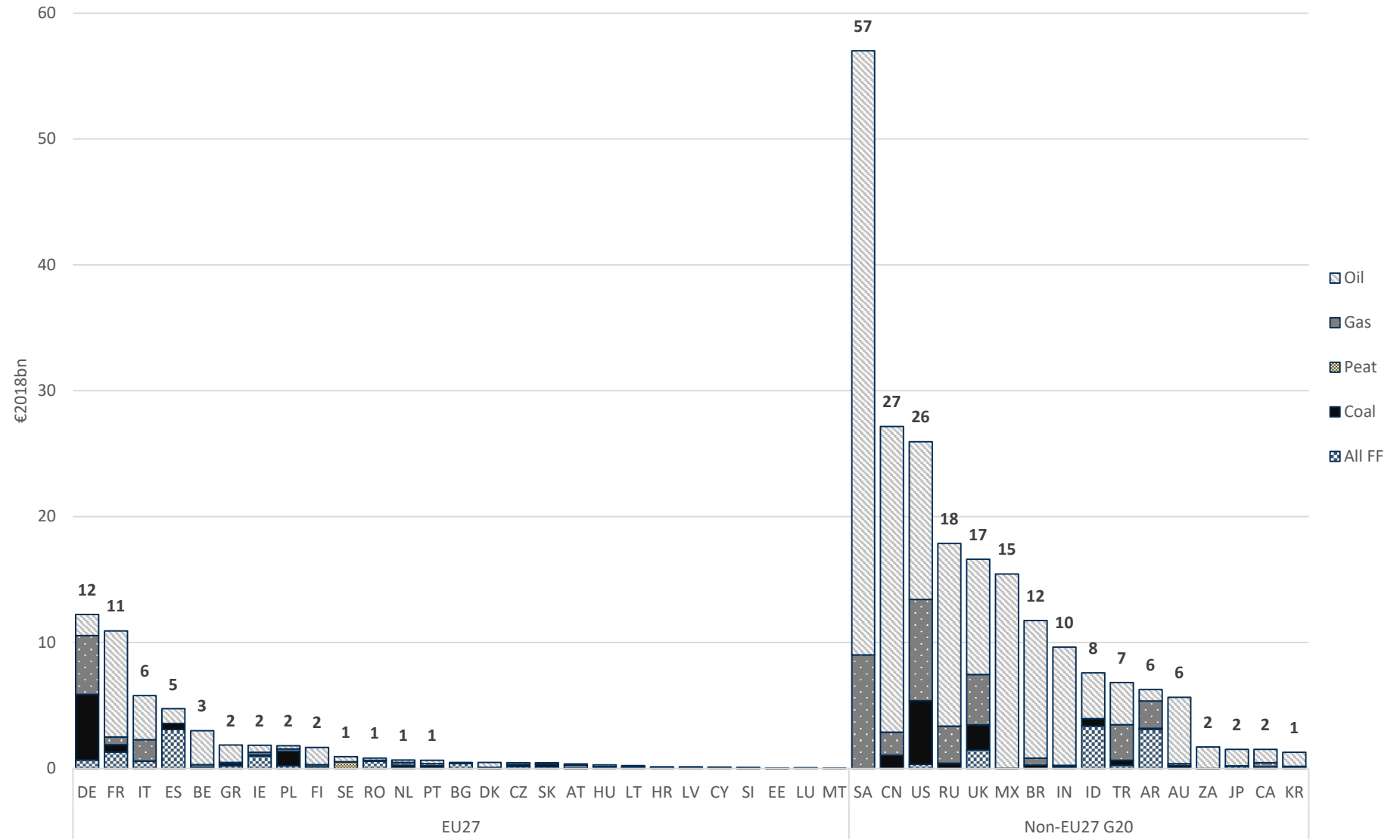


Figure 2-8 shows that large fossil fuel subsidies have been granted by some non-EU G20 countries with Saudi Arabia ranking first with an estimated €57bn of FFS in 2018, followed by China (€27bn) and the US (€26bn). Oil is by far the most supported fuel in the G20 countries mainly due to two types of policies: a) policies aimed at subsidizing fuel prices for end-users (road transport) in some countries like China, India, Indonesia, Mexico, Saudi Arabia and South Africa; b) policies supporting oil and gas extraction activities through tax expenditures (Brazil, Russia, the UK) (Figure 2-9)⁷.

When we consider fossil fuel subsidies per capita in 2018, Saudi Arabia ranks first with €1,692/cap (Figure 2-10), of which €1,015/cap supporting energy demand (Figure 2-11), followed by Ireland (€380/cap), Finland (€302/cap), Belgium (€263/cap) and the UK (€250/cap). The EU27 weighted average energy subsidy reached €112/cap in 2018, of which €71/cap were supporting fossil fuel consumption, which was more than two times higher than non-EU27 G20 countries weighted average of €46/cap, of which €29/cap supporting energy demand.

⁷ In the case of benchmark with non-European G20 countries, the reader must keep the note on data quality and exhaustiveness on p8.

Figure 2-9 Fossil fuel subsidies by purpose in EU27 and G20 countries in 2018 (€2018)

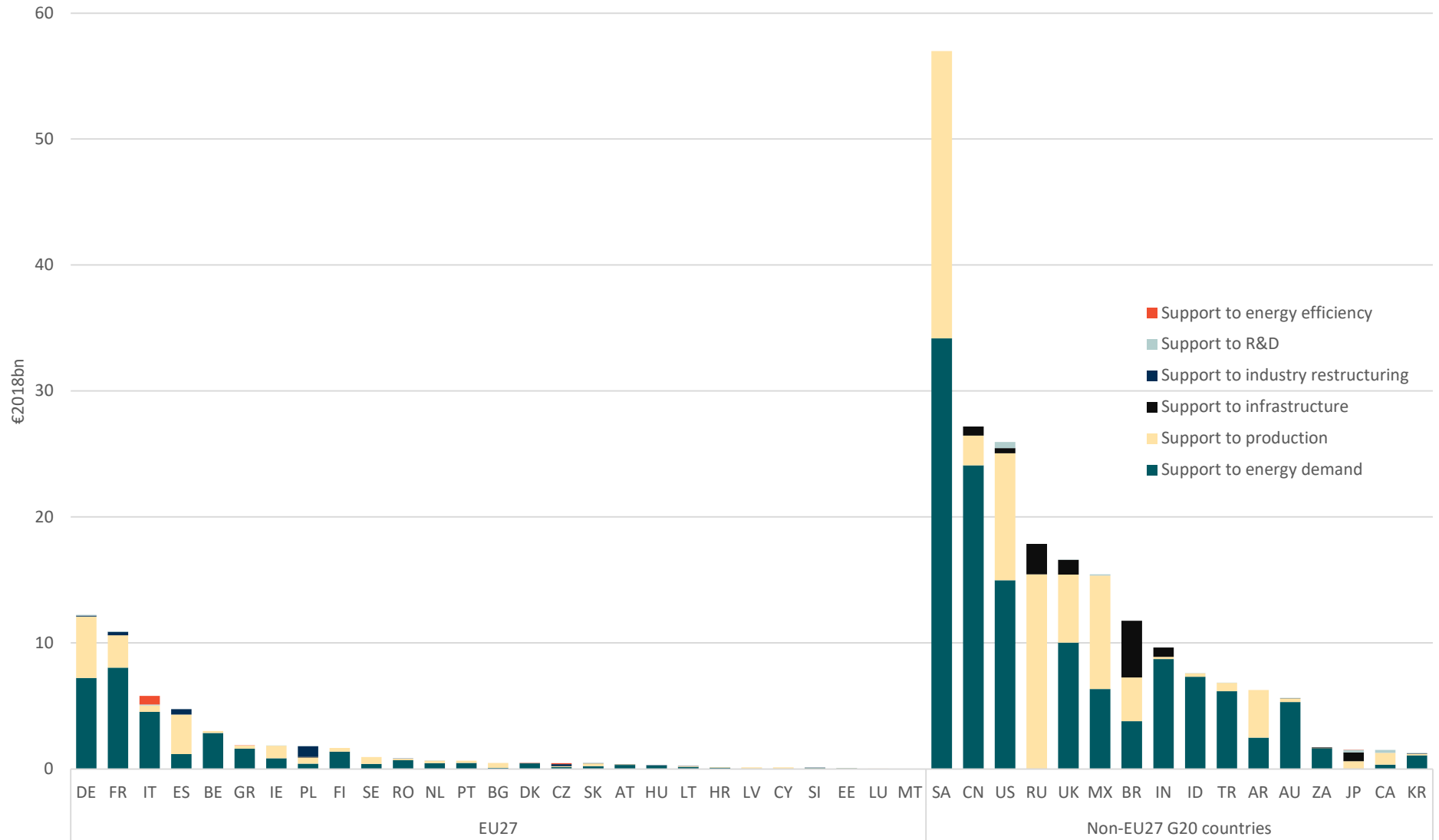
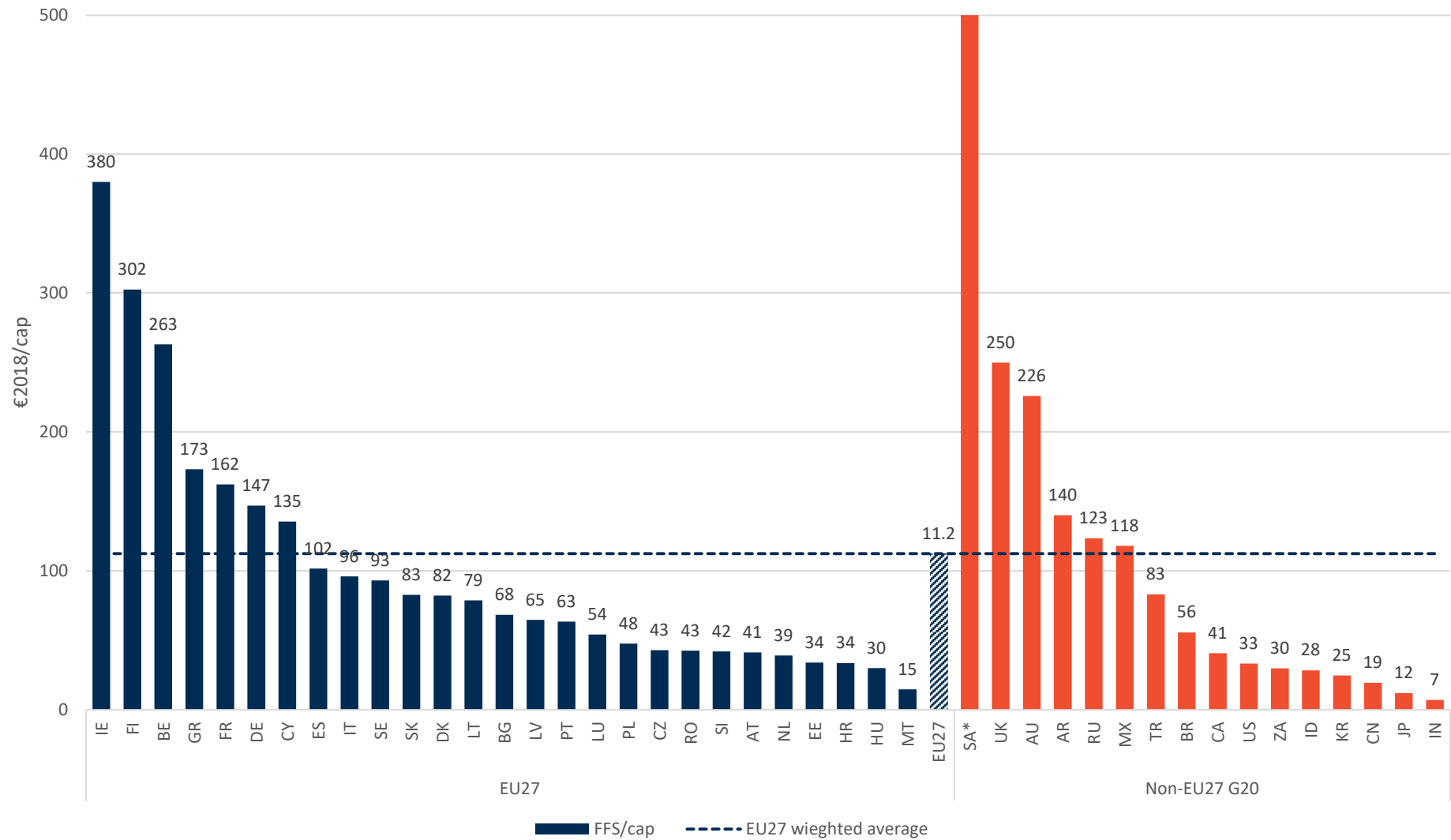
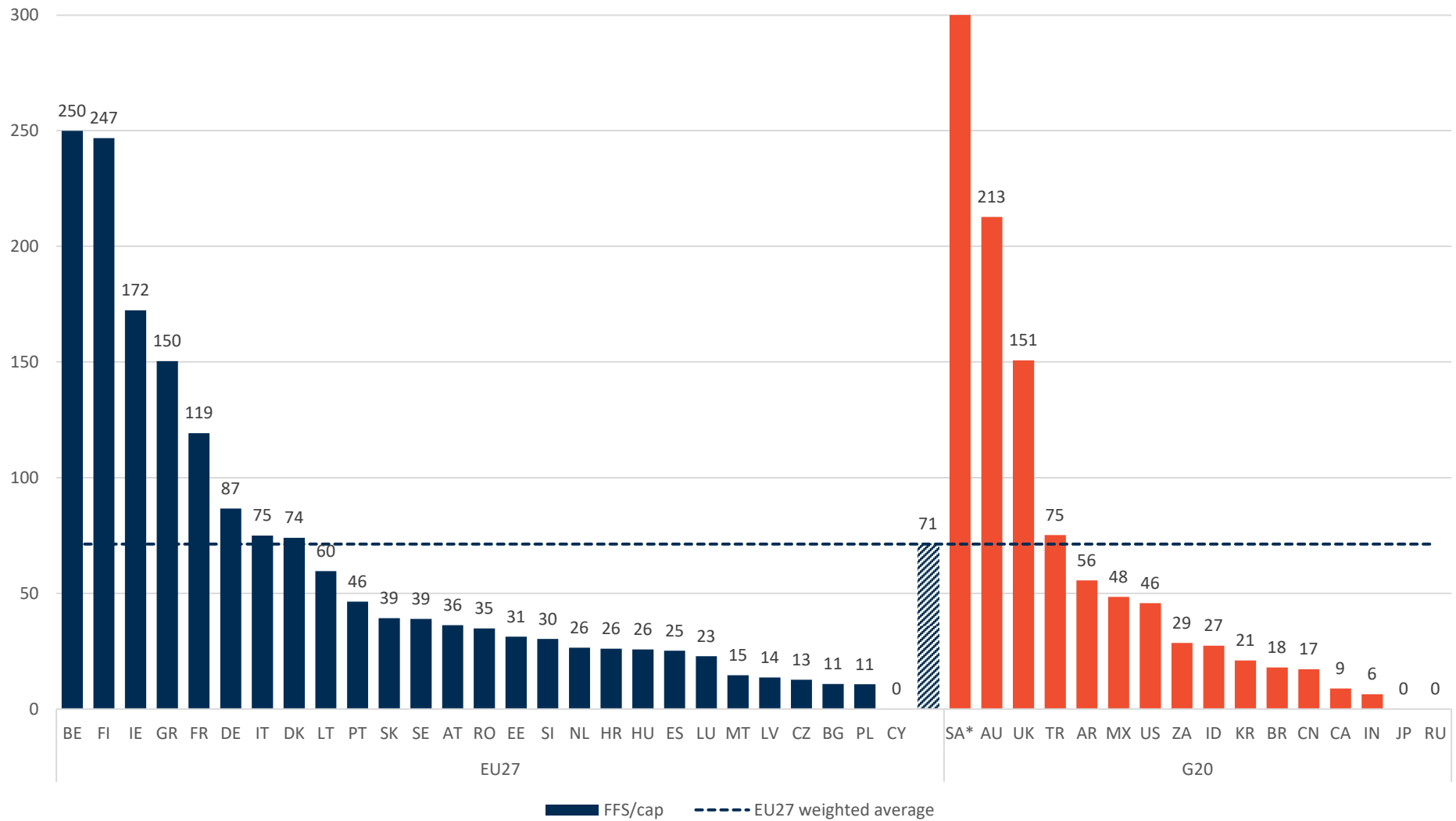


Figure 2-10 Fossil fuel subsidies per capita in EU27 and G20 countries in 2018 (€2018)



*: Estimated FFS subsidies per capita for Saudi Arabia reached €1,692 in 2018.

Figure 2-11 Fossil fuel subsidies supporting energy demand per capita in EU27 and G20 countries in 2018 (€2018)



*: Estimated FFS subsidies for energy demand per capita for Saudi Arabia reached €1,015 in 2018.

Diesel vs gasoline excise tax difference

In line with the Energy prices and costs in Europe study of 2018, the excise tax difference favouring diesel over gasoline has not been covered in this study, since we define tax expenditure as the exemption, reduction or refunds from the base of a tax for a given product. Therefore, the excise tax difference between diesel and gasoline has not been considered as tax expenditure, and therefore was not included in the current energy subsidies inventory.

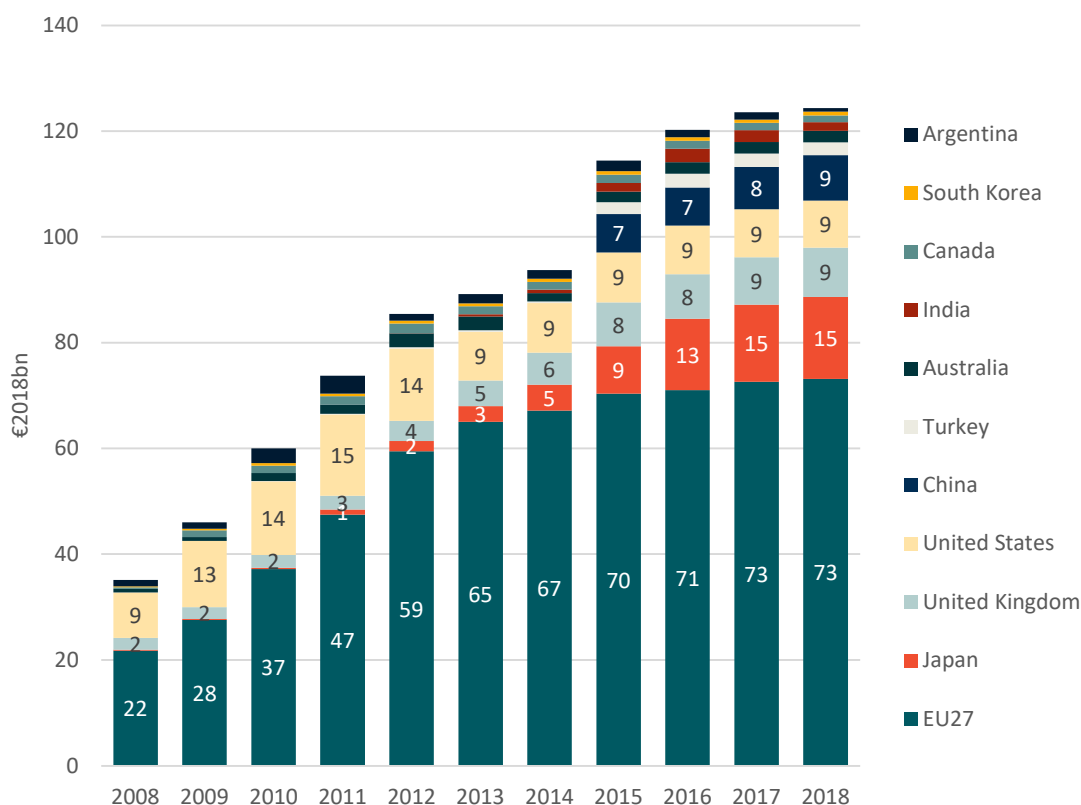
Furthermore, only few MS report the excise tax difference between diesel and gasoline as tax expenditure. Among them we have identified Austria (€725m in 2018), Denmark (€190m in 2018), Finland (€766m in 2018), Italy (€4,910m in 2018) and Sweden (€740m in 2018). Some MSs have estimated their potential tax revenue forgone: France estimates reached €6.1bn in 2015, while that of Germany amounted to €7.35bn in 2014.

2.2.2 Renewable energy sources

Focusing on renewable energy sources, Figure 2-12 shows that the EU27 provides by far the most subsidies to renewable technologies with €73bn provided in 2018, followed by Japan (€15bn), the UK, the US and China (€9bn each). This graph underpins that the EU27 MS, being the first mover countries supporting renewables, have borne, and continue to bear, substantial costs related to the deployment of generous policies that imply high legacy burdens. Indeed, EU27 countries used to provide high FiT and FiP rates between the mid 2000's until 2012-2013 to cover important investment costs during this period. As a result of the decline in investment costs observed as from the end of 2000's, the EU27 MS have reduced the rates to new plants but have continued to pay previously contracted projects. Meanwhile, non-EU27 countries such as the UK (in 2010), China (2011 for solar PV), Japan (2012) have started implementing FiT and FiP schemes providing adjusted rates according to lower investment costs.

Alternatively, financial support in the USA, which is mainly provided at federal level under the form of tax expenditures through the production tax credit (PTC) and investment tax credit (ITC) programs, has registered a rather constant flow fluctuating around €10bn/year (including bioenergy), except during the four years following the economic downturn of 2008 (between €13bn and €16bn).

Figure 2-12 Subsidies to renewable technologies by zone and country (€2018bn, 2008-2018)*



*: data provided above are partial since the cost of some programmes couldn't be identified such as the renewable obligation schemes implemented in Japan until it ended in 2012, FiT and FiP in China before 2015 and most policies implemented at state level in Federal countries such as China, India or the United States of America.

The EU27's subsidy upward trend is driven by Germany that is the leading country with €29bn provided in 2018, representing 40% of the total EU27 subsidies for renewables (Figure 2-13). In detail, Germany supplied €9.7bn to solar technologies, €7.2bn to biomass-based technologies, €6bn to wind onshore and €3.7bn to wind offshore. Italy, is the second largest subsidy provider with €13.1bn (18% of the EU27), of which €6.7bn for solar, followed by Spain (14%, €10.4bn, including €4.5bn for solar and €4.1bn for onshore wind) and France (8%, €5.5bn, including €2.7bn for solar and €1.2bn for wind onshore). Overall, Germany, Italy, Spain and France counted for 80% of the total EU27 subsidies for RES in 2018.

Amongst the non-EU G20 countries, Japan stands out with strong support for photovoltaic solar energy that has surged to €12.4bn in 2018, up from €1bn in 2012 when the FiT program was launched. Japan is now the world largest provider of subsidies for power generation from solar technologies. While the UK⁸ and the USA have quite balanced subsidy mix among the technologies, China supports mainly wind onshore (€4.2bn) and solar PV (€3.6bn) at federal level.

Using the per capita approach, Germany remains by far the leading country with €350/cap of subsidies for renewables in 2018 (Figure 2-14), followed Italy (€222/cap), Spain (€217/cap), France (€198/cap) and the Czech Republic (€168/cap) that drive the EU27 weighted average upwards at (€163/cap). Japan (€198/cap), the UK (€122/cap) and the US (€87/cap) rank first among the non-EU27 G20 countries, although significantly below the EU27 average.

⁸ The UK only provides total subsidy amounts for renewable throughout its several programs. The subsidies distribution across technologies has been estimated based on the national power mix.

Figure 2-13 Subsidies for renewable technologies by country in 2018 (€bn)

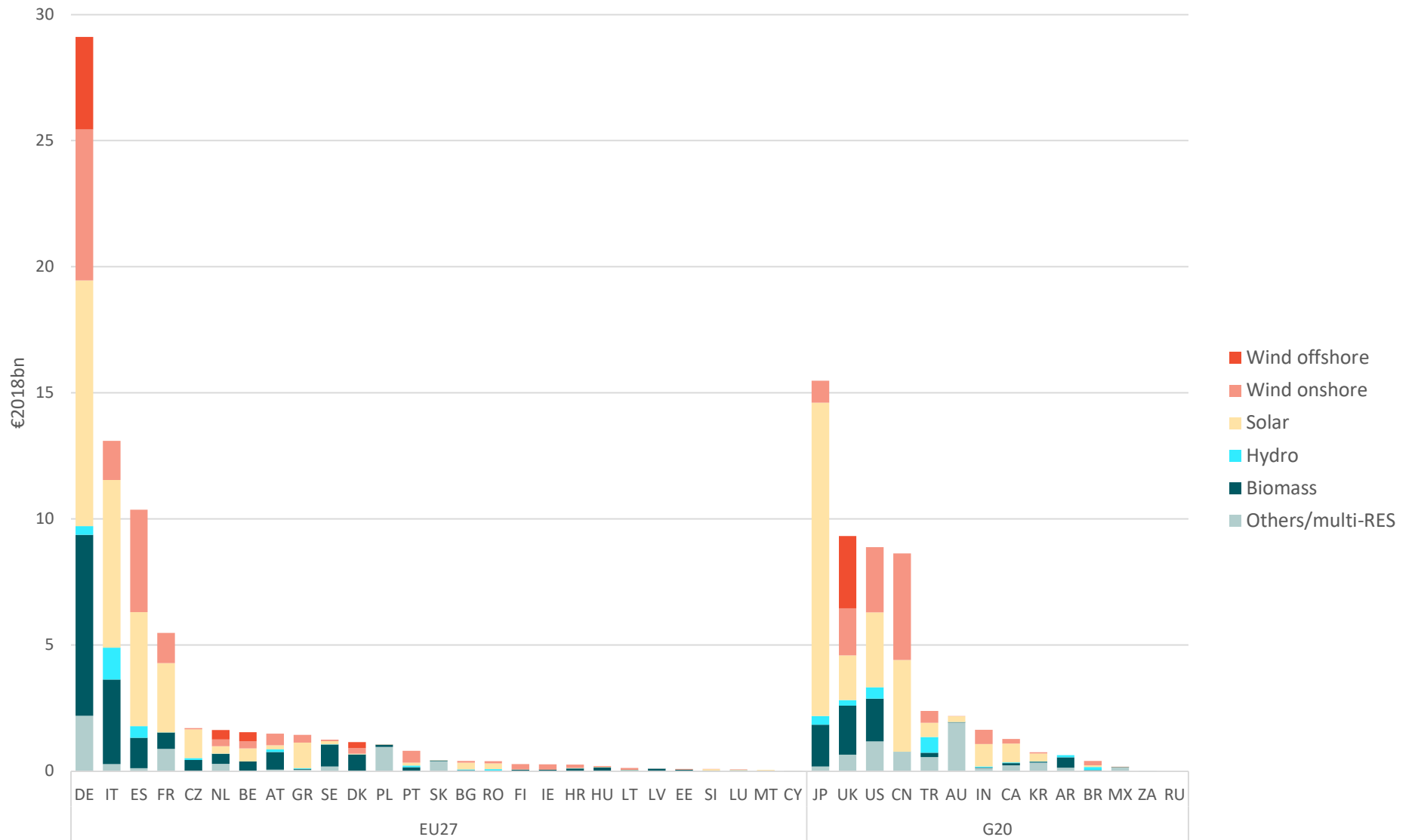
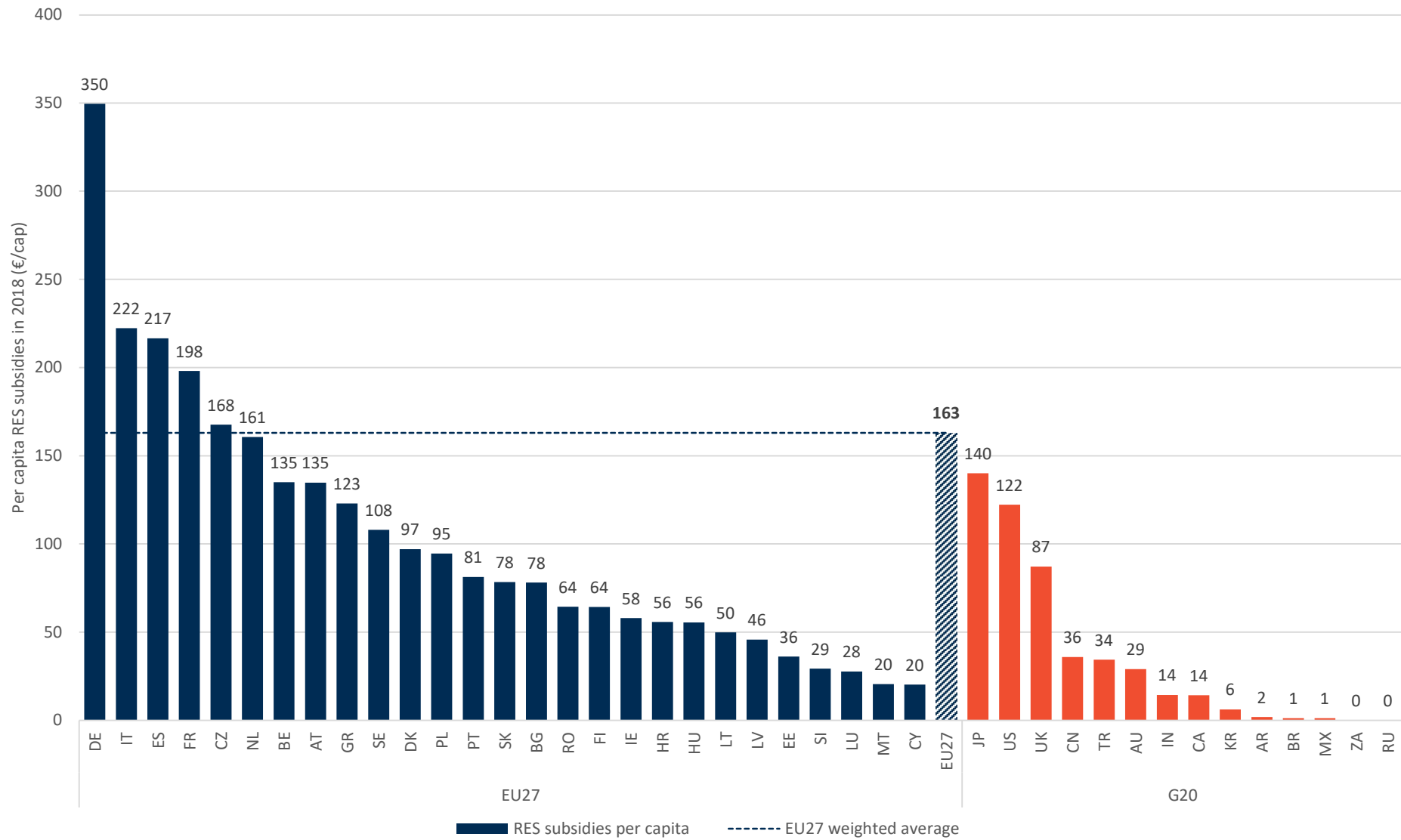


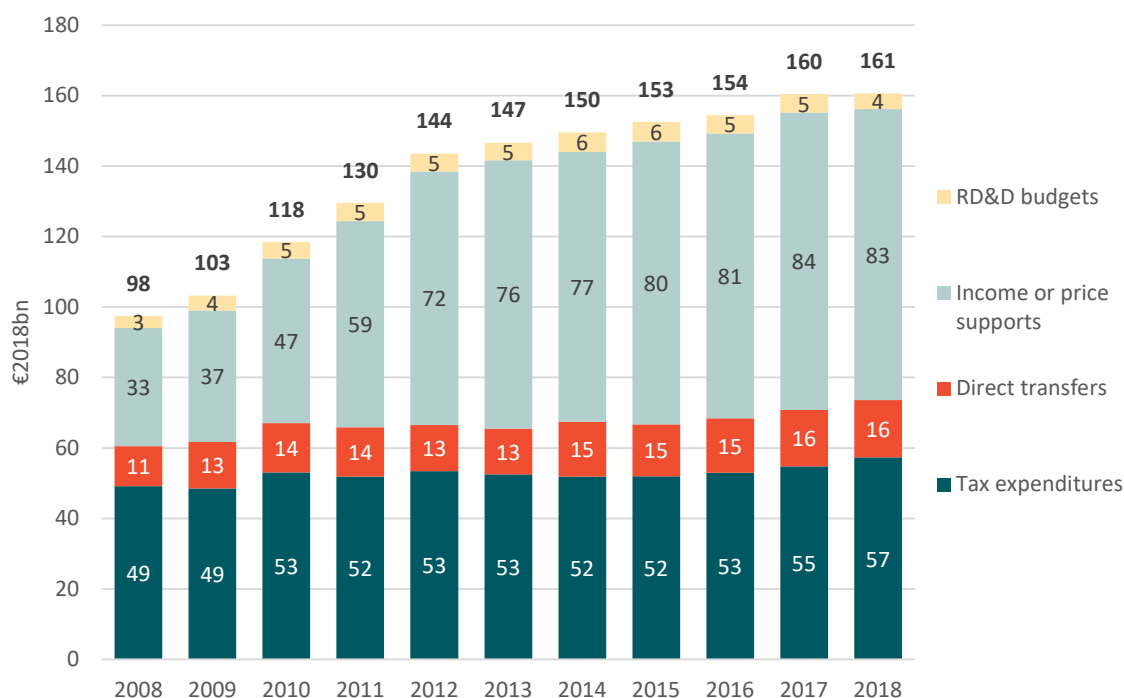
Figure 2-14 Per capita subsidies to renewable technologies by country (€/cap, 2018)



2.3 Subsidies by category

Since 2011, energy subsidies are mainly provided through income/price support schemes and represented 52% of the subsidies in 2018 (€83bn, +147% between 2008 and 2018), followed by tax expenditures (€57bn, +17%), while direct transfers remained marginal (€15bn in 2018) accounting for 9% of the total (Figure 2-15).

Figure 2-15 Energy subsidies by category in EU27 (€2018bn, 2008-2018)



2.3.1 Income and price support

Income/price support schemes include several cross-subsidies in the form of market-based tools that have been implemented to various degrees by MS. While FiT and FiP have been widely applied in Europe over the two last decades, schemes such as capacity mechanisms have also gained subsidy shares over the last years.

Of the additional €49bn of income/price support subsidies provided between 2008 and 2018, €41bn came from **FiT and FiP schemes**⁹, reaching €65bn in 2018; the lion's share has been dedicated to the development of RES technologies (€60bn in 2018, +275% since 2008). However, MS have still provided €5.4bn of support for electricity from CHP burning fossil fuels through FiT and FiP schemes in 2018 (down from €8.6bn in 2008).

The development of RES and CHP is also supported by **renewable obligation schemes** in five countries, namely Belgium, Italy, Poland, Romania and Sweden¹⁰ totalling €5.9bn of subsidies in 2018, of which €0.3bn for electricity from CHP burning fossil fuels.

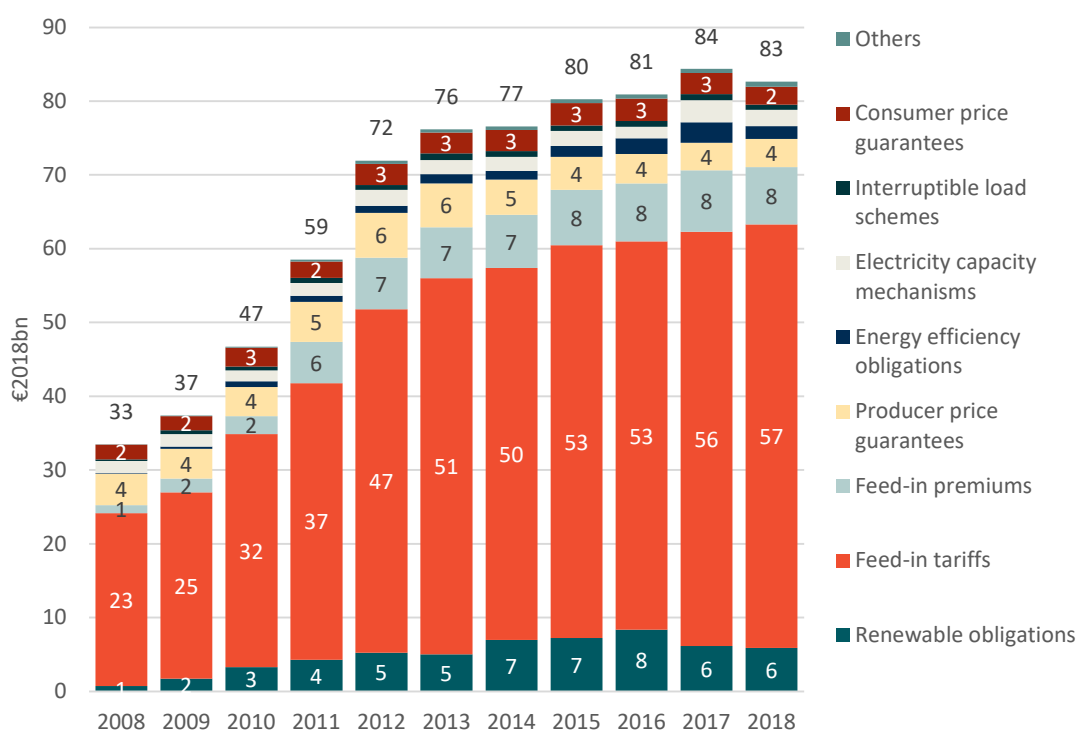
⁹ Amounts of FiT and FiP schemes are often reported together by MS, so a distinction between the two kinds of schemes is difficult. This explains the drop of FiT amounts between 2013 and 2014.

¹⁰ The renewable obligation scheme in Italy was phased-out at the end of 2012, although committed contracts continue to generate payments to operators engaged in the scheme before this date.

Support from **producer guaranteed prices** (mainly power purchase agreements, PPA) reached €3.8bn in 2018 (stable since 2008), of which €2.9bn for electricity burning fossil fuels (down from €3.5bn in 2008) (“producer price guarantees” in yellow in Figure 2-16).

Overall, support to power generation provided €66bn to renewables, and €8.5bn to electricity from CHP burning fossil-fuels.

Figure 2-16 Income and price supports in the EU27 by type (€2018bn, 2008-2018)¹¹



Schemes supporting the development of renewables

To reach the target of 20% RES in final energy consumption by 2020 as part of the third EU energy package, the EU MS have implemented policies that have boosted these technologies until the EU27 share reached 18.9% at the end of 2018¹², up from 12.6% in 2008. This increase has been even more important in the electricity sector where the share of RES within the power mix has increased from 18.6% in 2008 to 32.2% in 2018. However, this development also required important financial support that has increased from €17bn in 2008 to €67bn in 2018, driven by the development of power generation from solar PV (€26.8bn in 2018, +€23bn since 2008), wind onshore (€15.7bn, +€9.5bn), biomass (€14.4bn, +€8.7bn) and lately by wind offshore (€4.6bn, +€4.5bn).

Figure 2-17 shows that two phases of development can be distinguished: the first phase until 2012 shows a surge of financial support (33%/year on average¹³) mainly driven by high FiT for solar PV. The second phase from 2013 records a much lower increase in subsidy flow (down to 4%/year on average)

¹¹ It should be noted that most MS report subsidy amounts for FiT and FiP schemes together.

¹² See Eurostat SHARES (Renewables) available at <https://ec.europa.eu/eurostat/web/energy/data/shares>

¹³ The compound annual growth rate (CAGR) is the mean annual growth of an indicator over a specified period of time longer than one year.

resulting from the continuous decline in costs (see Task 2 on LCOE), the replacement of FiT by FiP in several MS¹⁴, the emergence of policies aiming at controlling the access to FiT and FiP (corridors) to project holders, the growing share of FiP over FiT, the appearance of reverse-auction based mechanisms for accessing FiP¹⁵ and lately the development of subsidy-free projects.

Figure 2-17 Subsidies for renewables by technology (€2018bn, 2008-2018)

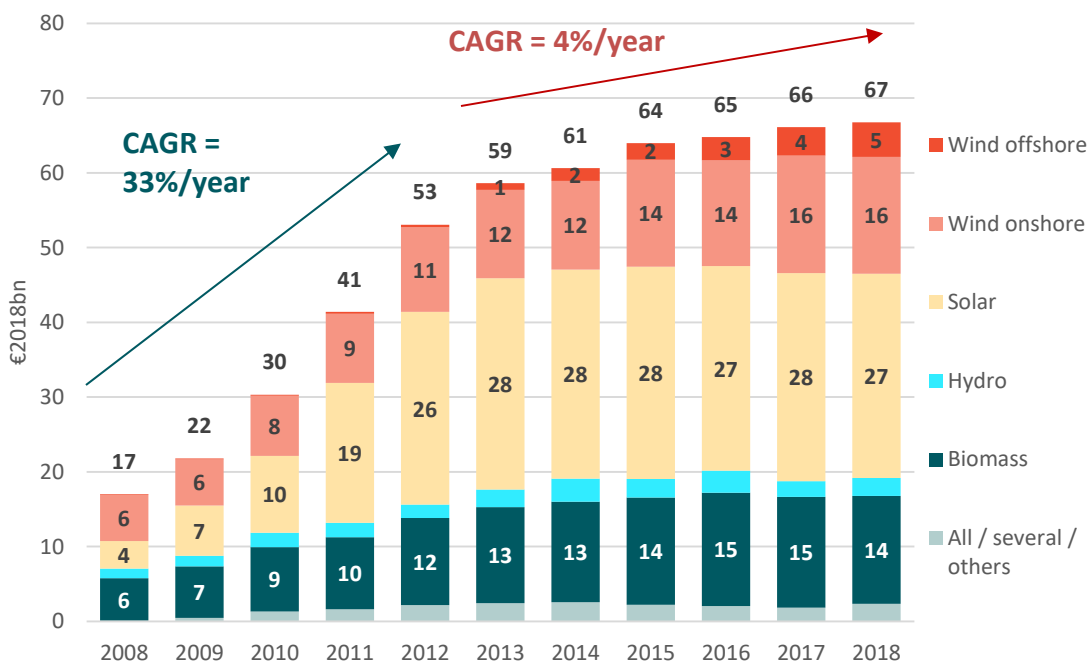


Figure 2-18 shows the evolution of actual average costs of subsidies (in 2018 €/MWh) of the renewable technologies calculated as the total subsidy amounts from income/price support instruments¹⁶ divided by the total power generation by these technologies, e.g. including power plants still producing electricity while having their FiT/FiP ended, and including subsidy-free projects.

Figure 2-18 shows that the cost of subsidies (including the legacy cost of former subsidy programmes) for wind onshore has been quite stable (in current euros) since 2008 fluctuating around €55/MWh, while that of biomass has increased until 2016 before decreasing to its level of 2013 at €90/MWh. The evolution of the subsidy cost for solar PV is singular since the cost has halved since 2018 while the legacy costs of pre-2013 policies provide large and easy free access to high FiT based on the earlier high technology costs. It is also noticeable that, even after the turning point of 2013, the total average cost has continuously decreased, and this trend is expected to continue with the large capacity expansions planned by MS¹⁷.

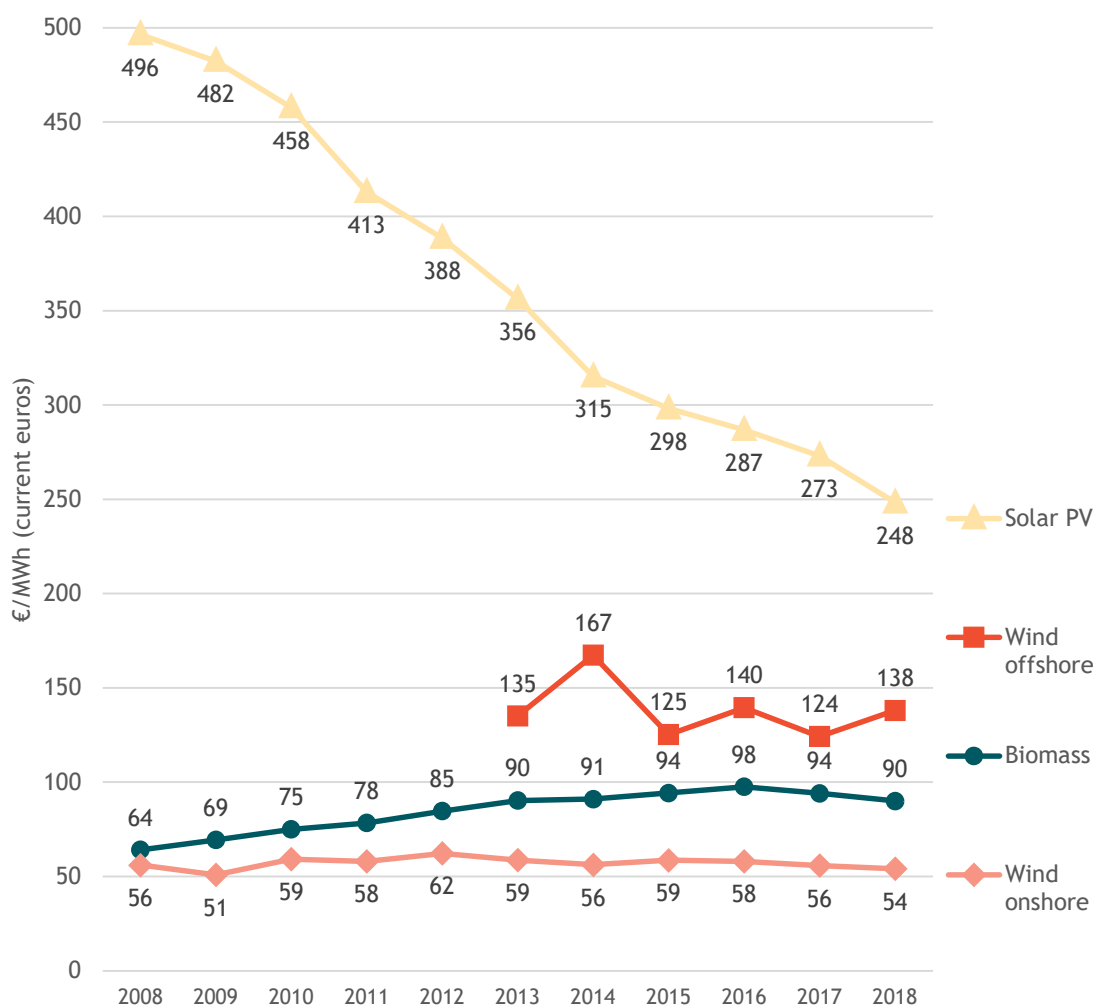
¹⁴ See Enerdata Renewable Energy Support Policies in Europe available at <https://www.enerdata.net/research/world-renewable-plants-policies-preview.html>

¹⁵ Commission’s Energy and Environmental State Aid Guidelines <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52014XC0628%2801%29>

¹⁶ Income/price support instrument for RES power gathers feed-in tariffs, feed-in premiums, renewable obligations and producer price guarantees (price regulation).

¹⁷ See MS National energy and climate plans (NECPs) available at https://ec.europa.eu/info/energy-climate-change-environment/overall-targets/national-energy-and-climate-plans-necps_en

Figure 2-18 Cost of subsidies for renewable power generation by technology in the EU27 (€/MWh, 2008-2018)



Schemes participating to secure electricity supplies

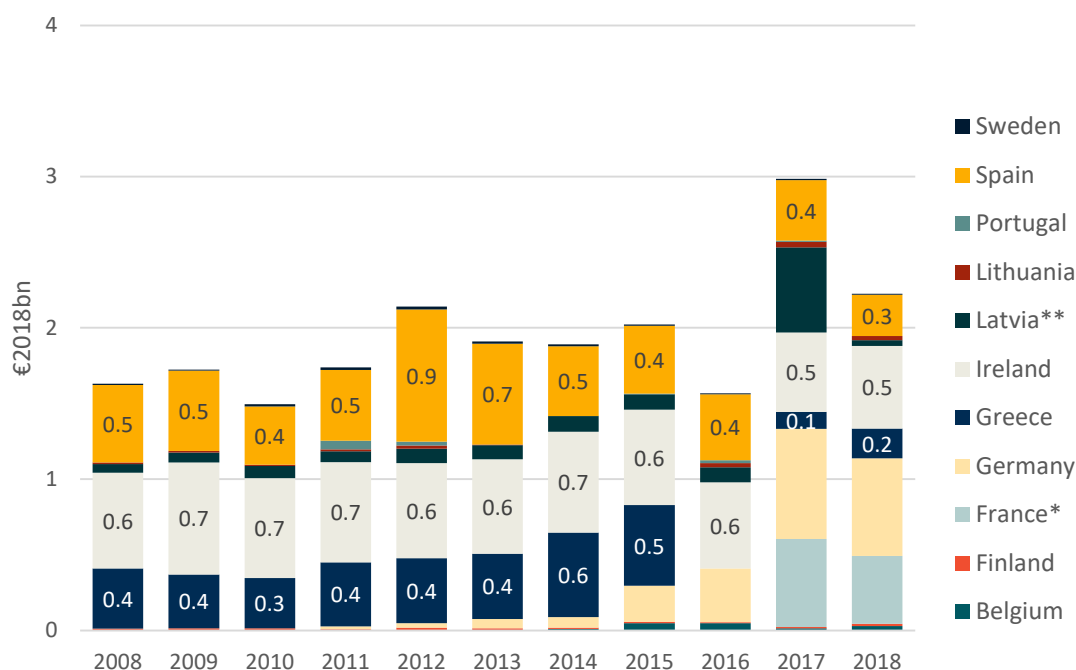
In response to the increasing penetration of intermittent renewables in the electricity markets (mainly solar and wind) and lower wholesale electricity prices, MS have implemented several economic mechanisms to ensure secure electricity supplies in their bidding zone. Among them, the **capacity mechanisms** (reserves) have rapidly expanded although the EC has called to limit their extent¹⁸: while 7 MS had developed such schemes in 2008, an additional 4 MS provided financial support in 2018 reaching the total amount of €2.2bn (Figure 2-17). Several other MS, including Italy and Poland, have already put in place regulations¹⁹ but they are not included in this report because no amounts were disbursed in 2018 or before. However, the magnitude of support is expected to be significant as Italy is planning to provide €1.3bn in 2023²⁰.

¹⁸ The Clean Energy For All Europeans stipulated that “The market design reform is removing priority dispatch for coal, gas and peat and will limit the need for capacity mechanisms which often relied on coal.” European Commission, “Clean Energy for all Europeans” package, (COM(2016) 860), November 2016. Available at: <https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/COM-2016-860-F1-EN-MAIN.PDF>

¹⁹ See DG COMP “State aid to secure electricity supplies” at https://ec.europa.eu/competition/sectors/energy/state_aid_to_secure_electricity_supply_en.html

²⁰ See communication by Terna at <https://www.terna.it/it/sistema-elettrico/pubblicazioni/news-operatori/dettaglio/rendiconto-Asta-capacity-market-2022>

Figure 2-19 Electricity capacity payments in the EU27 (€2018bn, 2008-2018)* **



*: amounts for France (2017 and 2018) are estimates. No actual amounts are yet available.

** : the unusually large amount in Latvia is due to a one-off payment of €454m in 2017 attributed to Latvenergo in compensation for the restructuring of the capacity mechanism.

To further tackle power grid balancing issues, MS have also developed demand-side market-based tools such as the so-called **interruptible load schemes**. However, the amounts of subsidies directed to these schemes have reached a much lower amount of €0.7bn in 2018. This seems to indicate that the energy market is favouring production-oriented tools over demand-side mechanisms.

2.3.2 Tax expenditures

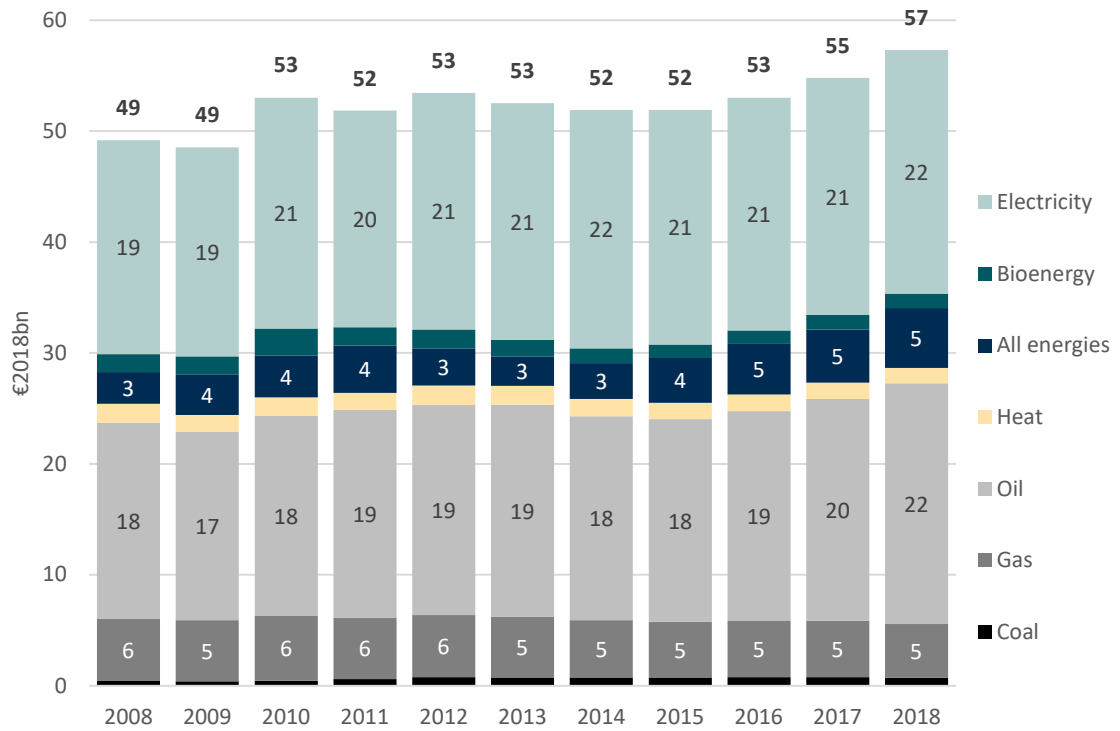
After the income/price mechanisms, tax expenditure is the second largest tool used to subsidise energy. In 2018, the total tax revenues forgone by the EU27 reached €57bn²¹, which corresponds to the total government revenue of Finland (€57.7bn in 2018). Since 2008, the tax expenditures, which place a strain on MS budgets, have increased by 17% (+€8bn). This is mainly due to the growing gaps observed since 2011 between standard tax rates, which are taken as reference to estimate tax expenditure and often promoted by governments, and exemptions (i.e. zero tax rate) and reduced rates that have been kept quite stable over the period.

Excise tax expenditures by fuels, energy carriers and sources

As shown in Figure 2-20, excise tax expenditures directly benefitted both oil products and electricity by €22bn each in 2018, followed by gas and bioenergy at €5bn each. Marked gasoil (also called coloured gasoil), which is used for off-road uses in agriculture, industry, rail transport, public administration and for heating purposes in residential and services, benefitted from €9.3bn in subsidies in 2018, up from €5.4bn in 2008. In addition, revenue forgone corresponding to the consumption of kerosene for domestic flights only (air transport) totalled €3.9bn in 2018 (stable since 2008).

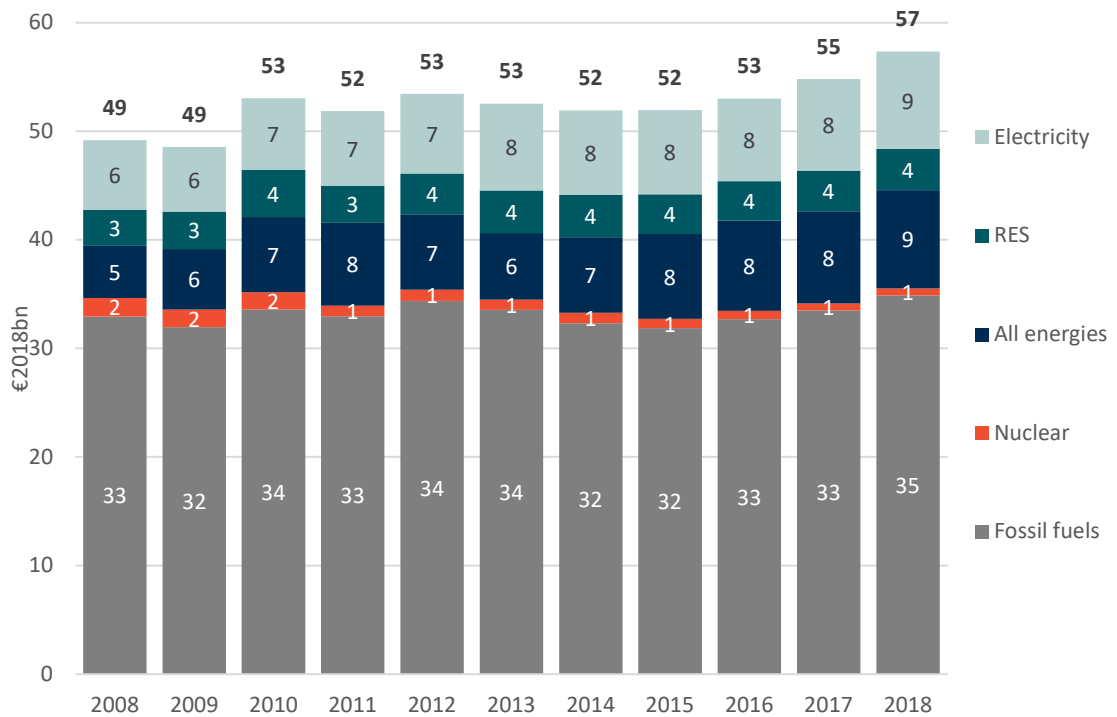
²¹ This amount disregarded behavioral responses, i.e. consumer price elasticity.

Figure 2-20 Tax expenditures in the EU27 by main energy carriers (€2018bn, 2008-2018)



After the allocation of inputs needed to produce both heat and electricity, we observe that fossils fuels are by far the main recipients of tax expenditures with no less than €35bn in 2018 (Figure 2-21).

Figure 2-21 Tax expenditures in the EU27 by energy carrier (€2018bn, 2008-2018)



Tax expenditures for non-domestic intra-EU27 flights

In addition to the estimation of tax expenditures corresponding to EU27 domestic flights as in the Prices and Costs Study of 2018, we have also estimated the tax expenditures for non-domestic intra-EU27 flights. Because of energy data limitations, the tax expenditures couldn't be allocated at country level and were estimated for EU27 as a whole and because no common standard tax rate for aviation kerosene is implemented within the EU27, we have calculated the tax expenditure for four tax rates. Accordingly, the tax expenditures for non-domestic intra-EU27 flights in 2018 reached, respectively:

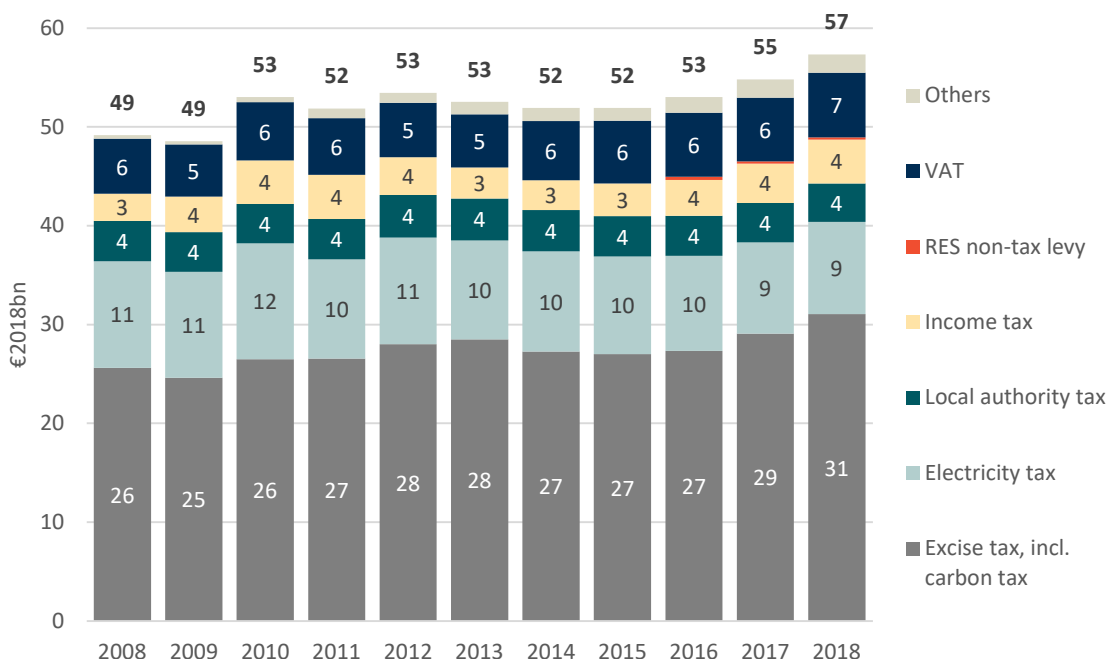
- €4.3bn with the threshold excise tax rate of €330/1,000 litres stipulated by the ETD 2003;
- €5.4bn with the median excise tax rate (€410/1,000 litres) of all EU27 MS;
- €5.7bn with the simple average excise tax rate (€437/1,000 litres) of all EU27 MS;
- €10bn with the highest excise tax rate (€764/1,000 litres) applied among the EU27 MS (i.e. Finland).

These figures are illustrative of the revenue forgone on non-domestic intra-EU27 flights and were not included in the global subsidy inventory. Therefore, subsidy amounts quoted all along the report do not include this €4.3-10bn subsidy estimate.

Nature of the tax expenditures

Of the €57bn of tax expenditures, €31bn were revenue waivers from excise tax on fossil fuels, including carbon taxes²², and €9bn from excise tax on electricity (Figure 2-22) totalling €40bn of revenue foregone, which corresponds to 18% of excise tax revenues in the EU27 in 2018 (stable since 2008 around 18%). For comparison, this amount of €40bn is akin to the total 2018 government revenues of Hungary or Romania (€42bn each).

Figure 2-22 Tax expenditure in the EU27 by type of tax and levy (€2018bn, 2008-2018)*



²² Most of the MS having implemented a carbon tax report the amounts corresponding to this tax included in the excise tax revenue. Only few MS report the amounts collected for their carbon tax separately. Therefore, for harmonisation purposes, it has not been possible to isolate the revenues from carbon taxes, and therefore they are included in the excise tax.

Excise tax expenditures per capita

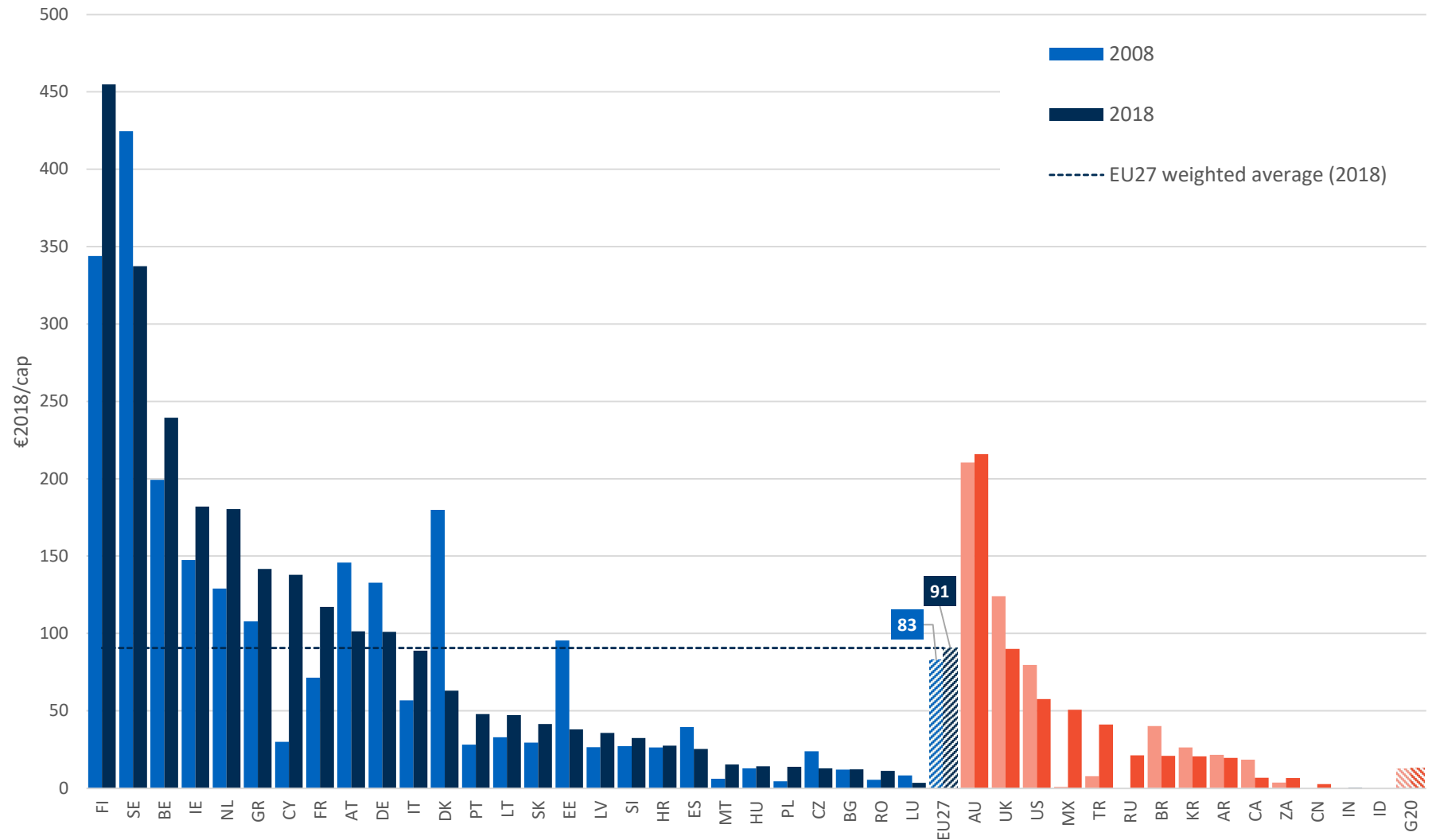
When looking at the excise tax expenditures per capita (Figure 2-23), Finland ranks first with €455/cap in 2018, followed by Sweden (€337/year/cap) and Belgium (€239/cap). However, it is important to note that since January 2011, Finland is calculating the tax expenditures using a benchmark made of three factors, namely energy content, CO₂ emissions and local emissions. According to our research, Finland is the only country calculating tax expenditure using this methodology. All other countries included in this study are estimating tax expenditures using the highest tax rates as a benchmark for each fuel/carrier, which is later compared against the exemptions or reduced rates. Since the change of methodology observed in Finland occurred in 2011, this may also explain the upward trend recorded over the 2008-2018 timeframe.

Figure 2-23 also shows that average annual excise tax expenditures per capita were lower than €50/cap in 15 EU MS, of which 7 MS provide less than €20/cap, which can be explained by a combination of low standard tax rates resulting in low tax expenditures, and the existence of fewer tax expenditures in the these MS.

Within the G20 countries, only Australia and the UK exceed the EU27 weighted average. The lower per capita tax expenditures in other non-EU27 G20 countries may be explained by a combination of factors of which a) lower taxation rates, which implies low tax expenditure volumes; b) fewer carbon taxes (see annexes to the External costs report for an overview); c) non-exhaustive tax and subsidy data²³.

²³ For more information refer to p7.

Figure 2-23 Excise tax per capita in Europe and in G20 countries in 2008 and 2018 (€2018/cap)



Excise tax expenditures, excise tax revenues and total government revenues in Europe

Beyond the absolute amounts of excise tax expenditures, it is also interesting to look at the impact of the foregone revenues from excise taxes on total government revenue. To do that, we combined two indicators:

- a. The share of excise tax expenditures vs the total excise tax revenues, to scale the size of the share of revenue loss. The higher the percentage, the higher is the financial effort by the government to balance its budget while incorporating these subsidies to recipients. This indicator is shown on the horizontal axis in the following graphs.
- b. The share of excise revenues within the total government revenues²⁴ to scale the reliance of the state on excise tax revenues. The higher the percentage, the higher the reliance on excise taxes to finance the state budget. This indicator is shown on the vertical axis in the following graphs.

Figure 2-24 shows that in 2008, three MS, namely Sweden, Belgium and Greece, had a share of excise tax expenditures compared to their revenues above 35% (horizontal axis), which means that the tax excise tax revenue forgone was significantly higher than the EU27 average (18%). However, these excise tax expenditures may have limited consequences on the three MSs' government budget since the excise tax expenditures account for slightly less than 8% of their total revenue. Estonia and Ireland are in a similar position, while presenting a lower excise tax expenditures / revenues ratio.

Germany (14%) and Finland (13%) stand out since the share of excise taxes in the government budget is much higher than the European average (7%) demonstrating that excise taxes are an important budgetary component for these two states. Globally, MSs reliance on excise taxes to finance their state budgets is relatively homogenous between 4% and 10%.

Figure 2-25 shows that the situation of the EU27 as a whole has not significantly changed since 2008 because both ratios have been quite stable. Ireland is moving toward the group of MSs with a high level of excise tax expenditures, namely Sweden and Belgium, while Greece has taken the opposite path getting closer to the EU average. When comparing situations in 2008 and 2018 (Figure 2-26), we notice that Germany has reduced its dependence on excise tax revenues while reducing its share of excise tax expenditures, and therefore getting closer to the EU27 average. Similar movements are observed for Austria, the Czech Republic and Sweden. Conversely, countries like Cyprus, France, The Netherlands, Poland and Romania have taken the opposite path increasing both their budget exposure to revenues from excise taxes and the subsidies provided. Overall, Figure 2-26 highlights the heterogeneity of fiscal strategies implemented by the MSs.

²⁴ Eurostat data series: Government revenue, expenditure and main aggregates [gov_10a_main] available at https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=gov_10a_main&lang=en

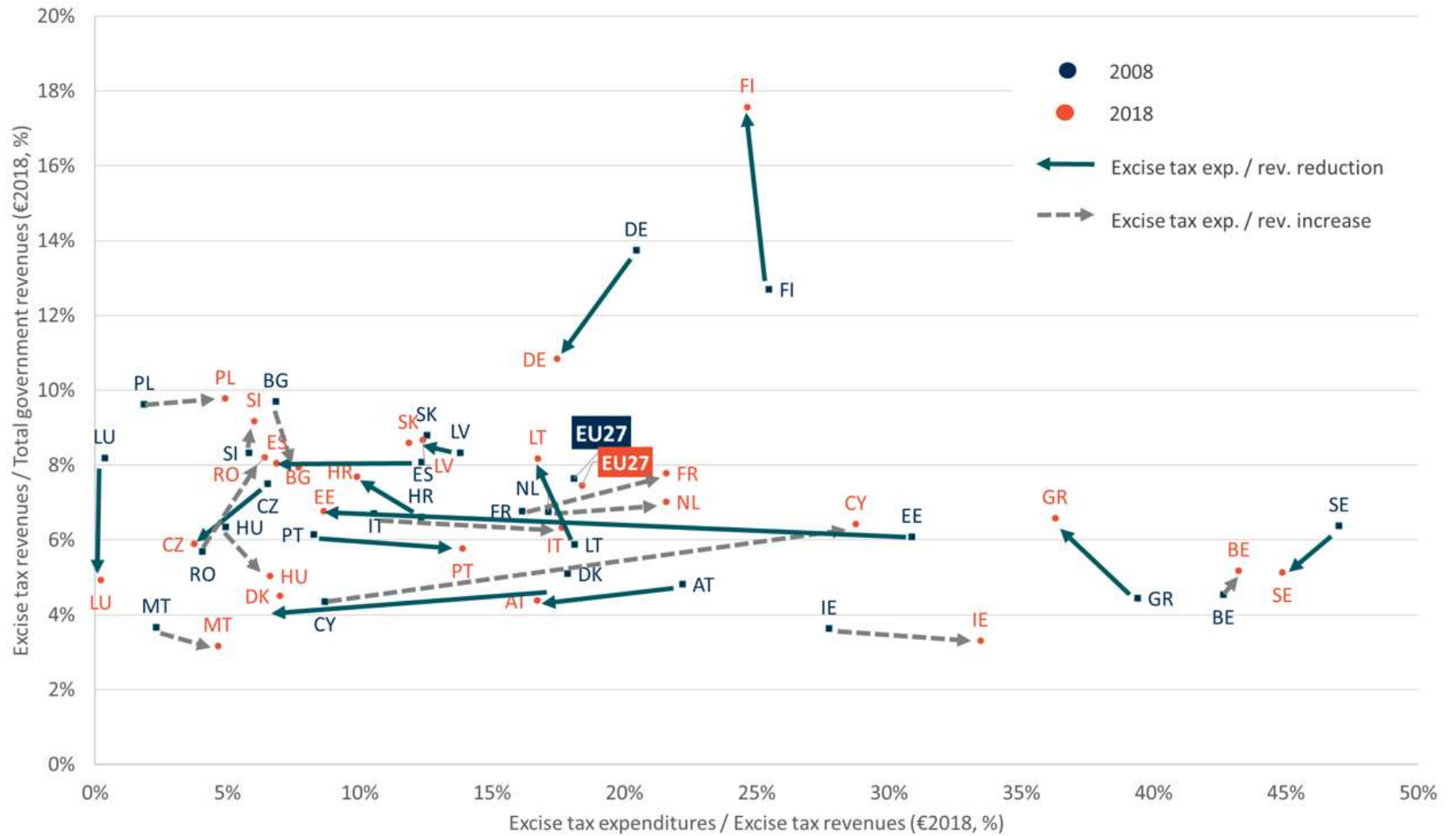
Figure 2-24 Excise tax expenditures vs excise tax revenues and total government revenues in 2008



Figure 2-25 Excise tax expenditures vs excise tax revenues and total government revenues in 2018



Figure 2-26 Excise tax expenditures vs excise tax revenues and total government revenues in 2018



2.4 Energy subsidies by economic sectors

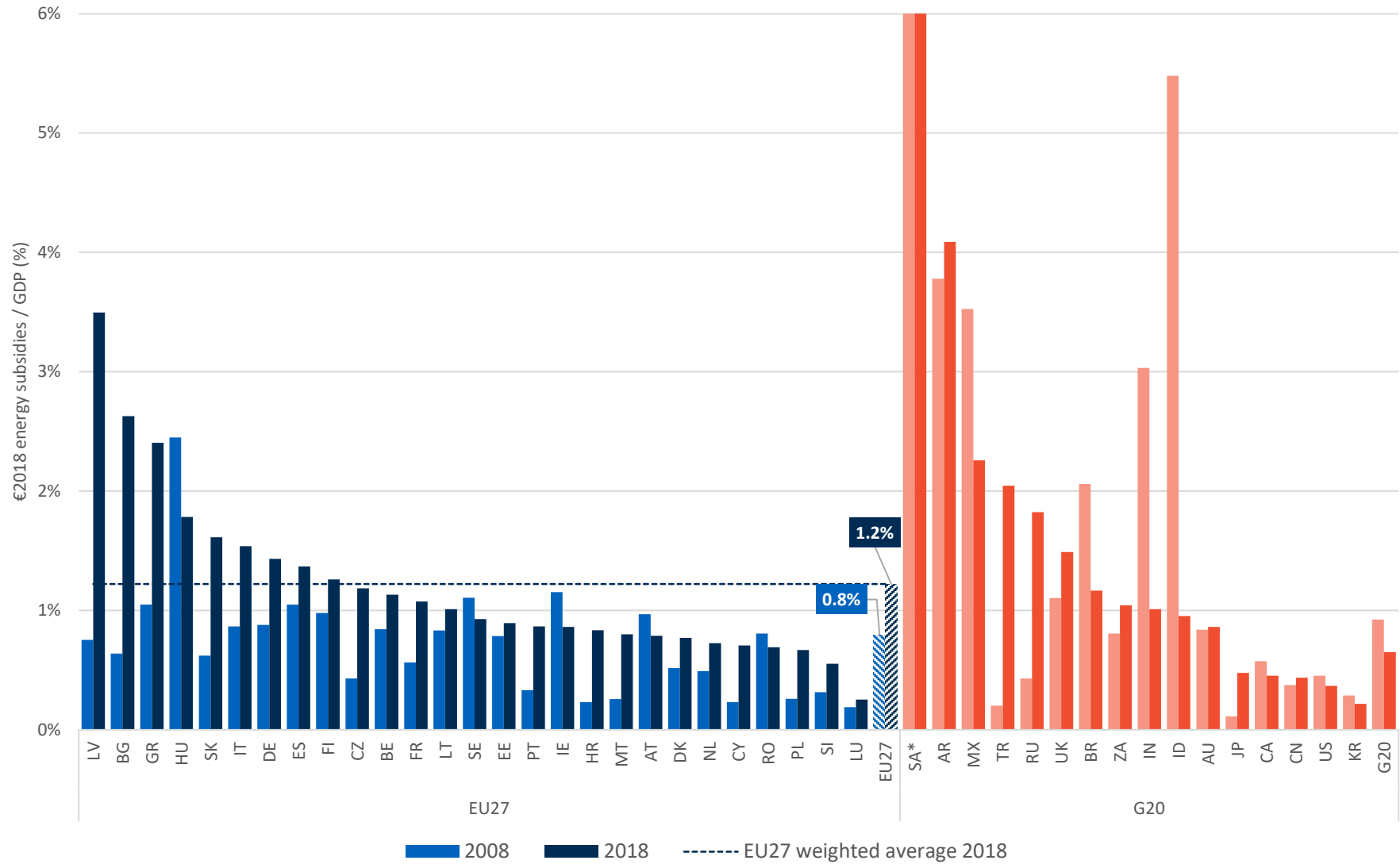
Before analysing which economic sectors benefit the most from energy subsidies, it is interesting to consider potential links between the total energy subsidies and GDP. Figure 2-27 shows that overall energy subsidies as a share of GDP have increased from 0.8% in 2008 to 1.2% in 2018 in the EU27. The upward trend is principally explained by the increase in subsidies for renewable technologies (see section 2.2.2) which have seen a 5.3% average annual growth over the 2008-2018 period, meanwhile the EU27 GDP grew at the lower rate of 0.8%/year, on average (both in real terms) (Figure 2-28). The total energy subsidy figures in the previous sections can be broken down into two phases: from 2008 to 2012, where the total energy subsidies in the EU27 have increased by 10.4%/year, on average, while the GDP contracted slightly by -0.4%/year, on average; and from 2012 to 2018, where energy subsidies and GDP increased both by 2%/year and 1.6%/year, on average. Accordingly, we conclude that there is no clear and direct correlation between the evolution of the energy subsidies and GDP.

Analysis of Figure 2-27 also shows that the energy subsidy/GDP ratio has increased in almost all the EU27 MS have during the 2008-2018 period: Hungary, Ireland, Austria and Romania being the only four countries presenting a lower percentage in 2018 than 10 years before. The four largest economies all present a ratio close to the EU27 average with Italy standing at 1.5%, followed by Germany, Spain (1.4% each) and France (1.1%).

Analysis of the evolution of the energy subsidy/GDP ratio in the non-EU G20 countries is more complex due to data quality and availability issues (see, p8). However, Japan and the UK record evolutions similar to that of the EU, again driven by the increasing subsidies for renewable technologies²⁵. On the contrary, the large declines in ratios noted in some of other non-EU countries are mainly driven by the evolution of fossil fuel subsidies. Indeed, significant reductions were noticed in Argentina, Brazil, Mexico, India and Indonesia where large petroleum products-related subsidies, especially tax reductions for end-users, were cut under the effect of both new policies aiming at reducing fossil fuel subsidies and the decline of crude oil prices on the international market. Therefore, rather than a specific link to the GDP, energy subsidies in these countries are most critically influenced by the fluctuations of the energy commodity prices on international markets.

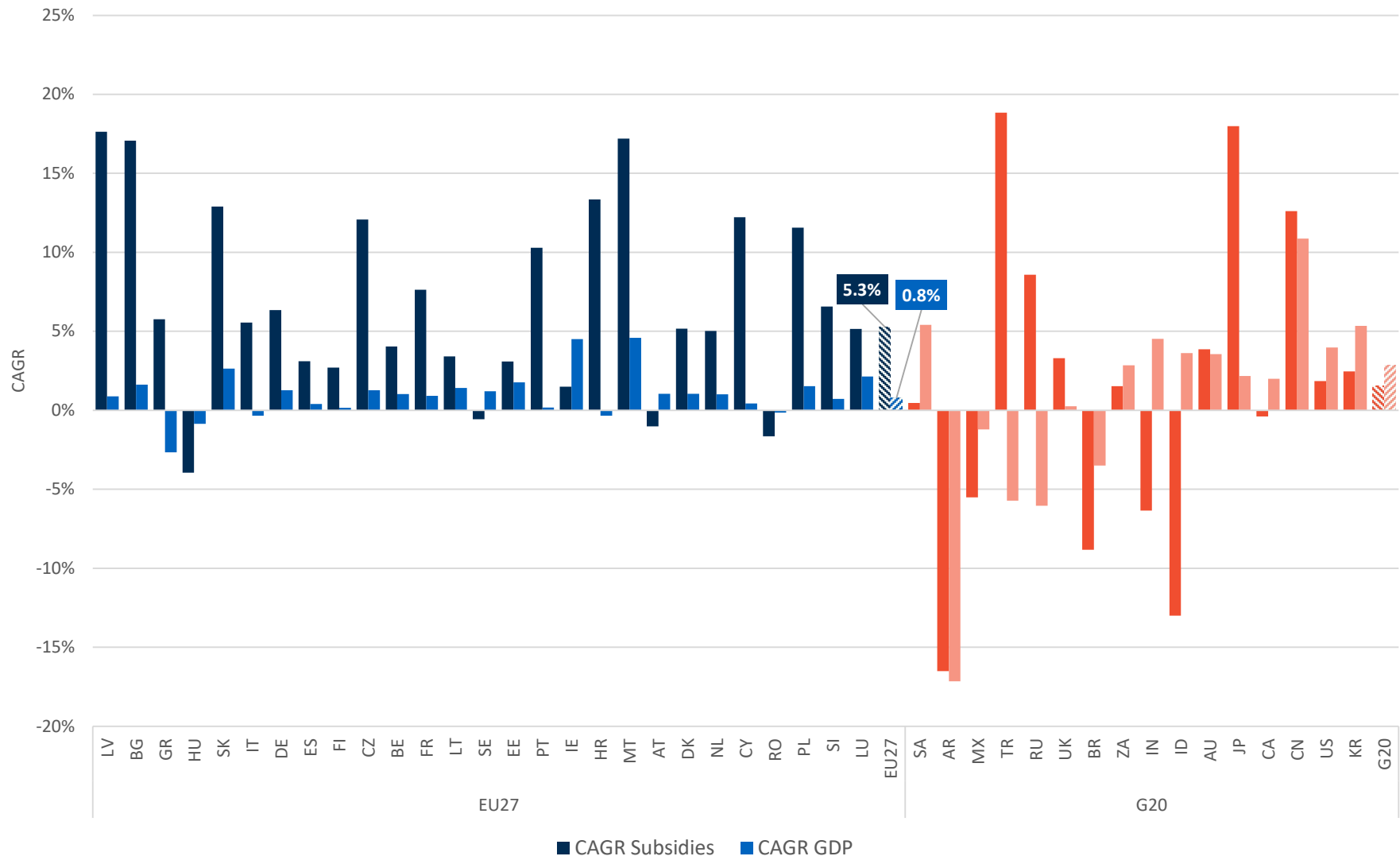
²⁵ Russia, South Africa and Turkey show similar subsidy pattern, but it is due to the lack of subsidy data during the first years of the 2008-2018 period.

Figure 2-27 Energy subsidies vs GDP by country in 2008 and 2018 in the EU27 and G20 countries (€2018, %)



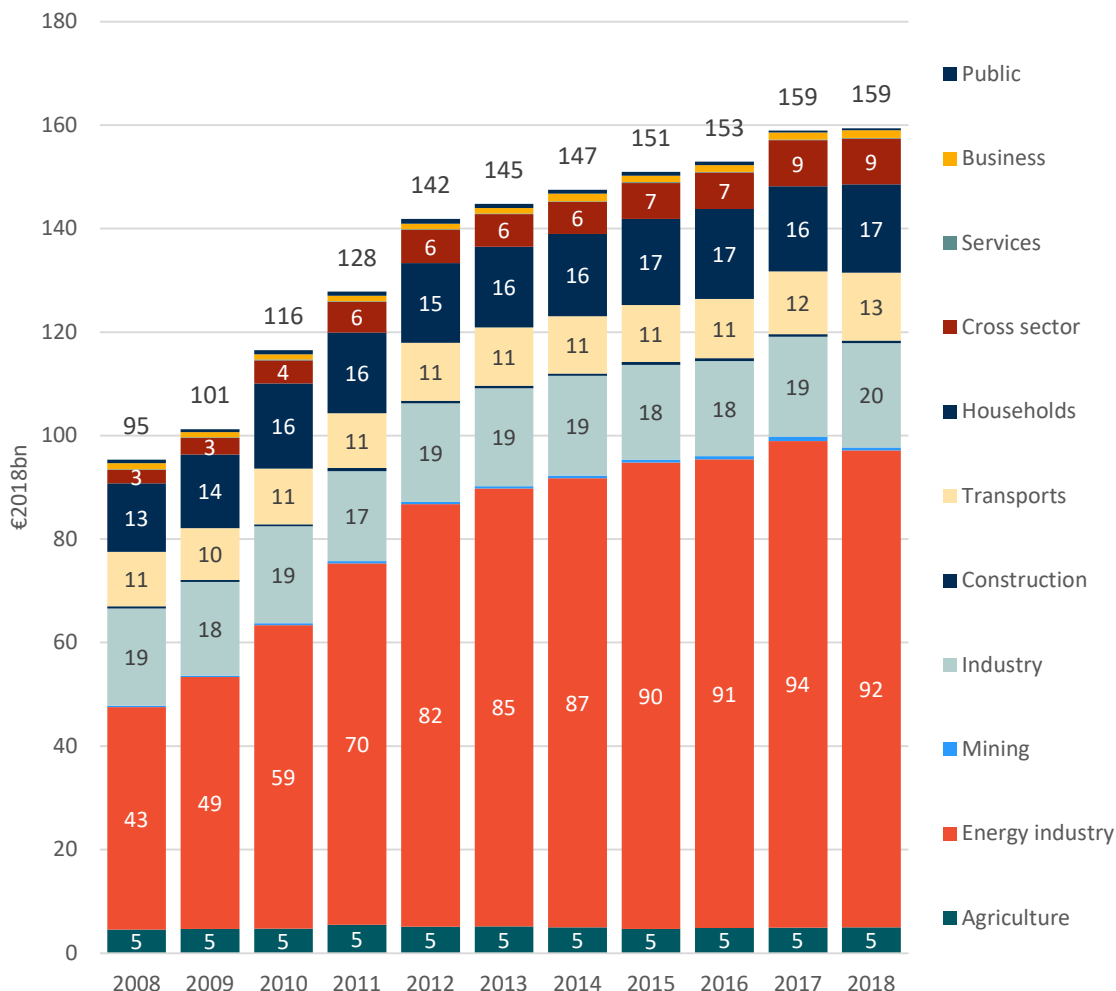
*: the share of energy subsidies vs GDP in Saudi Arabia reached 16% in 2008 and 10% in 2018.

Figure 2-28 Energy subsidies and GDP CAGR between 2008 and 2018 in the EU27 and G20 countries (€2018, %)



Overall, the energy sector itself captures most of the energy subsidies, reaching €92bn in 2018 (Figure 2-29), representing 58% of the global amount, followed by industry (€20bn, 13%), households (€17bn, 11%), transport (€13bn, 8%), and agriculture (€5bn, 3%).

Figure 2-29 Energy subsidies in the EU27 by economic sector (€2018bn, 2008-2018)



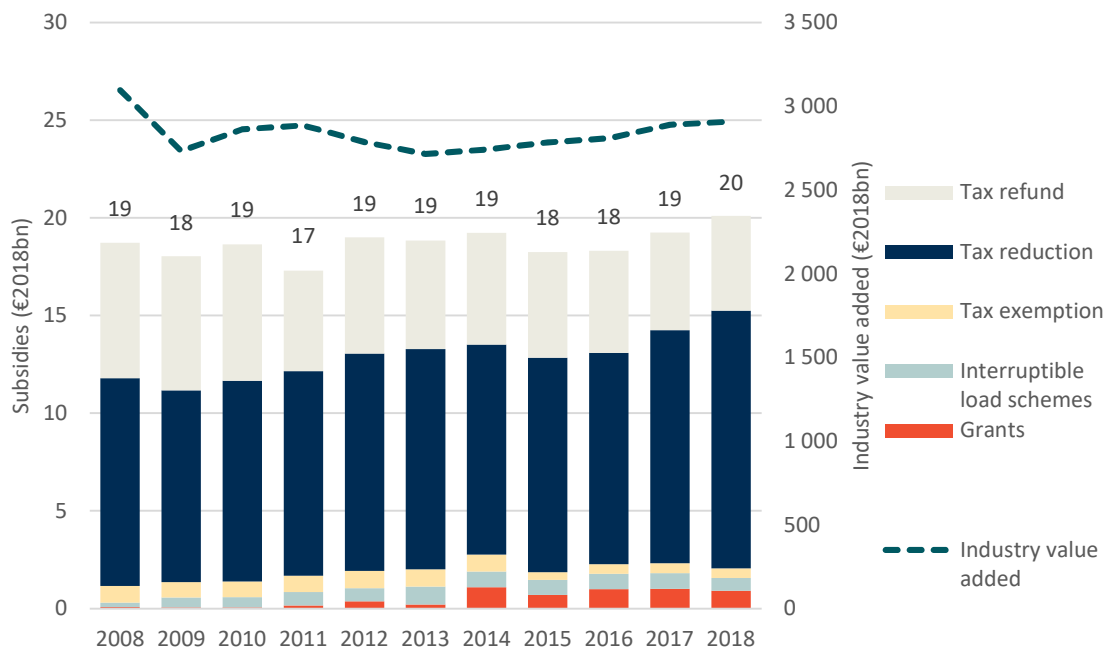
Amongst all the sectors benefiting from energy subsidies, we believe it is interesting to put a focus on two of them: a) industry because it is highly exposed to international competition and because it represent a large share of the EU27 energy consumption; and b), households because energy poverty has been a recurrent topic within the EU27 over the past years.

2.4.1 Industry

Figure 2-30 shows that despite evolutions within the subsidies provided, total energy subsidies from EU MS to industry were quite constant over the years at around €17-€20bn. Subsidies have shown a small increasing trend since 2016 to reach €20bn in 2018, this can be related to the increased value added²⁶ produced by the sector over the period.

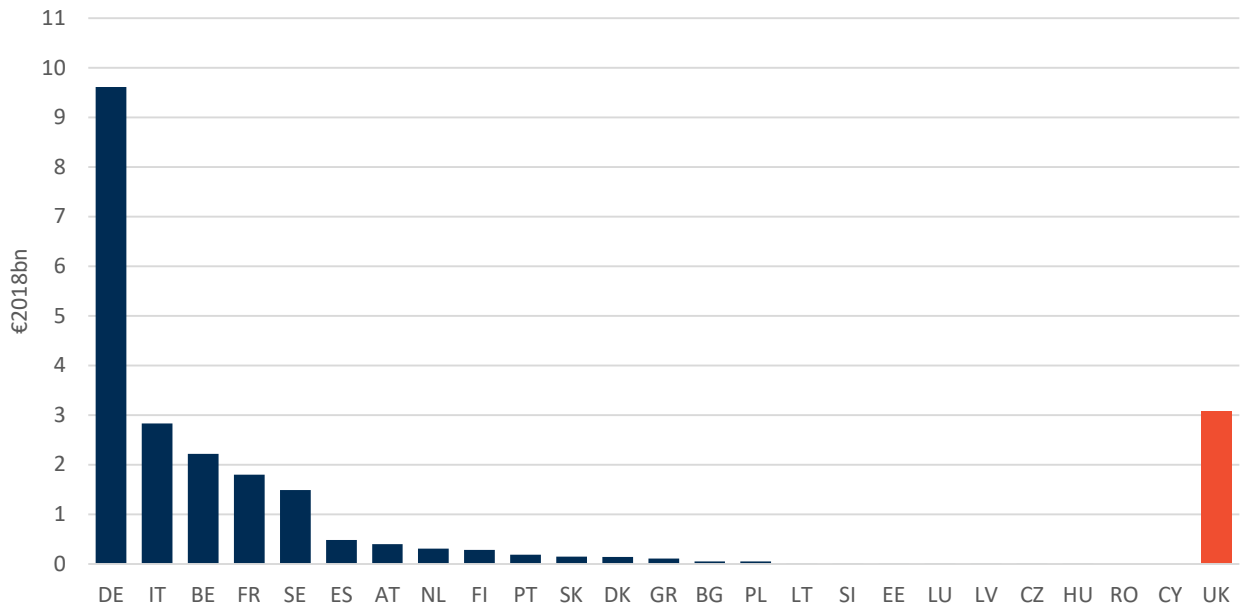
²⁶ Value added data at extracted from the Odyssee database, available at: <https://www.indicators.odyssee-mure.eu/>

Figure 2-30 Energy subsidies and industry value added in the EU27 (€2018bn, 2008-2018)



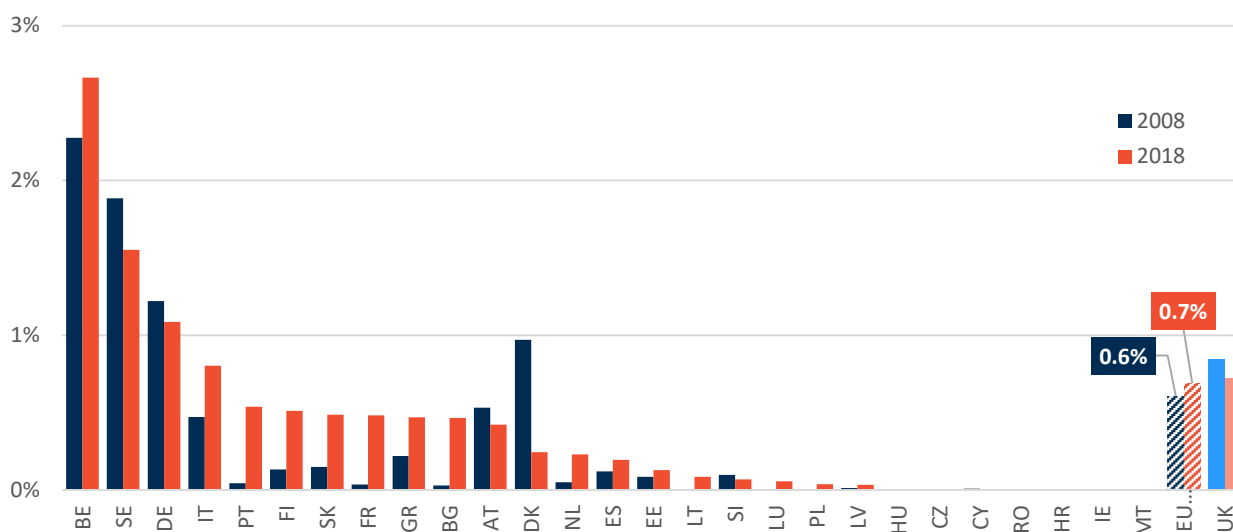
When analysing absolute amounts of subsidies by MS, we note that five countries represent close to 90% of the total, with Germany receiving the largest share in 2018 (48% of the EU27, €9.6bn), followed by Italy (€2.8bn, 14%), Belgium (€2.2bn, 11%), France (€1.8bn, 9%) and Sweden (€1.5bn, 7%).

Figure 2-31 Energy subsidies for industry in Europe in 2018 (€2018bn)



However, when the absolute amounts of energy subsidies are compared to the value added (Figure 2-32), Belgium is the country with the highest energy subsidy intensity, with energy subsidies representing 2.7% of the country industry value added in 2018. Sweden ranks second with a significantly lower ratio (1.6%), while Germany ranks third with an energy subsidy intensity of 1.1%. Overall, the energy subsidy intensity in the EU27 has slightly increased from 0.6% in 2008 to 0.7% in 2018.

Figure 2-32 Subsidies vs value added of industry by country in 2008 and 2018 (%)



Energy-intensive industries (EII)

Within industry, it is also interesting to look specifically at the energy-intensive industries (EII) that are highly affected by the price of energy, including taxes and levies. The Energy Taxation Directive of 2003²⁷ defines “energy-intensive business” as follows: “An ‘energy-intensive business’ shall mean a business entity (...) where either the purchases of energy products and electricity amount to at least 3,0 % of the production value or the national energy tax payable amounts to at least 0,5% of the added value.”²⁸

To analyse in detail the relationship between EII and energy subsidies, in addition to the data previously considered, it is important to include reductions and exemptions of **RES non-tax levies** that EII benefit from²⁹. Over the past decade, the increasing amount of subsidies to RES (see

Figure 2-17) has been accompanied by an increase in the surcharges (paid by electricity customers) that finance such developments. These surcharges are called *RES non-tax levies*. However, to protect their industries from the increase in electricity prices as a consequence of the increase of RES non-tax levies, many MS have granted exemptions or reductions of these RES non-tax levies to EII. This kind of support has increased from €1.1bn in 2008 to €7.7bn in 2018.

Similarly, the growing penetration of intermittent renewable energy in the MS’ power mix has resulted in higher **electricity network tariffs** due to the development of ancillary services to cope with intermittence. As for RES non-tax levies, MS have chosen to exempt EII from bearing this additional cost, often arguing that the stable energy consumption of EII brings stability to the grid and thus EII shouldn’t be penalised by grid tariff increases. These exemptions and reductions of electricity network tariffs reached €1.4bn in 2018, up from €0.1bn in 2008.

²⁷ The Directive, including definitions of ‘Purchases of energy products and electricity’, ‘Production value’, ‘Value added’, is available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32003L0096>

²⁸ Energy Taxation Directive (2003/96/EC), Article 17 1. (a). Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32003L0096>

²⁹ Since these RES non-tax levies are primarily intended to finance the development of renewables, their corresponding amounts have been allocated to renewables in the other graphs and analyses in this study. However, EII benefit from exemptions and reductions on these RES non-tax levies that are subsidies, but that are not included in other graphs/analyses in order to avoid double counting. When analyzing subsidies received by the EII, it is, however, appropriate to include this kind of tax expenditure.

Eventually, ten MS³⁰ have made use of the possibility to provide “aid to compensate for increases in electricity prices resulting from the inclusion of the costs of greenhouse gas emissions due to the EU ETS (commonly referred to as ‘indirect emission costs’)” as allowed by Article 10a(6) of the ETS Directive³¹. This financial support (“compensation indirect costs EU ETS” in Figure 2-33) reached a total €0.5bn in 2018 in the EU.

In addition to the subsidies previously mentioned, Figure 2-33 illustrates that MSs maintained a significant level of excise tax expenditures on both fossil fuels and electricity since 2008 (€5bn) reaching €6.3bn in 2018.

Figure 2-33 Energy subsidies for EII in the EU27 by instrument (€2018, 2008-2018)

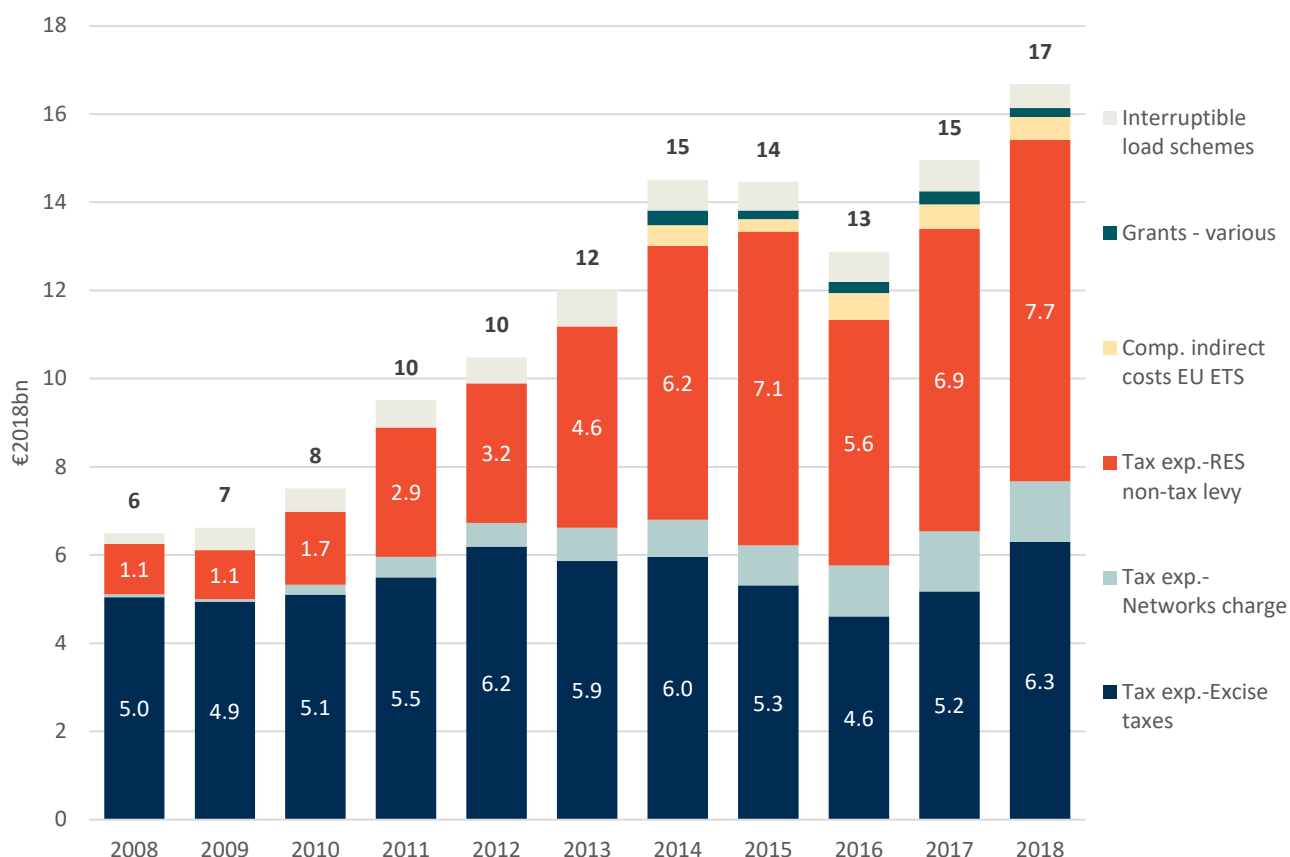
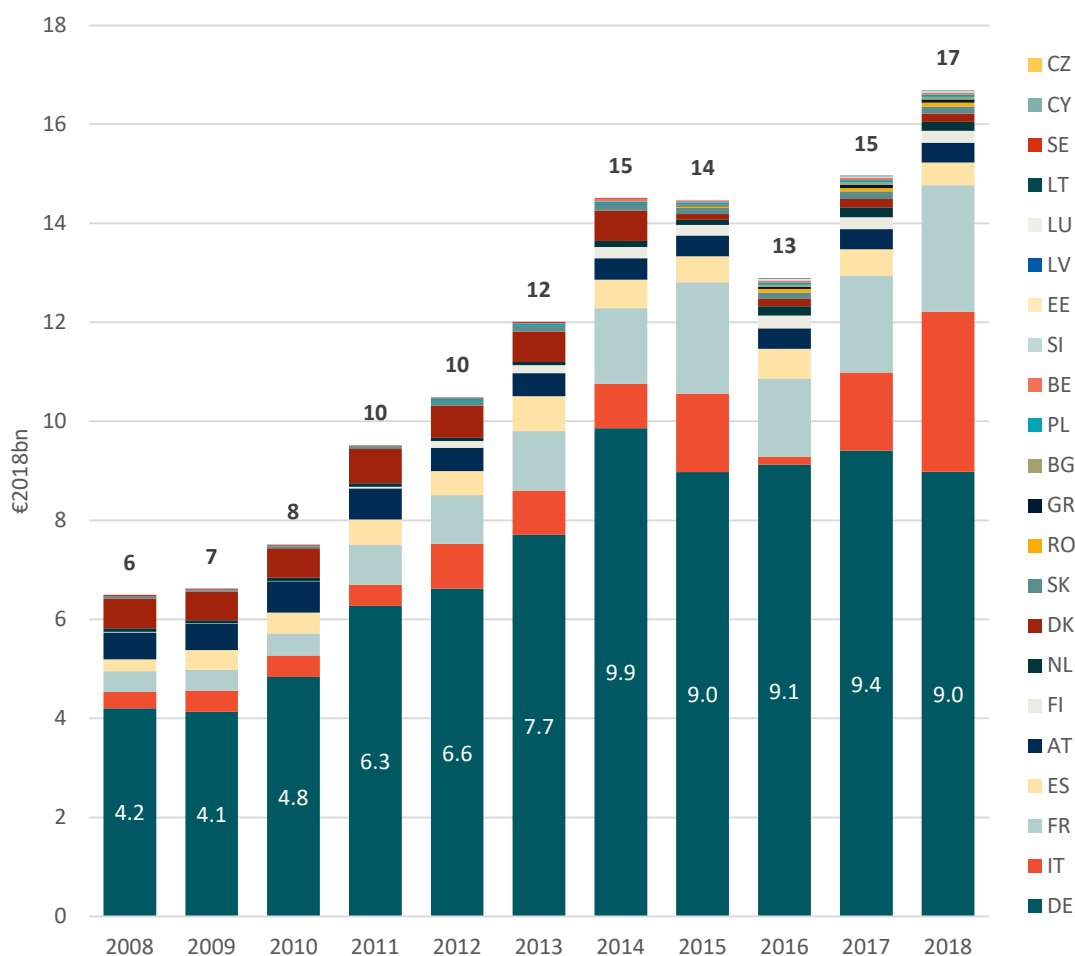


Figure 2-34 shows that three MS represent nearly 90% of the subsidies for EII in 2018 with the German EII receiving €9bn (54% of the total EU27 amount), followed by Italian EII (€3.2bn, 19%) and French EII (€2.6bn, 15%). All other countries grouped together received €1.9bn (11%).

³⁰ MS having support EII through the compensation indirect costs EU ETS scheme are Belgium, Finland, France, Germany, Greece, Lithuania, Luxembourg, Netherlands, Slovakia and Spain.

³¹ https://ec.europa.eu/clima/policies/ets/allowances/leakage_en

Figure 2-34 Subsidies for EII in the EU27 by country (€2018bn)



2.4.2 Other financial supports

The EU launched the world's first international emissions trading system (ETS) in 2005. In its first phase (2005-2007) almost all allowances were given to businesses for free. Under the second period (2008-2012) the proportion of free allocation was slightly reduced to around 90%³². Since the beginning of the third period (2013-2020), the EU ETS auctioning has become the default allocation method. Since 2013, the power generation sector is obliged to buy all its allowances and no longer receives free allowances, except for eight countries have made use of a derogation under Article 10c of the EU ETS Directive³³. In sectors other than power generation, the transition to auctioning is taking place progressively.

Figure 2-35 shows that although free allowances have dramatically reduced between 2012 and 2013, a significant amount of allowances remained allocated for free (0.76 GtCO₂ in 2018). In the meantime, Figure 2-35 shows that the average annual price of EUA had considerably dropped between 2008 and 2012 before stabilising at around €6/tCO₂ until 2018 when it surged to €15.5/tCO₂, it has continued higher since.

³² DG Climate Action, EU ETS Phases 1 and 2 (2005-2012), available at : https://ec.europa.eu/clima/policies/ets/pre2013_en

³³ The eight MS are: Bulgaria, Cyprus, Czechia, Estonia, Hungary, Lithuania, Poland and Romania. DG Climate Action, Transitional free allocation to electricity generators, available at: https://ec.europa.eu/clima/policies/ets/allowances/electricity_en

Figure 2-35 Free EUA and average annual EAU price in the EU ETS (2008-2018)

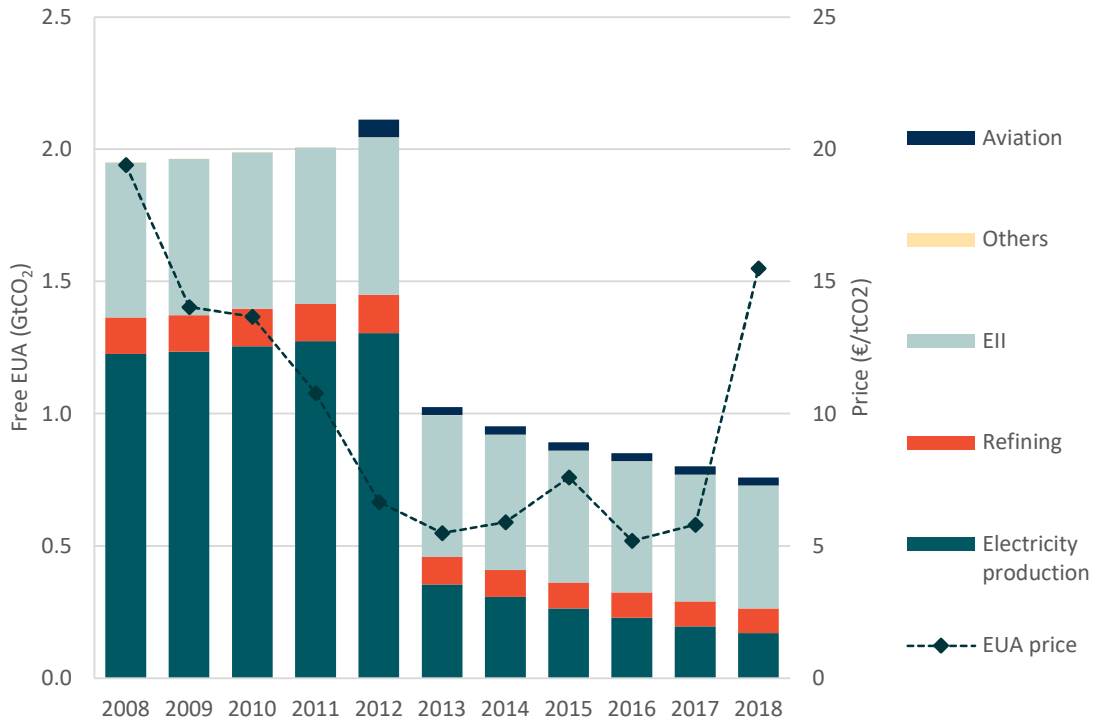
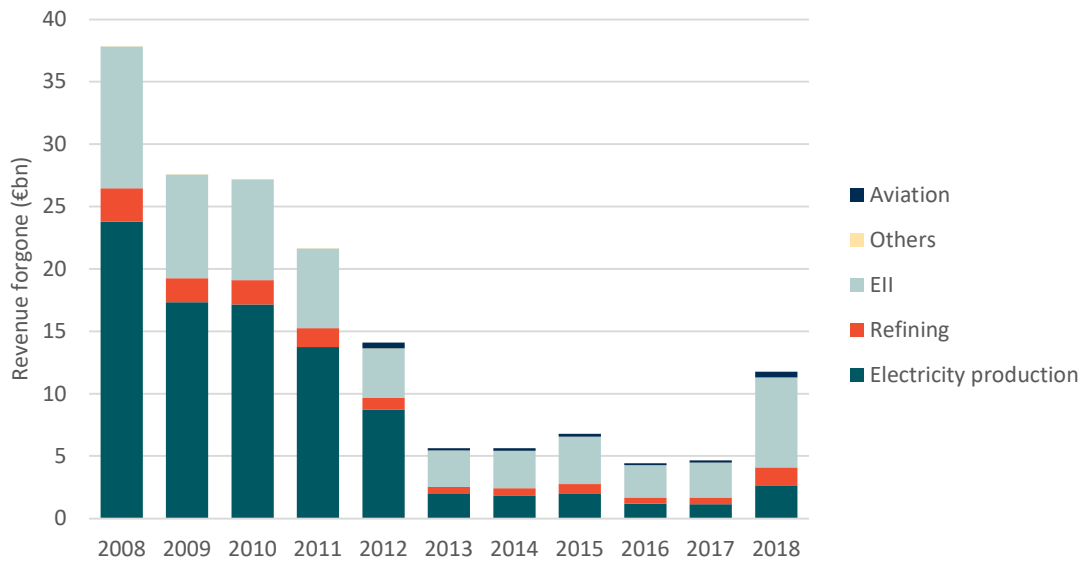


Figure 2-36 shows the revenue forgone³⁴ derived from the combination of the free EUA allocations and the average annual price. Globally, the revenue forgone shrank from €38bn in 2008, of which €23.8bn for the power generation sector, to €12bn in 2018 (€2.6bn to the power generation sector). In 2018, the EII are the largest recipient of this instrument with support estimated to €7bn, down from €11.4bn in 2008. The refining sector ranks third with €1.4bn of support (€2.7bn in 2008).

Figure 2-36 Revenue forgone from free EUA allocations (2008-2018)



³⁴ It is important to note that these total revenue forgone numbers are not counted anywhere in the study in the totals

2.4.3 Households

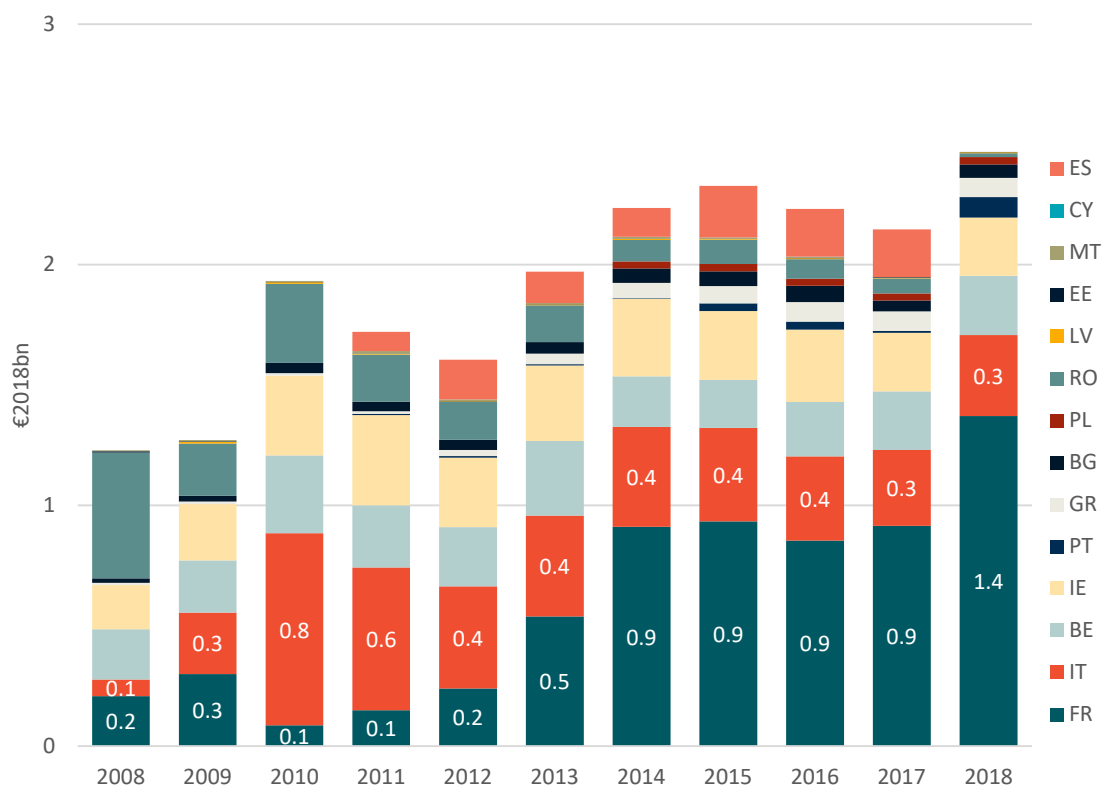
The second sector we have analysed in more detail is the residential / household sector, and here in particular the subsidies directed to low-income households.

Low-income households

Our study finds that over the 2008-2018 timeframe only 14 MS have implemented financial support schemes dedicated to helping low-income households to pay their energy bills, and only 11 were still in force in 2018 (Figure 2-37). Other MSs may address fuel poverty in other manners than providing green cheques, social tariffs, or grants, especially through social programmes, but subsidy amounts disbursed through such potential programmes have not been inventoried in this study.

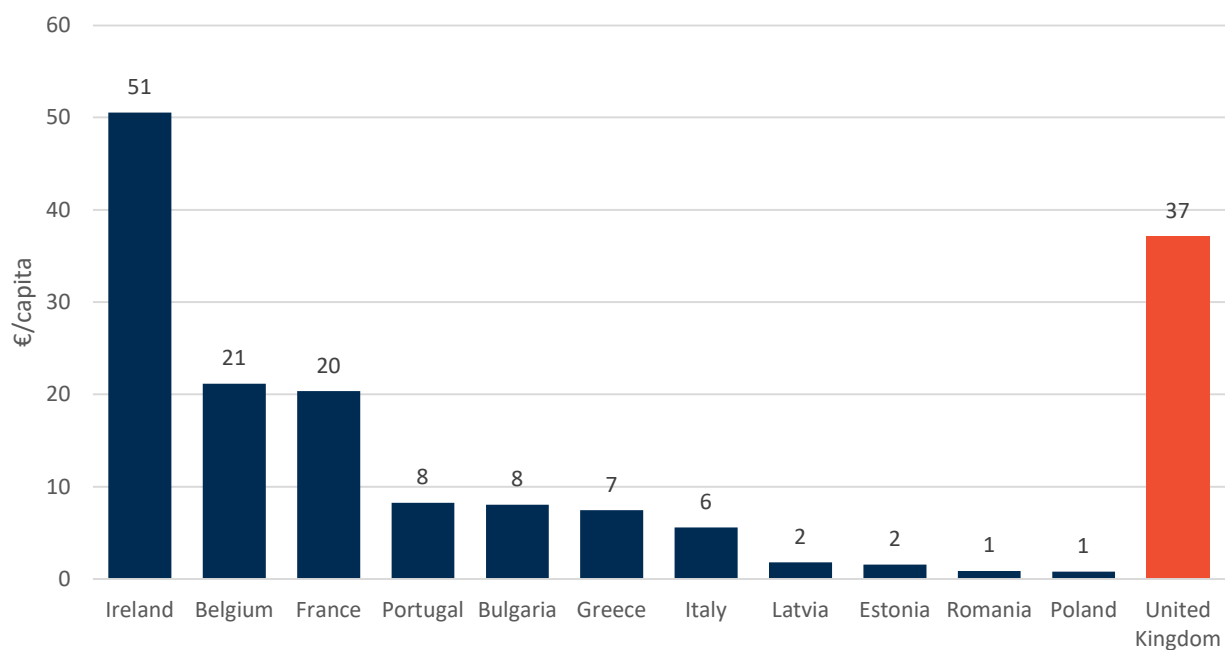
France is the largest provider of subsidies with €1.4bn in 2018 mainly through its Green cheques and building retrofit programme (“Habiter Mieux”), followed by Italy (€0.3bn) thanks to its social tariffs, Belgium (€0.2bn) with its social tariffs and Ireland (€0.2bn) with its Fuel allowance scheme.

Figure 2-37 Energy subsidies to low-income households in the EU27 by MS (€2018, 2008-2018)



Because there is no data currently available on the number of inhabitants considered in the situation of energy poverty, we have calculated the per capita contribution by MS to finance subsidies for low-income households in order to measure the “energy solidarity effort” made by the MS. The per capita approach Figure 2-38 ranks Ireland first with €51/cap financing the “energy solidarity effort” in 2018, followed by Belgium (€21/cap) and France (€20/cap).

Figure 2-38 Per capita contribution to energy subsidies for low-income households in Europe in 2018 (€2018)

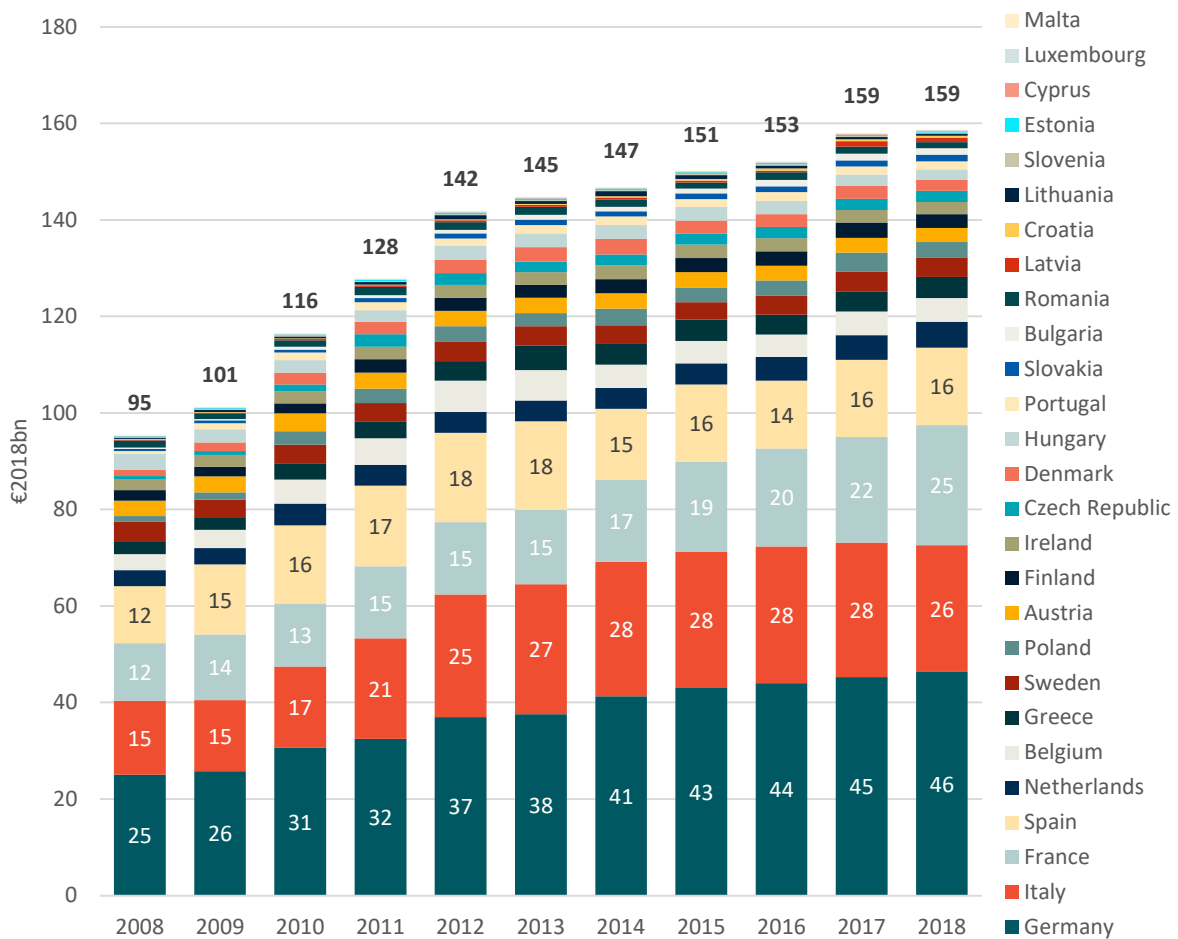


3 Energy subsidies per country

Energy subsidies in the EU27 have increased by 67% between 2008 and 2018, from €95bn to €159bn (+€64bn), mainly driven by Germany, Italy and France. As the largest European economy, Germany has also been the largest provider of energy subsidies and has recorded a continuous increase of 85% from €25bn in 2008 to €46bn in 2018 (+€21bn), the latter total representing 29% of the global EU27 amount. Italy ranks as the second largest contributor in 2018 with €26bn (+72%, +€11bn) but the total amounts distributed were stable around €28bn from 2013 to 2017 but fell in 2018, mainly due to the end of support schemes for renewables for new projects. France, the third largest supplier of energy subsidies in 2018 with €25bn, doubled its energy subsidies since 2008 (+108%, +€13bn) with acceleration since 2013 due to the development of solar and wind energy along with energy efficiency subsidies. Spain, with €16bn in 2018, provides the same amount of energy subsidy registered in 2010, mainly due to the stabilization of the costs related to the FiT and FiP schemes since 2012.

The other 23 countries provided an additional €14bn over the 2008-2018 period, with upward trends in The Netherlands (+63%, +€2.1bn), Poland (+200%, +€2.1bn), Greece (+75%, +€1.9bn), Czech Republic (+213%, +€1.6bn) and Belgium (+50%, +€1.6bn), and downward trends in Romania (-15%, -€0.2bn), Sweden (-5%, -€0.2bn), Austria (-10%, -€0.3bn) and Hungary (-33%, -€1.1bn).

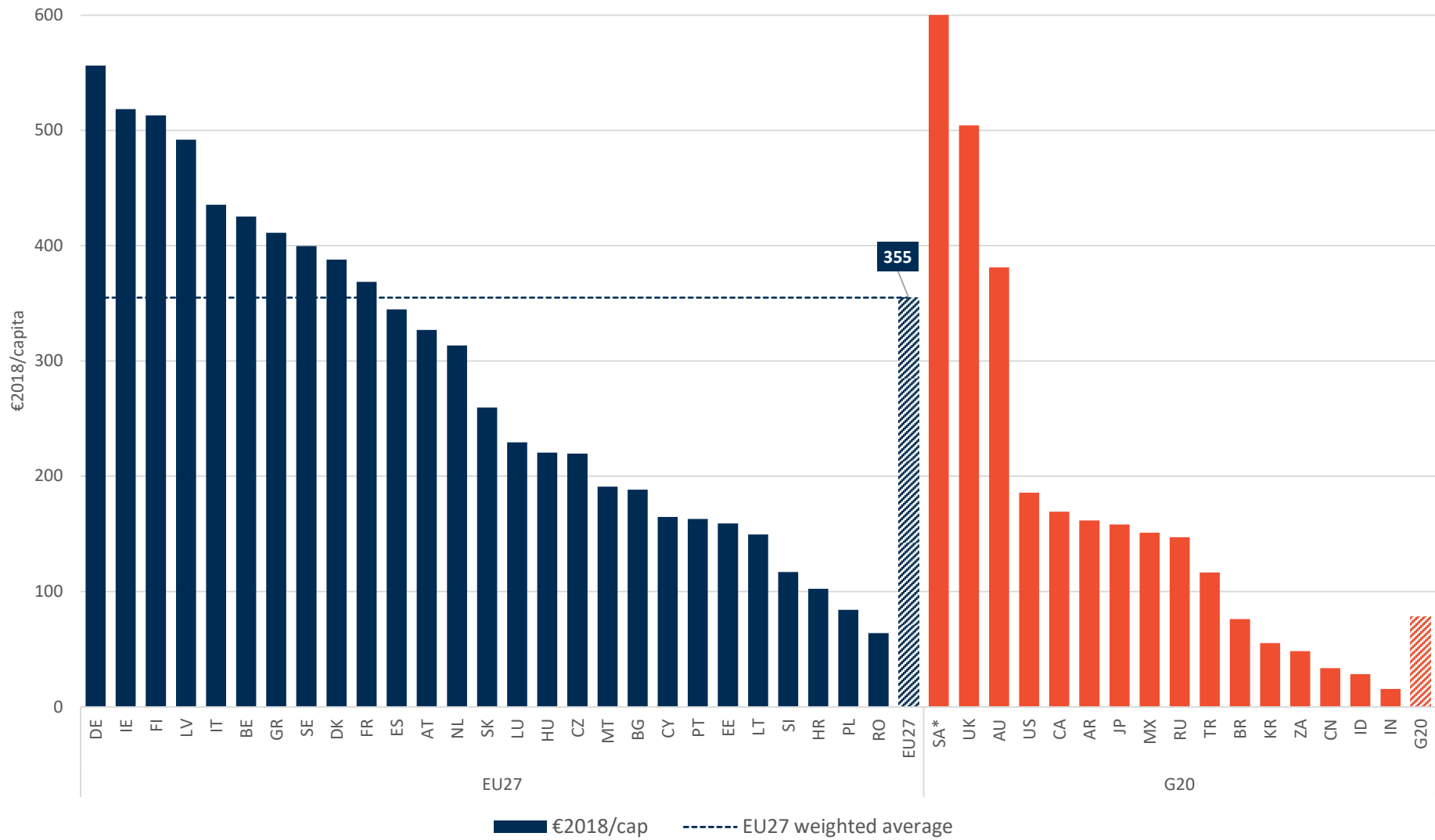
Figure 3-1 Energy subsidies in the EU27 by country (€2018bn, 2008-2018)



The per capita approach (Figure 3-2) confirms Germany as the largest energy subsidy provider at €556/cap in 2018, followed by Ireland (€518/cap) and Finland (€513/cap). Italy (€435/cap), France (€368/cap) and Spain (€345/cap) rank sixth, tenth and eleventh, respectively. MS like Romania (€64/cap) and Poland (€84/cap) provide respectively nine-fold and seven-fold less energy subsidy per capita than Germany. Overall there tends to be a general scaling of subsidies per capita with income per capita.

Among the non-EU27 G20 countries, Saudi Arabia provides the largest amounts of per capita subsidy with €1,962/cap, followed by the UK (€504/cap) and Australia (€381/cap). The USA and Canada rank fourth and fifth respectively at €186/cap and €169/cap.

Figure 3-2 Per capita energy subsidies in Europe in 2018 (€2018/cap)



*: Per capita energy subsidy in Saudi Arabia is estimated at €1,692.

Annex A - Definitions

Country list

Table A-1 Country abbreviations list (ISO 2-digit codes)

EU27	Code	Non-EU G20	Code
Austria	AT	United Kingdom	UK / GB
Belgium	BE	Argentina	AR
Bulgaria	BG	Australia	AU
Croatia	HR	Brazil	BR
Cyprus	CY	Canada	CA
Czech Republic	CZ	China	CN
Denmark	DK	India	IN
Estonia	EE	Indonesia	ID
Finland	FI	Japan	JP
France	FR	Mexico	MX
Germany	DE	Russia	RU
Greece	EL / GR	Saudi Arabia	SA
Hungary	HU	South Africa	ZA
Ireland	IE	South Korea	KR
Italy	IT	Turkey	TR
Latvia	LV	United States	US
Lithuania	LT		
Luxembourg	LU		
Malta	MT		
Netherlands	NL		
Poland	PL		
Portugal	PT		
Romania	RO		
Slovakia	SK		
Slovenia	SI		
Spain	ES		
Sweden	SE		

Definitions of subsidy purpose

Support to energy demand

Provision of financial and/or other preferential mechanisms to increase energy consumption

Support to energy efficiency

Provision of financial and/or other preferential mechanisms to decrease energy consumption

Support to infrastructure

Provision of financial and/or other preferential mechanisms to ensure adequate physical and organisational structures and facilities are in place

Support to production

Provision of financial and/or other preferential mechanisms to increase energy production

Support to R&D

Provision of financial and/or other preferential mechanisms to aid innovation. “R&D comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications”³⁵

Support to industry restructuring

Provision of financial and/or other preferential mechanisms to support social costs of industry restructuring (e.g. aids for coal mine closure)

Definitions of subsidy categories***Direct transfers***

Transfer of tax-exempt assets or funds from a government budget to a body or organisation

Tax expenditures

Alleviation of tax-related expenditure

Under-pricing of goods and services

Provision of goods and/or services at a reduced rate relative to other market players

Income or price support

Transfer of financial support through government-mandated schemes or regulations

Definitions of subsidy instruments***Accelerated depreciation***

Accelerated depreciation is a measure that can be used to provide a tax advantage to firms, resulting in foregone income to the government. It works by changing the rate at which capital assets can be written off in firm accounts, allowing firms to write off more than would otherwise be allowed in the early years of the asset life.

Accelerated depreciation can act as an important investment incentive, being advantageous in increasing a firm’s book costs and therefore reducing the profits on which tax is payable in the short term. Within an individual investment the nominal total tax liability should be unchanged over the asset life, but there are benefits to the firm of using accelerated depreciation due to time preference, i.e. it is preferable to have money now than in the future, as this can be used to generate interest or other returns in the meantime. It is also advantageous within a wider company portfolio to help reduce taxes paid on other incomes, and can be used to attract investors to a project where accounting rules allow for an investor to ‘buy’ the tax advantage of accelerated depreciation.

Biofuels blending mandate

Any market price support mechanisms for biofuel in the transport sector.

³⁵ IEA Guide to Reporting Energy RD&D Budget/Expenditure Statistics available at <https://iea.blob.core.windows.net/assets/3432ae79-1645-4cf1-a415-faa3588e6f29/RDDManual.pdf>

Capacity payment

Electricity capacity mechanisms have been deployed by MS in order to prevent energy shortages that could affect consumers. Capacity mechanisms are measures that allow energy providers to be paid for maintaining their existing power plants or even for investing in new ones. This is in addition to the normal payment they receive for providing electricity to the market.

Consumer price guarantees (cost support)

Price guarantees (by a public entity: government, regulator, etc.) to a specific group of final customers (e.g. low income households, specific geographic area) for the consumption of energy products (fuels, electricity, heat, etc...) at a certain level, which doesn't fully cover the total cost of the energy provided.

Consumer price guarantees (price regulation)

Price guarantees (by a public entity: government, regulator, etc.) to all final customers for the consumption of energy products (fuels, electricity, heat, etc...) at a certain level, which doesn't fully cover the total cost of the energy provided.

Contract for Difference (CfD)

Power generators receive payments based on variable top-up between the market price and a pre-agreed price (called "strike-price") for electricity produced for the duration of the contract.

Differentiated grid connection charges

New power plants have to pay costs associated with connecting to the grid. "Shallow" costs describe the connection to the next grid connection point. "Deep" costs include the reinforcement of existing grid infrastructure to cope with additional generation capacity. In some cases, governments intervene to reduce or waive these costs for certain technologies.

Differential tax treatment (diesel vs gasoline only)

Differing tax rates between diesel and gasoline for road transport only.

Energy efficiency obligations

In an energy efficiency obligation, an energy supplier (or other entity) is given an obligation by the Government to achieve a certain level of savings (either in energy or in carbon emissions). Often, these obligations include a social element requiring a certain proportion of the savings to be delivered in poorer households.

Feed-in premiums

In a feed-in premium scheme, plant operators have to sell their renewable energy on the market and receive an additional payment on top of the market price - either as a fixed payment or adapted to changing market prices (e.g. with cap and floor prices, sliding premium/Contract for Difference) to limit the price risk for plant operators.

Premium schemes provide a secure additional return for producers, while exposing them to the electricity price risk. The level of premiums is based on future expectations regarding the generation costs of renewable electricity and the average electricity market revenues.

Feed-in tariffs

In a feed-in tariff (FIT) system, power plant operators receive a fixed payment for each unit of electricity, heat and/or biogas generated, independent of the market price of these energy products. In other words, in FIT systems, generators do not sell the produced electricity on the power market, but a single buyer fulfils this role. Most countries use a differentiation according to technology, which facilitates the development of a range of technologies due to the different levels of tariffs they receive. The specific design of the feed-in scheme may differ as well: some countries have a fixed tariff over the complete support term, others have decreasing tariffs.

Grants

Grants are non-repayable funds or products disbursed or gifted by a public entity such as the European Union, governments, ministries, national agencies, etc.

Interruptible load schemes

In several countries, there are interruptible load schemes that provide payment to electricity consumers that agree to be switched off remotely where there is a danger of system black outs. These schemes are implemented additionally to balancing markets. Participants have to meet high standards to take part.

These prequalification standards only apply to energy intensive industries. The payments for capacity are tendered in an auction, but because of the low number of eligible participants, the result of the auction often hits the maximum price limit.

Producer price guarantees (price regulation)

Price guarantees (by a public entity: government, regulator, etc.) to a producer of primary energy (fossil fuels, nuclear) or energy products (fuels, electricity, heat, etc.) at a level above the market price.

RD&D budget

Energy research, development and demonstration (RD&D) budgets cover various types of interventions such as fiscal instruments (e.g. taxes), financial instruments (e.g. loans, grants), market-based mechanisms, direct investment (e.g. public procurement), education and information campaigns, or technology replacement programmes.³⁶

RES quotas with tradable certificates

In case of quota obligation schemes, governments impose minimum shares of a particular energy source on suppliers (or consumers and producers). Quota obligations are frequently combined with tradable green certificates. Plant operators receive certificates for their electricity, heat and biogas, which they may sell to the actors obliged to fulfil their quota obligation. Hence, green certificates provide support in addition to the market price and are used as proof of compliance. A green certificate represents the value of the energy and facilitates trade in that value.

Some countries apply what is called technology banding: distributing different amounts of certificates according to the cost of a particular technology. This is to avoid that only the cheaper energy options

³⁶ For more detail, see <https://www.iea.org/reports/energy-technology-rdd-budgets-2020#data-service-and-documentation>

are deployed. There are also examples of governments that apply minimum/‘floor’ prices and sometimes prices are capped by the government.

Soft loans

A loan or debt is the amount of money that is provided to a project by a third party under the condition that this will be (entirely or partially) repaid during or at the end of the agreed debt term. Loan facilities can be very helpful in case the availability of capital is a problem. Loans can cover up to 100% of the financeable cost and are used for both renewable energy and energy saving projects. Interest rates and repayment periods of loans have a major impact on the overall cost of projects. Especially new technologies, smaller projects or project developers without a proven track record often experience difficulties in obtaining commercial loans at reasonable conditions. Governments can increase commercial viability of projects significantly by offering low interest loans or loan guarantees.

Governments can offer low interest loans for specific technologies directly through state-owned banks or through subsidies to commercial banks. These loans can be characterised by lower interest rates and/or longer repayment periods. Low interest loans have been applied successfully in for example Spain and Germany. Governments can also offer just loan guarantees for certain projects. In that case the government guarantees debt repayment to the lending bank, thus reducing risk and hence interest rate (e.g. 1 to 2%), debt term and debt service conditions of the loan.

Tax allowances

Tax allowances (which can also be described as deductions, reliefs and exemptions) reduce the amount of income that is taxable. It refers to the amount of money which a taxpayer is allowed to earn and not pay tax on (taxable income), as a result of carrying out activities (in particular R&D). These are typically expressed in the form of a, for example, 150% allowance, which allows for a firm to deduct an additional 50% on top of the actual expenditure.

Tax credits

Tax credits are applied to the actual amount of tax owed/payable. It is typically based on a percentage of eligible R&D expenditures.

Tax exemption

Removal of obligation to pay a specific tax (e.g. custom duty exemption, temporary tax exemption).

Tax reduction

A lower rate of tax than the standard rate (e.g. reduced rate, tax rebate, tax deduction, royalty relief, partial exemption, reduced custom duty rate).

Tax refund

A partial or full reimbursement of taxes paid (e.g. duty repayment, tax reimbursement, compensation for an increased tax).

Others

Interventions in this category do not fit with any other pre-existing categories, but do relate to investments. Examples of public interventions that fall in this category are loan guarantees, planning exemptions, exemptions from stamp duties, etc.

Definitions of source of financing

Government / Public bodies

Subsidy funded on the government / public bodies budgets, i.e. spending money collected from citizens (taxpayer).

Endusers

Subsidy funded by fees applied on the consumption of energy products / services by final consumers. This can be considered as cross-subsidy. Also called end-users, final consumers.

Operators

Subsidy funded by fees applied on the production of primary energy sources, energy products / services by final consumers. This can be considered as cross-subsidy.

Definitions of economic sectors

Energy sector

Energy sector including activities or assets linked to fossil fuels extraction; exploration and production (E&P); cultivating energy crops for energy purpose; refineries; regasification and liquefaction LNG terminals; combined heat & power (CHP) / cogeneration; power plants; heat generation plants; district heating plants; conventional and advanced technologies to produce liquid biofuels; plants producing biogas using thermal processes and anaerobic digestion technologies; hydrogen production technologies and facilities; oil, gas, electricity, heating & cooling transmission and distribution networks and storage sites; decommissioning of energy assets (e.g. power plants, oil & gas pipelines); waste storage management site; retail assets.

Agriculture

Agriculture, including crop and animal production, hunting and related service activities, forestry and logging, fishing and aquaculture.

Industry

Industry sector as a whole.

Energy-intensive industry

All the industries as defined in the Energy Taxation Directive of 2003 under the terms of “energy-intensive business”³⁷. Subsidies to EII reported in this inventory are amounts specifically directed to EII or to industries included in the following list: production or processing of coke, metal ore roasting or sintering, pig iron or steel, ferrous metals, primary aluminium, secondary aluminium, non-ferrous metals, cement clinker, lime, dolomite/magnesite, glass, ceramics, mineral wool, gypsum or plasterboard, pulp, paper or cardboard, carbon black, nitric acid, adipic acid, glyoxal and glyoxylic acid, ammonia, bulk chemicals, hydrogen and synthesis gas, soda ash and sodium bicarbonate.

Non energy-intensive industry

By default, all industries not included in the definition of EII.

³⁷ “An ‘energy-intensive business’ shall mean a business entity (...) where either the purchases of energy products and electricity amount to at least 3,0 % of the production value or the national energy tax payable amounts to at least 0,5% of the added value.” Energy Taxation Directive (2003/96/EC), Article 17 1. (a). Available at : <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32003L0096>

Construction

Construction sector, including construction of buildings, civil engineering, specialised construction activities.

Transport

Transport sector as a whole

Air transport

Air transport (also called aviation, flights) for freight, passengers or leisure purposes.

Rail transport

Rail transport (also called train) for freight, passengers or leisure purposes.

Road transport

Road transport (road vehicles such as cars, trucks, motorcycles, taxi...) for freight, passengers or leisure purposes.

Water transport

Water transport (also called shipping, navigation, maritime transport) for freight, passengers or leisure purposes.

Public transport

Subsidy for local scheduled passenger transport by both bus and on rails indistinctly.

Services (tertiary sector)

Services, also called tertiary sector.

Business

The "Business sector" gathers private entities, by opposition to the public sector, households and NGO/associations. This classification is used by default when no further detail on the exact economic sector of the agents receiving the subsidy is available.

Households

Households, also called residential sector.

Low-income households

Subsidy provided to low-income households. Methodology and threshold to define low-income groups vary across country. Data collected correspond to the subsidy amounts in official publications and therefore to the local definition of each country.

Public

Public sector (State government, local governments, public bodies, state agencies...).

Cross sectors

Default classification to be chosen when a subsidy targets all sectors (or no specific one)

Annex B - Main data sources

Multi-country sources: European countries:

- DG Competition State Aid Scoreboard at https://ec.europa.eu/competition/state_aid/studies_reports/studies_reports.html;
- National Energy and Climate Plans (NECPs) https://ec.europa.eu/energy/topics/energy-strategy/national-energy-climate-plans_en;
- ODI fossil fuels inventory in Europe: <https://www.odi.org/publications/10939-phase-out-2020-monitoring-europes-fossil-fuel-subsidies>;
- Odyssee-MURE database for energy efficiency measures: <http://www.measures-odyssee-mure.eu/query-energy-efficiency-policy-household.asp>;
- Council of European Energy Regulators (CEER) Status Review of Renewable Support Schemes in Europe: <https://www.ceer.eu/1519>;
- VAT rates in Europe, including the reduced rates: https://ec.europa.eu/taxation_customs/business/vat_en;
- ODI Phase-out 2020: monitoring Europe's fossil fuel subsidies: <https://www.odi.org/publications/10939-phase-out-2020-monitoring-europes-fossil-fuel-subsidies>;
- Greenpeace EU capacity mechanisms inventory: <https://www.greenpeace.org/eu-unit/issues/climate-energy/1519/exposed-e58-billion-in-hidden-subsidies-for-coal-gas-and-nuclear/>.

Multi-country sources: Non-European countries

- OECD fossil fuels inventory: <http://www.oecd.org/site/tadffss/>;
- The list of VAT rates in OECD countries, including the reduced-rates: <https://www.oecd.org/ctp/consumption/Table-2.A2.1-VAT-GST-Rates-2018.xlsx>;
- IEA policies database: <https://www.iea.org/policies>;
- IEA energy technology RD&D budget database: <https://www.iea.org/reports/energy-technology-rdd-budgets-2020#data-service-and-documentation>;
- IEA Bioenergy Country Reports: <https://www.ieabioenergy.com/iea-publications/country-reports/2018-country-reports/>.

Annex C - Methodology

Defining what is an energy subsidy

Below we discuss how “energy subsidy” is defined in the study. There is currently no universal definition of “energy subsidy” across organisations. Therefore, the scope of public interventions reported depend on the definition adopted by the organisation reporting. However, most organisations, including all countries covered by this study apart from Saudi Arabia (as a non-signatory), define energy subsidies according to concepts set forth by the World Trade Organization (WTO) Agreement on Subsidies and Countervailing Measures (ASCM)³⁸ in 1994:

Article 1: Definition of a Subsidy

1.1 For the purpose of this Agreement, a subsidy shall be deemed to exist if:

(a)(1) **there is a financial contribution by a government or any public body** within the territory of a Member (referred to in this Agreement as “government”), i.e. where:

(i) a government practice involves a **direct transfer of funds** (e.g. grants, loans, and equity infusion), potential direct transfers of funds or liabilities (e.g. loan guarantees);

(ii) **government revenue** that is otherwise due is **foregone or not collected** (e.g. fiscal incentives such as tax credits);

(iii) a government provides goods or services other than general infrastructure, or purchases goods;

(iv) a government makes payments to a funding mechanism, or entrusts or directs a private body to carry out one or more of the type of functions illustrated in (i) to (iii) above which would normally be vested in the government and the practice, in no real sense, differs from practices normally followed by governments;

or

(a)(2) there is any form of **income or price support** in the sense of Article XVI of GATT 1994;

and

(b) a benefit is thereby conferred.

Although this definition is commonly used by institutions to report and measure energy subsidies, it allows room for interpretation. Consequently, organisations quantifying energy subsidies have adapted the definition to their specific needs. The OECD summarises the situation well in one of its publications on the topic: *“In practice, how a country chooses to define a subsidy is more a political decision reflecting domestic political, economic and legal frameworks and traditions. (...) At the international level, a number of organisations have developed definitions which (despite certain differences) largely reflect the essential elements of a subsidy as accepted in economic theory. (...) Over the years, the concept of “subsidy” has significantly evolved.”*³⁹

There are major hurdles to identifying subsidies and acquiring data on subsidies because of these various definitions and interpretations. Efforts were made in 2014 and in 2018 to develop a common definition for the European Union. These efforts resulted in a definition and classification system that partly matched with the WTO framework, but introduced other elements, and additional precision. However, due to the complexity of defining subsidies in economic and legal terms, along with the fact

³⁸ All documents related to WTO Agreement on Subsidies and Countervailing Measures are available at https://www.wto.org/english/tratop_e/scm_e/scm_e.htm

³⁹ OECD, EAP Task Force, Analysing energy subsidies in the countries of eastern Europe, Caucasus and central Asia, 2013. Available at: http://www.oecd.org/env/outreach/energy_subsidies.pdf

that new kind of public interventions have appeared (e.g. payments under electricity capacity mechanisms), further investigation was needed.

Development of a common reporting methodology

To prepare a common reporting method for the EU MS, defining the details and boundaries of each subsidy to ensure homogeneous reporting, we performed a thorough literature review: we concluded that it would be most useful to adjust the classification used in the Energy prices and costs in Europe study of 2018 to align with the WTO definition and classification of energy subsidies. This enables direct comparison with the previous inventory as well as with other studies. Table C-1 summarises the first level of classification developed by recognised institutions covered by our literature review.

Table C-1 Energy subsidy classifications by major international institutions

WTO	IISD	OECD	UNEP - IISD - OECD (May 2019)	Energy Prices & Costs in Europe study (2018)
A government practise involves a direct transfer of funds , potential direct transfers of funds or liabilities.	Direct and indirect transfer of funds and liabilities	Direct transfer of funds Transfer of risk to government (Indirect)	Direct transfer of government funds Transfer of risk to government (Indirect)	Direct transfer
Government revenue that is otherwise due is foregone or not collected	Government revenue forgone	Tax revenue and other government revenue forgone	Tax expenditures, government revenue forgone	Tax expenditure
Government provides goods or services other than general infrastructure, or purchases goods	Provision of government goods or services below market value		Under-pricing of other goods and services	Indirect transfer
Government makes payment to a funding mechanism, or entrusts or directs a private body to carry out the function(s) which would normally be vested in the government and the practise doesn't differ from practises normally followed by governments				
There is any form of income or price support	Income or price support	Induced transfers	Induced transfers (price support)	Indirect transfer
WTO Agreement on Subsidies and Countervailing Measures	IISD "India's Energy Transition: Mapping Subsidies to fossil fuels and clean energy in India" (2017)	OECD "Inventory of Estimated Budgetary Support and Tax Expenditures for Fossil Fuels" (2013)	UNEP - OECD - IISD "Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals" (2019)	European Commission "Energy prices and costs in Europe" (2018)

Based on our literature review, including the above comparison of approaches, we have adopted a classification broken down into four categories, namely direct transfers, tax expenditures, under-pricing of goods/services and income or price supports, that have been broken down into 26 instruments. The table below shows the complete matrix of both subsidy categories and subsidy instruments.

Table C-2 Classification of subsidy category and instruments

Subsidy category	Subsidy instrument
Direct transfers	Soft loans
	Grants
	Others
Tax expenditures	Tax reduction
	Tax exemption
	Tax refund
	Tax credits
	Tax allowance
	Others
Under-pricing of goods/services	Under-pricing of government-owned resources or land
	Under-pricing of government-owned infrastructure
	Under-pricing of other government-provided goods or services
Income or price supports	Capacity payments
	Biofuels blending mandate
	RES quotas with tradable certificates
	Differentiated grid connection charges
	Energy efficiency obligations
	Interruptible load schemes
	Contract for Difference (CfD)
	Feed-in premiums
	Feed-in tariffs
	Consumer price guarantees (cost support)
	Consumer price guarantees (price regulation)
	Producer price guarantees (price regulation)
Others	

Two items are absent from this table. The first one is the free EUA ETS allowances. In spite of being considered tax expenditures in the Energy prices and costs in Europe study of 2018, EU ETS is not a tax. Therefore, in the current study free ETS allowances are not counted in the total amount of subsidies. The second item is the differential tax treatment of diesel and gasoline, which has been excluded from the tax expenditure list to comply with the methodology implemented during the Energy prices and costs in Europe study of 2018.

Beyond the updated classification by category, sub-category and instrument, we also adopted the framework established in the Energy prices and costs in Europe study of 2018, with a few adjustments. The classification used is the following:

- **Purpose of subsidy:** support to energy demand, support to energy efficiency, support to industry restructuring (actions undertaken to facilitate early-closure of potential environmentally harmful activities), support to infrastructure (which mainly cover subsidies in energy networks and storage facilities), support to production, and support to R&D;

- Source of financing: supra-national institutions, government/public bodies; sub-national public bodies (state/region); end-users;
- Economic sector: see Table C-3;
- Energy sources/carriers: see Table C-4.

Table C-3 Classification of economic sectors

Economic sectors	Sub-sectors
Energy sector	Energy sector
	-ENER-Fossil fuel extraction
	-ENER-Energy crops
	-ENER-Conversion
	-ENER-Conversion-Refining
	-ENER-Conversion-LNG
	-ENER-Conversion-CHP
	-ENER-Conversion-Electricity production
	-ENER-Conversion-Heating & Cooling
	-ENER-Conversion-Liquid biofuels
	-ENER-Conversion-Biogas production
	-ENER-Conversion-Hydrogen production
	-ENER-Infrastructure
	-ENER-Infra-Transmission
	-ENER-Infra-Distribution
	-ENER-Infra-T&D
	-ENER-Infra-Storage
-ENER-Assets decommissioning	
-ENER-Waste management	
-ENER-Retail	
Agriculture	Agriculture
	-AGRI-Crop, animal production, hunting
	-AGRI-Forestry and logging
	-AGRI-Fishing and aquaculture
Construction	Construction
Mining	Mining
Industry	Industry
	-INDU-Energy-intensive industry
	-INDU-Non energy intensive-industry
Transport	Transport
	-TRANS-Air transport
	-TRANS-Rail transport
	-TRANS-Road transport
	-TRANS-Water transport
-TRANS-Public transport	
Services (tertiary sector)	Services (tertiary sector)
Business	Business
Households	Households
	-HH-Low income
Public	Public
Cross sectors	Cross sectors
Economic sectors	Sub-sectors

Table C-4 Classification of energy sources/carriers

Main energy sources	Main fuels and carriers	Products and carriers	
All energies	All energies	All energies	
Heat	Heat	Heat	
Electricity	Electricity	Electricity	
Nuclear	Nuclear	Nuclear	
Fossil fuels	FF-All / several	FF-All fossil fuels	
	FF-All / several	FF-Several fossil fuels	
	FF-Coal / Lignite	FF-Coal / Lignite	
	FF-Natural Gas		FF-Natural gas
			FF-Mine gas
			FF-Shale gas
	FF-Oil		FF-Crude oil & NGL
			FF-Oil & Gas
			FF-Petroleum products
			FF-PP-Gasoil
			FF-PP-Blended gasoil
			FF-PP-Gasoline
			FF-PP-Leaded Gasoline
			FF-PP-Unleaded Gasoline
			FF-PP-Blended gasoline
			FF-PP-LPG
			FF-PP-Kerosene
	FF-PP-Fossil-based marine fuels		
	FF-PP-Heavy fuel oil (HFO)		
	FF-Peat	FF-Peat	
Bioenergy	Hydrogen	FF-All fossil fuels	
		RES-Biogas	
	RES-Biomass		RES-Biogas
			RES-Biomass & biogas
			RES-Biomass (solid)
			RES-Biomass MSW
			RES-Liquid biofuels
			RES-Liquid biofuels-Biodiesel
	RES-Liquid biofuels-Bioethanol		
RES	RES-All / several / others	RES-All	
	RES-All / several / others	RES-Several	
	RES-Geothermal	RES-Geothermal	
	RES-Heat	RES-Heat	
	RES-Hydro	RES-Hydro	
	RES-Marine energy	RES-Marine energy	
	RES-Solar	RES-Solar	
	RES-Wind		RES-Wind
			RES-Wind offshore
		RES-Wind onshore	

Negative list

The following types of subsidies/areas we not included in the study:

- **Transport** is restricted to fuel tax reductions/exemptions and domestic transport (i.e. extra-EU27 international transport is not covered). The study does not cover:
 - Reductions/exemptions of distance-based road charges;
 - Reductions/exemptions or inexistence of potential urban road pricing schemes;
 - Reductions/exemptions of infrastructure charges, including rail, ports, airports.
- Financial support related to cost of integration of intermittent RES is addressed in Task 4;
- Government ownership (of all or a significant part) in energy companies;
- Government equity infusions in private firms.

Annex D - Data collection and control

Data collection

The European Commission, through two successive studies called “energy prices and costs in the EU”, created an inventory of energy subsidies (2014) that was extended (to agriculture and transport sectors) and improved in 2018. As part of this current study, our consortium has updated, expanded and further improved the previous inventories on energy subsidies by covering additional years (up to 2017, 2018), completing some missing information, and widening the geographical scope to non-EU G20 countries, while dedicating particular attention to fossil fuel and energy efficiency subsidies.

Data main features

The database structure complies with the respective definitions, classifications and boundaries of energy subsidies defined in Annex A. It also ensures the comparability of the inventory with the previous versions of the database (e.g. 2014, 2018) to analyse potential deviations from earlier findings. Country by country major changes in the inventory compared to previous version is addresses in Annex E - Country data controls and observations.

Annual data on subsidies collected on are both provided monetary amounts (in constant euros 2018) and energy volumes (when available).

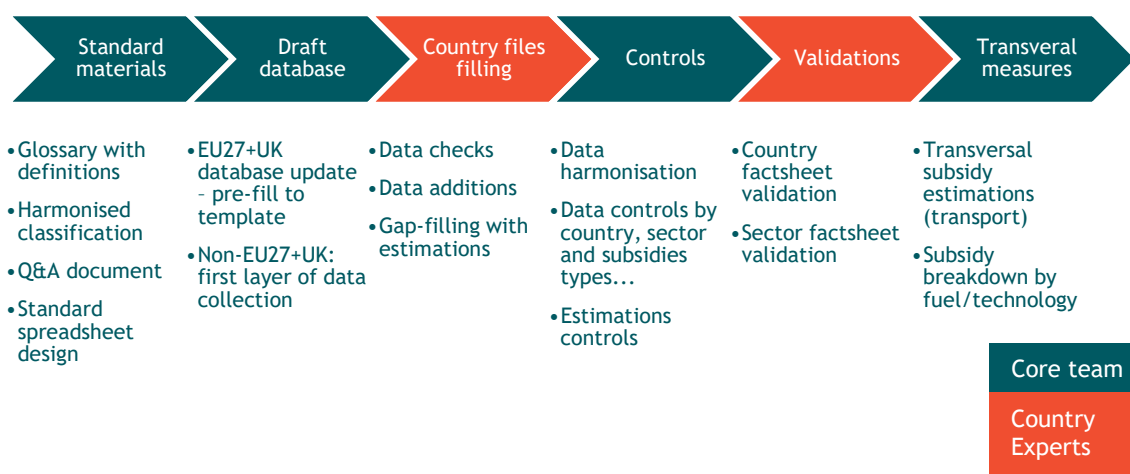
Data from country experts have been mainly sourced from official publicly available documents such as governments’ annual budget / finance law, government’s tax expenditure reports, MS statistics offices reports, MS Court of Auditor’s reports, ministries’ reports and reports from other public institutions such as energy regulators, energy agencies, government housing agencies, etc. In some cases, country experts or the core team have estimated missing data that were not reported, using transversal sources (Eurostat, OECD, CIRCABC-TAXUD...) or a combination of national sources.

Data has been collected at state-level, except for Belgium that has also provided data for the three regions that compose the country.

Data collection process

The data collection process includes six steps.

Figure D-1 Data collection process



The **first step** was carried out by the core team and included exhaustive guidelines that have been shared with country experts. The core team took the existing 2018 energy subsidies inventory as a starting point and adjusted the structure of the database to comply with the classification previously agreed with the EC.

The **second step**, carried out by the core-team, had consisted to gather and assemble data from several transversal sources to pre-populate country expert templates.

The **third step** was accomplished by country experts that have checked, updated and completed the pre-populated template. In the case of missing information, country experts have provided estimations. The **fourth step**, performed by the core-team, aimed at controlling and harmonising data received from country experts. More details on the data control process is provided below (see section Data control).

The **fifth step** requires country experts to validate any updates made by the core team.

The **sixth step** corresponds to additional transversal interventions that were estimated by the core-team and added to the global database. For example, some forms of tax expenditures are not reported in all governmental budgets or financial laws (e.g.: the tax expenditures on domestic fuel consumption in maritime and air transport corresponding to the zero-rate excise tax). The methodology to estimate these subsidies was agreed with the EC (similar to the previous Energy Prices and Costs 2018 study).

In addition to these estimates, when applicable and relevant, the core team has broken down the amounts of subsidies by energy sources/carriers and/or by economic sectors based on official countries' energy balances.

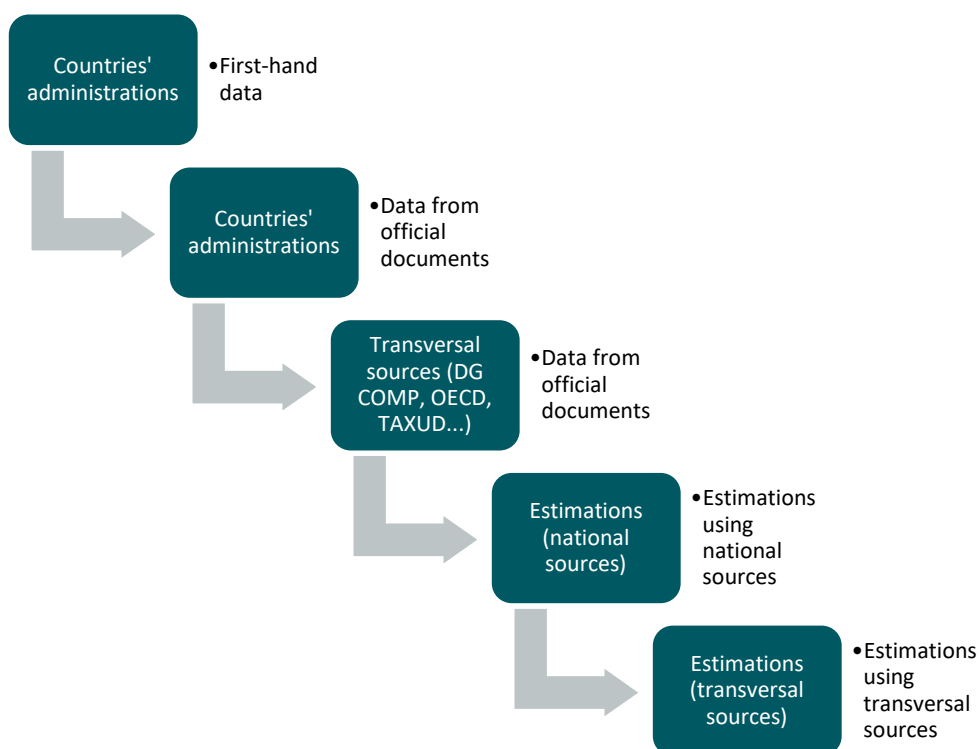
Data hierarchy

A default data hierarchy which has been established to collect and assemble the data. It was organised as follows:

1. Data taken from official documents (from ministries, government agencies, energy regulators, statistical offices, Court of Auditors...) have been preferred over estimations.

- a. Several Ministries of Finance have provided first-hand information. In this case, these data have been used as the preferred data;
 - b. Amounts collected in official documents (from ministries, government agencies, energy regulators, statistical offices, Court of Auditors...) from national sources have been preferred over amounts from transversal sources;
 - c. When no official data were available, data from official transversal sources (OECD, DG COMP State Aid Cases database, MURE....) have been preferred to country experts' estimations.
2. When official data were not available, country experts and the core team have performed estimations:
- a. Estimations performed by country experts have used national statistics (for energy data) and national data from fiscal/custom/ministry administration;
 - b. When national data were not available for estimations, we have used transversal sources (i.e. Eurostat for energy data, CIRCABC and TAXUD data for fiscal data).

Figure D-2 Data hierarchy chart



Data control

Given the nature of the data collected, which was not well structured nor well transparent across countries, a key issue was to find means of controls to ensure the comparability of the data across countries to perform consistent and relevant analysis. To achieve good data quality, we have therefore implemented several layers of controls through benchmarking with existing external databases.

OECD fossil fuel subsidies database

The OECD has developed a large database on fossil fuel subsidies⁴⁰ that is fed directly by its members and some guest countries. The database provides several types of subsidies that are gathered in two main categories, namely budgetary support and tax expenditures. Therefore, this database has been used as an essential benchmark for our inventory.

Table D-3 OECD FFS database and current inventory comparison for the EU27 in 2016 (current million euros)

OECD database	Consortium inventory	Difference (€m)	Difference (%)
36,739	44,303	+7,564	21%

The table aboveshow that our inventory is providing a satisfactory level of FFS although it is to be noticed that the scope of both inventories differs: the OECD comprises all subsidies reported by the countries, of which certain are not included in our inventory such as the differential tax between diesel and gasoline; conversely, our inventory includes subsidies received in the form of FiT and FiP for electricity produced from CHP burning fossil fuels. Therefore, the above comparison of FFS is to be taken with caution.

A significant improvement of the current inventory compared to the previous versions is that the OECD database has only been used as a benchmark for this study, while it was previously used directly to feed our inventory. This enables three main improvements of our inventory: providing subsidy titles in national languages to increase transparency, feed the data from national sources only, and enable a direct comparison between both databases. 457 subsidies included in our inventory have OECD references.

MURE database (focused on energy efficiency)

The Odyssee-MURE database is an EC-funded project running since 1995 that gathers information on energy efficiency issues in the EU, including the MURE⁴¹ database that offers information on various policies and instruments implemented by each MS. The database does not provide systematically amounts of subsidies for each policy deployed. However, we have used the MURE database to ensure that our inventory includes all the policies compiled in the MURE database⁴². As for the OECD database, our inventory enables direct comparison between both databases. 181 subsidies included in our inventory have MURE references.

DG COMP State Aid Cases database

DG COMP provides aggregated information on the State Aid amounts disbursed by MS through its State Aid Scoreboard⁴³. Direct comparison between data in the State Aid scoreboard and our inventory is not straightforward because the classification differs significantly from the scope our inventory. However, for illustrative purposes we present below the amounts of State Aids classified under “Environmental protection including energy savings” (OBJ02).

⁴⁰ Available at: <http://www.oecd.org/fossil-fuels/data/>

⁴¹ Available at: <http://www.measures-odyssee-mure.eu/query-energy-efficiency-policy-household.asp>

⁴² For a few countries, few policies couldn't be monetised, therefore they have not been included in our inventory.

⁴³ Available at: https://ec.europa.eu/competition/state_aid/scoreboard/index_en.html

Table D-4 DG COMP State Aid Scoreboard “Environmental protection including energy savings” (current million euros)

State Aid scoreboard Obj-02	Consortium inventory (total energy subsidies)	Difference (€m)	Difference (%)
63,669	159,373	+95,704	250%

DG COMP also provides online the State Aid Cases⁴⁴ database that allows to perform refined search queries that have been extensively used to a) check the data and amounts collected by country experts; b) better understand the purpose, scope and application of certain subsidies thanks to detailed explanations provided in each State Aid case (in English and in local language); and, c) feed our inventory as this tool assembles in one single place a lot of information that was directly useful for our study, especially for newly implemented subsidies/State Aid Cases (e.g. government grants for compensation of indirect EU ETS costs). As for the OECD and MURE database, when possible, our inventory includes direct references to each State Aid Case (through the State Aid number) to facilitate comparison and link between both tools. 319 subsidies included in our inventory have State Aid Cases references.

CEER data on RES electricity support expenditure

The Council of European Energy Regulators (CEER) publishes every other year a report called Status Review of Renewable Support Schemes in Europe⁴⁵ that includes, among other things, the RES electricity support expenditure in millions of euros. We have used this report to compare the amounts we have inventoried with that provided by CEER. The table below shows a summary and a comparison of both databases for the EU27 in 2016 (last available amounts provided by CEER).

Table D-5 RES electricity support expenditure 2016 (current million euros)

CEER data	Consortium inventory	Difference (€m)	Difference (%)
53,110	66,041	+12,931	24%

We have also used the CEER reports to identify countries providing partial or full exemptions to certain electricity customers from contributing to the financing of RES support policies (i.e. exemptions and reductions of RES non-tax levies).

National Energy and Climate Plans (NECPs)

At the time of data collection by the experts, which occurred between September and December 2019, final NECPs had not yet been released. Therefore, these documents that must include a “Description of energy subsidies, including for fossil fuels” couldn’t be used as reference since only a few draft NECPs provided amounts of subsidies.

During the data control period (between November 2019 and March 2020), the core team has reviewed and compared the list of subsidies and their respective amounts for final NECPs that were already made available on the EC’s website⁴⁶. Comparisons have been established for each MS having released its NECP by the end of March 2020. The comparison and comments are included in Annex E.

⁴⁴ Available at: <https://ec.europa.eu/competition/elojade/isef/index.cfm>

⁴⁵ Available at: <https://www.ceer.eu/1519>

⁴⁶ Final NECPs are available at: https://ec.europa.eu/info/energy-climate-change-environment/overall-targets/national-energy-and-climate-plans-ncpcs_en

Interactions with MSs' administrations

Several MS have provided first-hand data, mainly on tax expenditures through their Ministry of Finance⁴⁷, or have controlled and validated the inventory built by country expert thanks to their delegation in Brussels⁴⁸. The implication of such institutions doesn't ensure that our inventory is fully exhaustive, but it is a first step to ensure the quality of the data collected for these countries and, by means of comparison, that of other MS.

Greenpeace EU capacity mechanisms inventory

To identify countries providing payments through electricity capacity mechanism schemes and to benchmark the data our country expert had assembled we have used information provided by Greenpeace⁴⁹.

Subsidy amount allocations

Allocation of multi-sector and multi-energy subsidies

In line with the methodology used in the Energy prices and costs in Europe study of 2018, when relevant and feasible, we have allocated the amounts related to multi-sectors and multi-energy subsidies based on countries' energy balances. See below two examples of allocation:

Multi-energy subsidy

Feed-in tariffs for electricity production from CHP burning fossil fuels has been allocated according to the share of each fossil fuels within the power generation mix from cogeneration.

Multi-sector subsidy

The subsidy amounts corresponding to the tax reduction on marked diesel (off-road consumption) are usually reported as whole. Therefore, we have broken down the subsidy amounts between the various consuming sectors of off-road diesel.

Allocation of subsidies according to instruments

In addition to multi-sectors and multi-energy subsidies, we have used the following management rules to allocate the subsidy amounts to technologies and economic sectors according to their nature. By default, we have applied the following rules to allocate the subsidy amounts:

1. Feed-in tariffs, premiums and renewable obligations are "Support to production" and allocated to the energy sector;
2. Subsidies for CHP are allocated to electricity, assuming that the economic value of electricity is higher than the heat;
3. Production of biogas is allocated to the energy sector, assuming that most of the producers belong to the energy sector;
4. Costs related to energy saving obligation schemes have been allocated to the energy sector (sub-sector: -ENER-Retail);
5. Capacity mechanisms: in some cases, the allocation to specific fuel has not been possible. Therefore, the amounts have been allocated to "Electricity";

⁴⁷ Belgium, Czech Republic, Croatia, Estonia, Hungary, Latvia, Slovakia, Slovenia; Denmark provided such data during the last edition of the inventory.

⁴⁸ France

⁴⁹ Available at: <https://www.greenpeace.org/eu-unit/issues/climate-energy/1519/exposed-e58-billion-in-hidden-subsidies-for-coal-gas-and-nuclear/>

6. Amounts of energy efficiency subsidies are generally allocated to all energy sources, unless the measures target a specific energy source/carrier;
7. When the amounts of subsidies for EE & RES (mainly grants) cannot be broken down in two categories, the amounts are allocated to “support to energy efficiency” assuming that investments in RES contribute to energy efficiency improvements.
 - a. All subsidies supporting the development of charging infrastructures for EV have been allocated to “-ENER-Infra-Distribution”.

Subsidies estimations across countries

Two cross-country tax expenditure interventions have been subject to in-house estimates for consistency and comparison purposes.

Tax expenditure on fuel consumption in maritime and air transport

The Energy Tax Directive (ETD)⁵⁰ states that “*Existing international obligations and the maintaining of the competitive position of Community companies make it advisable to continue the exemptions of energy products supplied for air navigation and sea navigation, other than for private pleasure purposes, while it should be possible for Member States to limit these exemptions*”.

The Energy prices and costs in Europe study of 2018 revealed that MSs’ own methodologies used to calculate these tax expenditures were significantly heterogeneous. Therefore, it was decided to carry out an estimation of each MS tax expenditure using a common standardized approach. This consisted of combining the fuel sold for consumption for domestic traffic (available in the energy balances of Eurostat for domestic aviation and inland navigation) with the excise duty rates for kerosene/fuel oil/diesel by MS for the respective year (available in the EC TAXUD database⁵¹). In compliance with the previous study, we have monetised the subsidy in-house for each country using the following calculation:

Air transport tax expenditure = kerosene consumption for domestic aviation in €/1,000 litres x countries’ standard excise tax rate for kerosene in €/1,000 litres

Water transport tax expenditure in € = gasoline, diesel and fuel oil consumption for domestic navigation in toe x countries’ standard excise tax rates for gasoline, diesel and fuel oil in €/toe

Tax expenditure on fuel consumption in air transport for intra-EU27 flights

As for estimating the tax expenditure on MS domestic flights, we have also estimated the tax expenditures corresponding to non-domestic intra-EU27 flights. The estimation has been carried out using energy consumption data derived from the EU ETS verified emissions figures⁵² complemented with from Eurostat. Under the EU ETS, emissions data are collected from aircraft operators and allocated to the countries that issued their operating licence. This reporting method implies inconsistencies with Eurostat data, i.e. for some countries the energy consumption for intra-EU27 flights were higher than

⁵⁰ Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity, OJ L 283, 31.10.2003. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32003L0096>

⁵¹ Taxation and Customs Union, “Taxes in Europe” database (TEDB). Available at: https://ec.europa.eu/taxation_customs/taxes-europe-database-tedb_en

⁵² Data available at <https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1>

the energy consumption for total international flights. Consequently, the estimation has been performed for the EU27 as a whole. Tax expenditures have been estimated for four different tax rates corresponding to the EU27 MS median, the simple average, the highest rate and the threshold rate of the ETD 2003.

The tax expenditure data covering the non-domestic intra-EU27 flights have not been incorporated into the subsidy inventory, thus are not included in the total subsidy amounts quoted in this report.

Other financial support estimations

Free EUA ETS

During the EU-ETS Phases I and II (2005-2012), stationary installations (manufacturing industries and the power sector) were allocated free emission allowances (note that one allowance is the right to emit one tonne of CO₂ equivalent). During Phase I, almost all allowances were given to businesses for free. Over Phase II, the proportion of free allocation fell slightly to around 90%. Since the beginning of Phase III (2013-2020), the power sector no longer receives free allowances (with the exception of free allowances under condition of investments for the modernisation of the power sector in eight MS⁵³) and only part of the manufacturing industries benefits from this intervention⁵⁴.

Since Phase III, the intra-European Economic Area (EEA) air flights are also included in the system although 85% of the allowances are granted for free to aircraft operators⁵⁵. In both cases, stationary installations and aviation, country experts have not reported this intervention⁵⁶. Consequently, we have monetised the subsidy in-house for each country using the following calculation:

$$\text{EUA ETS support in €} = \sum \text{tCO}_2 \text{ of free allowances/year} \times \text{EUA average annual prices in €/tCO}_2.$$

In order to provide a more detailed analysis than in the Energy prices and costs in Europe study of 2018, the free allowances have been broken down into 5 sectors (while it was only divided in two categories, namely Aviation & Stationary installations in the previous inventory):

- Aviation (10 Aviation);
- Power plants (20 Combustion of fuels);
- Refineries (21 Refining of mineral oil);
- Energy-intensive industries (codes 22 to 44):
 - 22 Production of coke;
 - 23 Metal ore roasting or sintering;
 - 24 Production of pig iron or steel;
 - 25 Production or processing of ferrous metals;

⁵³ Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Poland and Romania, see https://ec.europa.eu/clima/policies/ets/allowances/electricity_en

⁵⁴ European Commission, Climate action. Available at/ https://ec.europa.eu/clima/policies/ets/allowances_en

⁵⁵ The legislation, was designed to apply to emissions from flights from, to and within the European Economic Area (EEA). The EU, however, decided to limit the scope of the EU ETS to flights within the EEA until 2016 to support the development of a global measure by the International Civil Aviation Organization (ICAO). In light of the adoption of a Resolution by the 2016 ICAO Assembly on the so-called CORSIA global measure, the EU has decided to maintain the geographic scope of the EU ETS limited to intra-EEA flights from 2017 onwards. The EU ETS for aviation will be subject to a new review, that should consider how to implement the global measure in Union law through a revision of the EU ETS legislation. In the absence of a new amendment, the EU ETS would revert back to its original full scope from 2024. See https://ec.europa.eu/clima/policies/transport/aviation_en

⁵⁶ Some MS have implemented schemes to compensate the indirect cost of the EU ETS to support their manufacturing industries to prevent from a risk of carbon leakage in the context of global competition. These subsidies inventoried in the database come in addition to the monetisation of the free allowances carried out by the core team.

- 26 Production of primary aluminium;
- 27 Production of secondary aluminium;
- 28 Production or processing of non-ferrous metals;
- 29 Production of cement clinker;
- 30 Production of lime, or calcination of dolomite/magnesite;
- 31 Manufacture of glass;
- 32 Manufacture of ceramics;
- 33 Manufacture of mineral wool;
- 34 Production or processing of gypsum or plasterboard;
- 35 Production of pulp;
- 36 Production of paper or cardboard;
- 37 Production of carbon black;
- 38 Production of nitric acid;
- 39 Production of adipic acid;
- 40 Production of glyoxal and glyoxylic acid;
- 41 Production of ammonia;
- 42 Production of bulk chemicals;
- 43 Production of hydrogen and synthesis gas;
- 44 Production of soda ash and sodium bicarbonate.
- Others (codes 45, 46 and 99):
 - 45 Capture of greenhouse gases under Directive 2009/31/EC;
 - 46 Transport of greenhouse gases under Directive 2009/31/EC;
 - 99 Other activity opted-in under Art. 24.

Annex E - Country data controls and observations

EU27

Austria:

Alignment with OECD

Alignment with OECD FFS inventory is ensured

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

No subsidy amount is provided in both the Draft and Final NECP.

Situation vs previous inventory

Energy tax refund: in the previous inventory, the breakdown by energy sources was based on that of the OECD, while for the current inventory that amounts have been taken from documents from the ministry of finance. Therefore, we have kept 25% of the amounts to electricity (ratio proposed by the OECD) and remaining amounts gather under “All-fossil fuels”.

Exemption from mineral oil tax for kerosene and Exemption from mineral oil tax on inland waterway transport: these subsidies have been deleted from the current inventory (included in 2018, €380m and €50m in 2016, respectively) because they are double counted with the subsidies fuel exemption on internal flights and internal navigation (estimated by the core team, and wrongly not withdrawn from of the previous inventory).

Tax exemption of biogenic fuels in pure form and as blending in petrol and diesel: the subsidy was previously reported as Petroleum product. It is now classified as Liquid biofuels; i.e. bioenergy/RES (€340m in 2016).

The subsidy called “Provincial support for housing, construction, energy and environment (covering refurbishment of buildings)” has been added (€490m in 2018)
Few other additions, including FiTs for new technologies.

General observation

Austria reports diesel-gasoline tax difference (EUR725m in 2018)

Expert also reported “Commuting allowance” (not included in the report because out of scope) but amount around EUR600m/year.

Belgium:

Alignment with OECD

Alignment with the OECD FFS inventory is ensured, except for one subsidy called “BEL_DT_04: Flat rate reductions for heating generated by natural gas or electricity” (€6.5m/year between 2009 and 2012). This subsidy wasn't found in national publications.

An additional discrepancy has been recorded for the subsidy called “OECD - BEL_TE_04: Fuel Tax Exemptions for Agriculture”. See explanation below.

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

No subsidy amount is reported in the Final NECP (in French). Therefore, no comparison is possible.

Situation vs previous inventory

The two following subsidies (inventoried in the OECD) called “**Reduced energy excise duty for industrial/commercial use of motor fuel**” (€86-232m/year) and “**Reduced energy excise duty for industrial/commercial use**” (€26-161m/year, reported as “OECD - BEL_TE_04: Fuel Tax Exemptions for Agriculture” in the OECD inventory) have been deleted because no track of such subsidy has been found in national publications.

The subsidies called “**Support for heat pumps**” (€0.1m/year) and “**Support for thermal solar + PV**” (€0.2-0.4m/year) in the previous inventory have been deleted because they have been included/replaced by the subsidy called “**Subsidy for energy efficiency investments of households**”.

The subsidy called “**Support for geothermal energy**” (<€0.1m/year) in the previous inventory have been deleted because they have been included/replaced by the subsidy called “**Subsidy for energy efficiency investments of non-residential buildings**”.

The subsidy called “**Tax rebate for energy saving investments in residential buildings**” (<€0.1m/year) in the previous inventory have been deleted because they have been included/replaced by the subsidy called “**Subsidy for energy efficiency investments of non-residential buildings**”.

The subsidy called “**Reduced energy excise duty for heating**” (€1-40m/year) in the previous inventory have been deleted because they have been included/replaced by the subsidy called “**Reduced energy excise duty for kerosene used as propellant in the industry and commercial sectors**”.

The subsidy called “**Lump sum heating grant**” has been deleted because it was a double count.

General observation

Data are spread among many institutions because of the institutional organisations of the country (federal and regional levels).

The main tax expenditure report

(https://finances.belgium.be/fr/statistiques_et_analyses/chiffres/inventaire_depenses_fiscales_federales) at federal level has not yet been published when we are writing this note. Consequently, figures for 2018 may vary a change when the new report is published.

Bulgaria:**Alignment with OECD**

Bulgaria is not covered by the OECD FFS inventory. Therefore, no comparison is possible.

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

No subsidy amount is provided in both the Draft and Final NECP.

Situation vs previous inventory

No major change compared to the previous inventory

General observation

Access to information is difficult and not organised in user-friendly manner, except for the annual tax expenditure report.

Croatia:**Alignment with OECD**

Not included in the OECD FFS inventory

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

NECP list several subsidies without providing amount. The subsidies listed in the NECP are all included in the inventory, but no possibility to compare the amounts.

Situation vs previous inventory

Several subsidies have been added with data from July 2013. Comments from the experts: "Following Croatia accession to the EU, Croatia introduced excise duties on electricity and gas. Some sectors / usages were exempted, and these are the values provided. In the Act on Excise duties, excise duties on electricity and gas were 0 prior to July 2013."

Czechia:**Alignment with OECD**

Alignment with OECD FFS inventory is ensured

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

No subsidy amount is provided in both the Draft and Final NECP.

Situation vs previous inventory

See below comments and feedbacks from the country expert on two subsidies:

Exempted, then reduced excise duty on vegetal oils and FAME (fatty acid methyl ester): from 2010 to 2014 biofuels were fully exempted, this is why subsidy was much higher than in 2016-2018.

The Green Savings Programme C - generation of RES: negative amounts mean that returned financial support exceeded given financial support at respective year.

General observation

Our country expert is contesting the fact the subsidy called “**Management of all the radioactive waste repositories**” is a subsidy because it is financed via charges paid by polluters. However, we consider this as subsidy since a special tax is financing specifically one single energy (as the RES non-tax levies are implemented for the RES technologies).

Cyprus:

Alignment with OECD

Not included in the OECD FFS inventory

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

Support for RES technologies mix several types of instruments. Amounts reported in our inventory are aligned with those of the Final NECP.

No amount is reported on fossil fuel subsidies in the NECP. Therefore, no comparison is possible.

Situation vs previous inventory

“**Derogation under article 10c of the EU Emission Trading Directive (Directive 2003/87/EC as amended by Directive 2009/29/EC)- Allocation of free allowances in the electricity sector under the trading scheme for greenhouse gas emissions after 2012**” (€38m in 2016): this subsidy has been deleted from the previous inventory because it was a double counting with estimation of freely allocated EUA carried out for all the MS.

Several additions, mainly energy efficiency/savings subsidies (from MURE).

General observation

Almost no data available. Very difficult to access data. As far as we know, the country doesn’t publish tax expenditure report, therefore it is not possible to track such subsidy in the energy sector.

Denmark:

Alignment with OECD

Alignment with OECD inventory is ensured, except the one called “**Reduced Energy Duty for CHP Generation**”. See hereafter explanations from:

- our expert: *“To our knowledge, an estimate of the value of the reduced energy duties does not exist. We have spoken to a couple of experts on the subject, and their message is that building an estimate of the value of these reduced tax rates on energy sources would be unfeasible. This is due to the fact that the reduction in subsidies varies between plants/companies based on their input energy mix for the year, output energy mix for the year, and changes in production capabilities. The companies report their tax obligations e.g. the payable taxes, but not tax savings. We have not been able to identify any public source*

for the companies reporting. As we do not know the background of the OECD estimates, we feel reluctant to “self-report” these, as we cannot verify them”;

- The OECD: Since 2015, the Ministry of Taxation has decided not to regard this measure as tax expenditure anymore. Hence, estimates of revenue foregone will not be recalculated in the future. When heat and power are generated in combined production (CHP) there is no physical law that determines the split between fuel used for heat and fuel used for power. The Reduced Energy Duty for CHP Generation is a way to determine the tax base for fuels used for heat production in CHP production. The Danish Ministry of Taxation does not consider this a subsidy for fossil fuels. With a different determination of the tax-fuel-base, heat produced in CHP generation could have been less competitive against individual oil or gas-powered heating.

Alignment with MURE

Alignment with OECD inventory is ensured (only 1 measure reported in MURE, with no amount).

Alignment with NECP

The list of subsidies mentioned in the final NECP corresponds to the list that Enerdata agreed upon with the Ministry of Finance as part of the Energy Prices and Costs 2018 study. The NECP also makes direct mention of the study for FFS.

Situation vs previous inventory

Energy tax exemption for agriculture and EII was estimated during the last inventory based on total amount of tax expenditure for both sectors in 2017⁵⁷ and energy balances. Two issues have been detected and fixed in this inventory: a) the respective shares of the two sectors were reversed (therefore, EII are now representing the larger share, while it was the opposite in the last version); b) based on the OECD inventory, this tax expenditure has decreased significantly in 2015 (from DKK5.7bn in 2014 to DKK1.1bn in 2015). Since no historical amount is available national sources, we have updated the amounts based on the evolution of the OECD amounts, using the same (and now correct) breakdown between agriculture and EIUs as agreed with the national administration (Ministry of Taxation, SKM) as part of the Energy Prices and Costs 2018 study. Eventually, compared to the previous inventory, this result in a significant overall tax expenditure cut (as from 2015) as well as lower amounts for agriculture and higher amounts for EII.

General observation

Reduction of RES non-tax levy for EII from 2011 to 2014 has not been inventory because information is not available.

The Ministry of finance reports the tax expenditure corresponding to the **tax difference between diesel and gasoline** for trucks, buses and tractors only (DKK 1,400m in 2018; €190m).

Estonia:

Alignment with OECD

Alignment with OECD FFS inventory is ensured.

⁵⁷ The Danish administration sent us their tax expenditure estimates on 27 June 2018, only few days before the final version of the previous project.

Alignment with MURE

Alignment with MURE database is ensured.

Alignment with NECP

The list of subsidies mentioned in the final NECP correspond to the list of the OECD inventory. Therefore, our inventory match with the list included in the NECP.

Situation vs previous inventory

Few changes compared to the last version of the subsidy inventory, except few new subsidies that have been added. The overall amounts are very low.

General observation

The amounts of tax expenditures have been provided by staff of the Ministry of Finance. This explain some discrepancies with tax expenditure reports available online. The amounts provided by the Ministry of Finance is in line with the data provided to the OECD inventory.

Many subsidies are financed by international funds.

Germany:**Alignment with OECD**

Alignment with OECD FFS inventory is ensured

Alignment with MURE

Alignment with MURE inventory to be is ensured

Alignment with NECP

The final NECP provides a list of FFS. Amounts reported in the inventory are in line with those reported in the Final NECP. Among other things, our inventory also provides the level of support for FiT for CHP (€976m in 2018), the Network reserve (€415m), Capacity payments to coal- and lignite-fired power plants (€230m) as well as subsidy amounts for energy efficiency, renewables and infrastructures.

Situation vs previous inventory

Large FFS have been broken down by fuel by the country expert using similar (more accurate) methodology than in the former inventory.

National Innovation Programme Hydrogen- and Fuel-Cell Technology 2016-2026: classified as “RES-Biogas-based hydrogen”

Tax reduction for energy production that is used to fuel gas turbines and combustion motors in advantaged facilities: comment of the expert: “The German government does not classify this tax reduction as a shortfall in tax funds. Requesting the full tax rate would render the use of energy products as a fuel in energy production uneconomical (and hence disable it). This tax reduction further serves as a means to avoid double taxation in electricity production (as output is taxed too). The German government therefore does not publish figures on this measure.”

Subsidies deleted from the previous inventory because non relevant:

- Electricity price reduction for non-ferrous metal industry (no amount in previous inventory);

- Incentive programme for the usage of renewable energy in heating (no amount in previous inventory);
- Support of highly efficient cross-sectional technologies (no amount in previous inventory);
- Smart meters (pilot) (no amount in previous inventory).

General observation

The government releases a report on potentially environmental harmful subsidies every other year. This is a solid basis for reporting. However, the said document does not report all the subsidies. Some subsidies are still not regularly estimated (especially those related to EEG exemptions/reductions) although the website of the regulator is improving fast, being more and more exhaustive and transparent.

Greece:

Alignment with OECD

Alignment with OECD FFS inventory is ensured

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

The final NECP does not provide amount of subsidy, nor a list of such measures.

Situation vs previous inventory

The following lines have been deleted from the previous subsidy inventory because no amount:

- Feed-in tariff for geothermal;
- EU structural and cohesion funds to Greece (ended at end-2013);
- Development Law.

The following lines have been deleted from the previous subsidy inventory because out of scope:

- Grants - National development and Investment law (no amount);
- Leasing subsidy: National development and Investment law (no amount);
- Tax relief: National development and Investment law (no amount).

General observation

The data is spread over many entities which make the data collection difficult.

Finland

Alignment with OECD

Alignment with OECD FFS inventory is ensured

Alignment with MURE

Alignment with MURE inventory is ensured

Situation vs previous inventory

No major changes vs previous version. Some additions.

General observation

Effective 1 January 2011, the benchmark against which some tax expenditures are calculated are based on three factors namely energy content, CO₂ emissions and local emissions.

The following two subsidies “Tax exemption for wood based fuels” and “Tax exemption for waste incineration” have been defined as tax subsidy in August 2019. However, no amount reported by Ministry of Finance in its official document over the 2008-2018 period, therefore subsidy amounts reported at zero in the database. However, the subsidies have been estimated in 2019 at:

- Tax exemption for wood based fuels = €480m;
- Tax exemption for waste incineration = €46m.

Amounts for “Differential tax treatment (diesel vs gasoline only)” reported in the country file (varying between €724-964m over the period).

France

Alignment with OECD

Alignment with OECD FFS inventory is ensured, except “VAT Reduction for Petroleum Products Sold in Corsica” (€28-29m/y) included in the OECD inventory, which was not found in national publications.

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

Final NECP (in French) includes the tax expenditures and some programs. However, our current inventory has a larger coverage.

Situation vs previous inventory

Exclusion of the Overseas Departments from the scope of the internal fuel consumption tax applicable to fuels: the previous inventory reported directly the figures mentioned in the national budget, including a methodological change by the Ministry of Finance to estimate the subsidy leading to an artificial €691m increase (from €104m in 2011 to €795m in 2012). In the current inventory, the subsidy has been retroactively estimated to incorporate the methodological change of 2011-2012.

In 2016, the electricity fee, called CSPE, that covered power generation from RES, equalisation and social tariffs, has been integrated into the excise tax on electricity (called TICFE). CSPE reductions and exemptions for energy-intensive users have been renewed (although slightly reshaped) within the TICFE. For consistency reason, exemptions and reductions on both the CSPE (RES non-tax levy) and the TICFE (electricity tax) have been classified in the inventory as “double counting”, therefore excluded from the total analysis because they finance RES develop.

Energy saving certificates: estimations has been reviewed, upward from €5-9m/y to €5-490m/y.

Contribution to the electricity utility for electricity (CSPE) - Non-renewable purchase contracts (EDF-SEI (Island Energy Systems) contracts with local producers): distribution of the cost has been reviewed (no longer electricity from natural gas, only coal and oil).

Reduced rate of domestic consumption tax applicable to heating oil used as diesel fuel in agriculture and construction: amounts have been allocated in a different manner (different breakdown by sector) than in the previous inventory to taken into account new reporting by the Ministry of Finance (Finance Law 2020) and from the availability of new source of information.

Exclusion of the Overseas Departments from the scope of the internal fuel consumption tax applicable to fuels: the Ministry of Finance has changed the methodology of estimation in between 2011 and 2013 leading to a significant jump (already pointed out in the Energy Prices and Costs 2018 study). Therefore, we have made retroactive estimation to harmonise the dataset for this subsidy to avoid historical breakdown that can lead to misinterpretation.

Determination of the taxable profit of shipping companies according to the tonnage of their vessels: deleted because out of scope (transport services) (€200-40m/y between 2008 and 2016).

Reduced rate of VAT on the part of the journey within the national maritime area for the air or sea transport of persons and goods from or to Corsica: deleted because out of scope (transport service) (€3-5m/y)

Guarantees associated with Green Loans (Oséo / BPI France): (no amount since 2012, €112m in 2012): deleted because no track of this subsidy has been found.

General observation

The information on subsidies is spread over many different institutions. The budget is use as a base for the tax expenditures. Many documents are still in pdf format, hampering easy data manipulation. Very few documents provide historical data.

Hungary

Alignment with OECD

Alignment with OECD FFS inventory is ensured

Alignment with MURE

Alignment with MURE inventory (monetised measures) is ensured

Alignment with NECP

NECP only refers to OECD amount (on average within the EU). Therefore, no comparison possible.

Situation vs previous inventory

Several additions, mainly energy efficiency/savings subsidies (from MURE) and tax expenditures biofuels communicated directly by the Ministry of Finance.

Support of power industrial workers: data are mainly assumption and single information captured in newspaper articles because no publicly available information was found.

Consolidated FFS is lower than in the previous inventory partly because “**feed-in tariff for CHP plants**” (fuelled by natural gas) was terminated on 30 June 2011, while it was wrongly reported as “ongoing” in the previous inventory.

General observation

Difficult to access data, not very transparent country.

Italy**Alignment with OECD**

Alignment with OECD FFS inventory is ensured

Alignment with MURE

Alignment with MURE inventory (monetised measures) is ensured

Alignment with NECP

Alignment with list of subsidies in the NECP is ensured.

The following measures reported in the NECP under the status “to be quantified”, and not included in our inventory:

- Incentivisation for measures encouraging technological and industrial development;
- Promotion of energy efficient measures and production of energy by thermal RES (Cogeneration and high-yield cogeneration);
- Incentives for energy produced by plants powered by sustainable biomass, biogas and bioliquids / Incentivi sull’energia prodotta da impianti alimentati da biomasse, biogas e bioliquidi sostenibili;
- Particularly favourable system for Use Efficiency Systems (UES) created prior to Legislative Decree No 115/2008 and ORC cycle systems for self-generation of electricity / Regime di particolare favore per i SEU realizzati pre Decreto n. 115/2008 e ai sistemi di autoproduzione di energia elettrica con ciclo ORC;
- Direct or indirect production of electricity by plants subject to notification under the provisions governing tax on electricity consumption. Exemption for vegetable oils that have not been chemically modified;
- Help for operators at risk of carbon leakage / Aiuti a operatori a rischio di carbon leakage;
- Tax relief on fringe benefits for workers who use their company cars for mixed purposes (employee company car);
- Reduction in excise duty on energy products for vessels sailing exclusively within the port
- VAT reduction for crude mineral oils, fuel oils .

Situation vs previous inventory

The following subsidies were included in the previous inventory and no longer in the new update :

The Reduced VAT on equipment and materials used for the supply of gas and electricity. Was at zero in the last inventory (no amount): no longer reported in the annual report on environmentally harmful subsidies released by the Ministry of Environment, nor in the NECP.

Excise duty exemption for lubricating oils used in rubber production: double count with Consumption Tax Exemption for Lubricating Oils Used in the Petrochemical Sector.

Excise Tax Reduction on Mineral Oils Used in the Agricultural Sector (€1.05bn/y in the previous inventory): comment from the expert “I have been told that the data used in 2016 were already kind of old since who provided them stopped doing so already in 2014. hence the 2016 data was not updated anymore, considering also that the use of these oils is almost null nowadays”

Subsidy on the purchase of diesel and petrol fuel in certain border regions (no amount): No new data found.

Excise tax credit for diesel fuel used by drivers (category 2 or lower) (€160m in 2016): No longer reported by the Ministry of Environment (neither in the NECP).

Tax reductions for power plants was merged and reported under the name of “Direct or indirect production of electricity by plants subject to the declaration provided for by the provisions governing tax on electricity consumption” by the Ministry of Env in 2017. Both subsidies have been merged.

Tax credit for the purchase of vehicles powered by natural gas or LPG or electrically powered or for the installation of natural gas and LPG fuel systems: correction of a mistake in the former inventory, from €1bn-780m (2008-2016) to €7-691m (depending on the source). This subsidy has been taken off the energy subsidy inventory.

White certificates: the methodology to estimate and allocate amount across energy has been reviewed. In the previous inventory, the total amounts were broken down based on the energy balance. In the current inventory, the amounts are broken down based on their targeted fuels, namely electricity, gas, CHP and others (i.e. petroleum products). Allocation is based on the respective shares of white certificate recorded over the 2008-2017 period. Since November 2017, there is only one type of certificate (called “unified”).

All **RES schemes**, including the new Green Certificate scheme, the Ritiro Dedicato (RID) are now included in the inventory causing an increase of +€3.5bn in 2016 compared to the previous inventory.

General observation

Italy has put strong effort on transparency and can definitely be considered as a leading country in terms of transparency. However, many historical data (mainly before 2011) have been estimated because no data was available.

Italy reports diesel-gasoline tax difference (€4.91bn in 2018).

Ireland

Alignment with OECD

Alignment with OECD FFS inventory is ensured

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

Draft NECP mentions the subsidy inventory from CSO. We have also used this publication and we have completed it with other sources. Therefore, our inventory has a larger coverage than what is reported in the Draft NECP.

Situation vs previous inventory

Subsidies deleted from the previous inventory because out of scope:

- Afforestation Grant and Premium Scheme (no amount);
- Pig and Poultry Investment Scheme (PPIS) (no amount);
- Young Farmer Capital Investment Scheme (YFCIS) (no amount).

Subsidies deleted from the previous inventory because they were double counts (because excise tax expenditure for internal navigation are estimated by the core team):

- Mineral Oil Tax Repayment for Commercial Sea Navigation (€76m in 2016);
- Marine Diesel tax relief (Repayment of VAT on Hydrocarbon Oil used in Sea Fishing Vessels) (€0.1m in 2016).

General observation

The scope of coverage by the CSO inventory has changed since the last year version. This explains some variations in the current inventory against the previous one. The subsidies formerly included in the “Potentially Environmentally Damaging Subsidies” tab of the CSO report are unfortunately no longer reported by the CSO, which has led us make some assumptions.

Latvia

Alignment with OECD

Alignment with the OECD FFS inventory is ensured, except for the subsidy called “**Excise Tax Exemption for Oil Products Imported from non-EU Countries by Individuals for Own Consumption**” (see OECD definition below: Oil products that individuals import for their own consumption from non-EU countries are subjected to excise tax exemption, within the limit of one full vehicle standard fuel tank and one additional portable fuel tank per vehicle containing no more than 10 litres. Since January 1, 2012 individuals are subject to excise tax exemption of the allowed amount once every seven days instead of every day as it was before. State Revenue Service has estimated the illegal sales and average annual amount of oil products imported by individuals and it has been used as basis for calculations (Ministry of Finance, 2012).

The benchmark against which this tax expenditure is calculated is the excise tax rate on unleaded gasoline)

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

The Final NECP mentions €2.6m of tax expenditures for the electricity in 2017, which is in line with our inventory (€2.55m).

The Final NECP (in Latvian) provides total amounts of indirect transfers by fuel totalling EUR159m. However, no detail by instrument is provided. Therefore, comparison is difficult.

The Final NECP doesn't include amount of tax expenditure on excise tax, nor amount for direct transfers. Therefore, no comparison is possible for these two types of subsidy.

Situation vs previous inventory

The **tax expenditure report** published by the Ministry of Finance is providing more details every year, with a significant improvement in 2015. However, when tax expenditures are broken down into several items (corresponding to several energy uses), retroactive amounts are provided for the two past years. Therefore, the amounts of 2013 (from the tax expenditure report of 2015) have been replicated from 2008 to 2012. Because of this changes, some subsidies have changed of name since the previous inventory.

Subsidies deleted from the previous inventory because out of scope:

- Credit guarantees (€3m in 2016);
- Soft Loans for businesses to improve competitiveness (no amount);
- Enterprise Income Tax - Rebate to facilitate investment (€0 in 2016);
- Enterprise Income Tax - Rebate to facilitate investment (€0 in 2016);
- High value-added investments (EU funds 2007-2013 programming period) (€0 in 2016);
- Corporate Income Tax Relief to Facilitate Investment (€2.6m in 2016).

Capacity payments have been added. Caution, there is a one-off payment of €454m in 2017 attributed to the Latvenergo in compensation for the restructuring of the capacity mechanism.

General observation

Reduced VAT for the wood fuels, if the consumer is an inhabitant who purchases and consumes firewood for domestic needs: methodology to estimate (by the Ministry of Finance) this subsidy seems to have changed over the year because there are significant variations.

Total amounts of **FiT for RES & CHP schemes** (€121m in 2018) is lower than amount reported by DG COMP (€159m in 2018). We couldn't explain this discrepancy.

Lithuania

Alignment with OECD

Alignment with the OECD FFS inventory is ensured.

Alignment with MURE

Alignment with MURE inventory is ensured

Situation vs previous inventory

Most of the tax expenditures have been reshaped and their amounts modified to stick with the tax expenditure report published by the Ministry of Finance (most of them where estimated in the previous inventory). Thus, several subsidies have been deleted and their amounts transferred to other subsidies.

General observation

A large part of the subsidies to energy efficiency is financed through EU programmes.

Support for Klaipėda LNG terminal: a one-off €448m grant has been reported in 2014. This partly distorts the analysis across years.

Luxembourg

Alignment with OECD

Not included in the OECD FFS inventory

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

No amount is reported in the Final NECP. No comparison possible.

Situation vs previous inventory

Several additions, including FiT for solar (€17.5m in 2018).

General observation

No tax expenditure report provided by Ministry of Finance or Treasury.

Malta:

Alignment with OECD

Not included in the OECD FFS inventory

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

No amount is reported in the NECP. Therefore, no comparison is possible.

Situation vs previous inventory

Not major change, some data update.

General observation

EI benefit from a reduced rate of the RES non-tax levy (0.075 ct/kWh vs a standard rate of 3.63 ct/kWh). However, the regulator doesn't estimate the amount of subsidy it represents. Therefore, it subsidy is not included in the current inventory.

Netherlands

Alignment with OECD

Alignment with OECD inventory is ensured

Alignment with MURE

Alignment with MURE inventory is ensured

Situation vs previous inventory

“Differentiated tax rates electricity” and “Differentiated tax rates natural gas” are no longer part of the inventory because we found no way to monetise this subsidy. Actually, these measures consist to applying a decreasing block tax rates on electricity & gas consumption (tax/kWh decreasing while consumption grows). These measures are not monetised by the Dutch administration while it

could/should be (similar subsidy scheme - increasing block tax rates - is monetised by the administration in Italy).

“**Tax reduction for households**” was broken down between natural gas and electricity by mistake in the previous inventory because of misunderstanding. The full amount is now allocated to electricity.

General observation

The following two subsidies are not monetised (neither reported in official document) while they could represent significant amounts (depending on the volume of retrofit activity).

- Lower VAT for insulation measures homeowners;
- Energy saving credit (homeowners).

Poland

Alignment with OECD

Alignment with the OECD FFS inventory is ensured, except for the subsidy called “Rebates on Diesel Fuel Tax in Farming” that is missing.

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

In line with the amounts are reported before 2018. However, most of the subsidies mentioned cover 2020 onwards, therefore not directly applicable in our inventory. In addition, the NECP doesn't mention any tax expenditure.

Situation vs previous inventory

Excise duty exemption on natural gas in agriculture and **Agricultural tax relief** (no amount) have been deleted from the previous inventory because no track of such subsidy was found (measure inherited from the 2014 inventory).

Issue with **green, purple, yellow, red and white certificates** because no data is available for 2013 causing a “whole” in 2013 and therefore distorting the analysis.

General observation

High uncertainty on the amounts of tax-expenditure reported because no “tax expenditure report” has been published since 2016. In addition, no data estimated since 2012 for several tax expenditures. Many tax expenditures are not monetised.

Portugal

Alignment with OECD

Alignment with the OECD FFS inventory is ensured.

Alignment with MURE

Alignment with MURE inventory is ensured

Romania

Alignment with OECD

No included in the OECD FFS inventory

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

The final NECP only provides subsidy amounts related to “State aid authorised for closure of coal mines for the period 2011-2024”, but with no annual details. It also encompasses aids to energy poverty with low detail on the volume of subsidy granted.

Situation vs previous inventory

Many additions by the expert, including renewable obligation scheme, scheme supporting CHP, support coal mines closures, and few state aids (from DG COMP).

General observation

Transparency has improved over the last years. The largest subsidies are well tracked by the State Aid data from DG COMP.

Spain

Alignment with OECD

Alignment with the OECD FFS inventory is ensured although presentation of the coal-related subsidies differs with our inventory (see below).

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

The Final NECP (Spanish) list and describes several subsidies but doesn't provide amount disbursed. Therefore, not direct comparison is possible with our inventory.

Situation vs previous inventory

Feed-in tariffs:

- FiT broken down in two periods: before and after 2014 because of regime change;
- FiT CHP & FiT CHP from gas merged into FiT from CHP;
- FiT solar PV & FiT solar CSP merged into FiT from solar.

Uncertainty on the amounts for the subsidies called “Guaranty-of-supply restriction mechanism”:

- No single source from the regulator (CNMC) over the full period of the mechanism. We have reported €1.6bn over 2011-15, including some payments due for the years 2012, 2013 and 2014 have been disbursed after the end of the program⁵⁸ (2015 onwards);
- State Aid “N178/2010 Preferential dispatch of indigenous coal plants”⁵⁹ planned a max of €1.3bn over 2011-14;

⁵⁸ https://www.cnmc.es/sites/default/files/1365168_8.pdf

⁵⁹ https://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=3_N178_2010

- Greenpeace reports €2.8bn⁶⁰.

Subsidies for the coal sector: the total amount of support of several subsidies is broken down in a different manner as from the previous inventory (and therefore from the OECD) as it is now based on official documents (national budget), while it still consistent with total amounts reported by the OECD. Several additions and updates.

General observation

No centralised information or report on subsidies found.

Slovakia

Alignment with OECD

Alignment with the OECD FFS inventory is ensured.

Alignment with MURE

Alignment with MURE inventory is ensured

Situation vs previous inventory

Many subsidies have been broken down into several ones by the expert to reflect more accurately with reality.

Income price support for electricity and gas were included in the previous inventory (measure active since 2012) with amounts that were estimated by the country expert. For the current study, the regulator (URSO) proposes not to include these subsidies because the “price formula comprising all eligible costs and reasonable profit”. “Regulated prices for the supply of gas / electricity to households / small businesses are not considered by URSO (RONI - NRA) as being eligible for financial support, relief or concessions. On the contrary, prices include all eligible costs and reasonable profit according to the Office Decree No. 18/2017 and No. 223/2016.”

The subsidies called “**Raising accessibility of lignite reserves**” and “**Support for Phasing Out Mining Activity by Bana Dolina, Vel’ky Krtis, a.s**” from the previous inventory are gathered and included in the subsidy called “**Mining subsidies**”.

Tax exemptions on coal, gas and electricity have been broken down by recipient. Physical quantities of electricity, coal, gas exempted spread according to amounts.

Slovenia

Alignment with OECD

Alignment with the OECD FFS inventory is ensured.

Alignment with MURE

Alignment with MURE inventory is ensured (most of the subsidies are included in the Eco Fund).

⁶⁰ https://revista.greenpeace.es/wp-content/uploads/2018/10/GPM27_LR.pdf

Alignment with NECP

The final NECP (in Slovenian) mentions €163m of EE & RES support in 2017. Our inventory reach €126m. The final NECP mentions €95m of tax expenditures for oil and gas in 2017. Our inventory reach €67m.

In both cases above, we don't exactly know what is included in the amounts in the NECP which makes comparison difficult.

Situation vs previous inventory

Feed-in tariffs: the cost of subsidies has been reviewed, previously the amounts reported were FiT payments (instead of the cost of the FiT, i.e. payments minus wholesale price). The amounts reported from 2012 onwards because the data available before a not reliable

General observation

Transparency is good, access to information is easy.

Sweden

Alignment with OECD

Alignment with OECD FFS inventory is ensured

Alignment with MURE

Alignment with MURE inventory is ensured

Situation vs previous inventory

The following subsidies (at least) are not included in the final NECP (included in our inventory)

- **Reduced energy tax for diesel in mining industry** (Nedsatt energiskatt för diesel i gruvindustriell verksamhet) (SEK260m in 2018);
- **CO2 tax reduction on diesel fuel in mining industry activities** (Nedsatt koldioxidskatt för dieselbränsle i gruvindustriell verksamhet) (SEK150m in 2018).

The following three subsidies have been deleted from the previous inventory because they were double counts with tax expenditures estimated by the core team for air and water domestic transport:

- CO2 tax reduction on fuels for domestic maritime shipping (SEK280m in 2016);
- CO2 tax exemption on fuels for domestic aviation (stopped in 2011, so impact only on 2008-2011, SEK640-720m/year);
- Energy tax exemption on fuels for domestic maritime shipping (SEK350m in 2016).

Energy tax exemption on diesel in the rail transport sector (Energiskattebefrielse för bränsleförbrukning vid bandrift): amounts divided tenfold because of mistake in the previous inventory.

Energy tax exemption on electricity for energy-intensive industrial companies participating in energy efficiency improvement programs (Energiskattebefrielse på el vid deltagande i PFE inom industrin (Befrielse från energiskatt på el vid deltagande i program för energieffektivisering inom industrin): amounts multiplied tenfold because of mistake in the previous inventory.

CO2 tax reduction on diesel fuel in mining industry activities. (Nedsatt koldioxidskatt för dieselbränsle i gruvindustriell verksamhet): amounts multiplied tenfold because of mistake in the previous inventory.

General observation

Sweden reports diesel-gasoline tax difference (SEK7.6bn in 2018).

Transparency is good for FFS, while it is hard to track subsidies for RES, especially the Green Certificate scheme (no estimation of the cost found in official publications).

G20

United Kingdom

Alignment with OECD

Alignment with OECD FFS inventory is ensured

Alignment with MURE

Alignment with MURE inventory is ensured

Alignment with NECP

No mention to energy subsidies in the Draft NECP. Therefore, no comparison possible.

Situation vs previous inventory

Several new (large) subsidies have been added compared to the previous inventory, especially because of more data transparency from the HMRC, of which:

- Corporation tax - ring-fenced oil and gas trades - tax relief for decommissioning expenditure;
- Petroleum Revenue Tax (PRT) - Tax relief for decommissioning expenditure;
- **Income tax and corporation tax - ring-fence oil and gas trade, first-year capital allowances for plant and machinery.** For this subsidy, no estimate available before 2014. HMRC said: *“In regards to the Ring-fence oil and gas first-year capital allowances for plant and machinery relief, HMRC produced cost estimates for this relief for the first time in Jan 2019; these estimates covered the 2013/14 to 2018/19 period. We updated them in Oct 2019 and are available on our website. Cost estimates for periods before 2013/14 are not currently available.”*

Carbon price floor (CFP): previously classified as FF (because FF for power generation), now classified as Electricity from CHP

Petroleum Revenue Tax (PRT) oil allowance: As the rate of PRT was reduced to 0% from January 2016, the amount of the allowance became nil starting since 2016. => Therefore, this means that when a tax rate decreases it mechanically triggers the reduction of tax expenditure.

Feed-in tariffs: estimations have been reviewed. Total number slightly dropped. Distribution between technologies has also changed.

Subsidies deleted from the previous inventory because out of scope:

- VAT exemption for International passenger transport (UK portion) - Aviation (oil products, £333.3m in 2016) (transport service);
- VAT exemption for International passenger transport (UK portion) - Maritime (oil products, £16.7m in 2016) (transport service).

Argentina

Alignment with OECD

Alignment with OECD inventory is ensured

Alignment with IEA policies database

Alignment with IEA policies is ensured

General observation

Expert explanations on support for RES and CAMMESA: “Law 27.191 was passed in September 2015 and implemented in March 2016. The RenovAr Program was launched in April 2016 as the main program destined to promote investment in renewables to fulfil the law’s mandates. RenovAr’s main promotional tool is a long-term PPA with CAMMESA and a set of guarantees that make the PPA bankable and attractive. The PPAs were awarded to private companies (SPVs) via 4 rounds of tenders (1, 1.5, 2 and 3). Each SPV awarded must find its own financing via equity and/or debt. No government support is given other than the off-take agreement and the guarantees scheme which covers energy payment delays, off-taker default and certain changes to the macro-economic rules. The price of the PPA was set competitively on a US\$/MWh basis and the full cost of those PPAs is passed through to end users (residential, commercial and industrial). There are NO direct subsidies other than the fiscal benefits (import duty exemption) which are included in the template (subsidy called “Exemption of import excise tax and tax certificate for local content to renewable energy projects (Law 27.191)”). As the first projects under RenovAr were awarded in late 2016, some of them started construction in mid-2017. No other benefits or subsidies existed before 2017.

As mentioned, the cost of the electricity purchased by CAMMESA under the PPAs is passed on to end-users and thus it’s not a subsidy per se. However, the government has kept the price of electricity passed through to residential, commercial and certain industrial users at a point lower to actual costs thus creating a significant subsidy which is included in the template (subsidy called “Operating aid to CAMMESA”). This situation has been so since 2002 and is not directly related or attributable to renewables but to the whole power sector and it is mostly justified on the higher costs of imported natural gas, diesel, coal and residual fuel used in power generation. Renewables under PPAs accounted for just 0.5% of the power supply in 2017 and the first RenovAr’s PPAs started in late 2017”.

Australia

Alignment with OECD

Alignment with OECD inventory is ensured

Alignment with IEA policies database

Alignment with IEA policies is ensured

General observation

Note: all data is by financial year (July to June), unless otherwise noted. Thus, 2018 = FY2018 = financial year ending June 2018.

The **Fuel Tax Credits (FTC) Scheme** is not recognised by Australia as a subsidy, therefore not reported in the OECD inventory. Our country expert notes “*Defining the FTC scheme as a “subsidy” is highly politically contentious in Australia. (See, for example page6 in TCI 2014: http://www.climateinstitute.org.au/verve/_resources/TCI_SocialCostOfCarbon_PolicyBrief_September2014.pdf).*” The document quoted points out: “*the federal government does not consider the fuel tax credits regime as a subsidy. Excise on diesel fuel was originally introduced to help fund road construction and maintenance; off-road diesel use by mining, agriculture and other industries should therefore not be subject to the excise. On the other hand, fuel excise is not hypothecated to road funding, and as many changes to the excise regime have been to increase general revenue rather than to direct more resources at roads the provision of credits to some industries and not others may be considered a subsidy to the former*”.

Very few data on the cost of the **energy efficiency obligation schemes** (below). Data are gross estimated. Scheme concerned are the following:

- NSW Energy Savings Scheme (ESS);
- Victorian Energy Efficiency Target Scheme (VEET);
- Retailer Energy Efficiency Scheme (REES).

Globally, we estimate the dataset for Australia to be close of being exhaustive.

Brazil**Alignment with OECD**

Alignment with OECD inventory is ensured

General observation

Brazil’s subsidy trend is heavily driven by the subsidy called “Reduction of the tax rates on the contribution to PIS/PASEP and COFINS due to the import and retail of gasoline, diesel, LPG and Kerosene” which is by far the largest subsidy in place.

Canada**Alignment with OECD**

Alignment with OECD inventory is ensured.

General observation

Data have been collected at both federal and provinces levels which represent large amount of data. Therefore, we estimate the dataset for Canada to be close of being exhaustive.

China**Alignment with OECD**

The data from the OECD have been used a primary data because of the lack of data.

General observation

Because data couldn't find by national expert, subsidy data other than that provided by the OECD have been collected by Enerdata. Subsidy data come from national budgets from the Federal Ministry of Finance that is releasing information since 2015 only. No data are available before. Data transparency is increasing over the years meaning the budgets offer more and more details over the years. However, no explanation, or very little explanation, are provided on the meaning of each amount disbursed. Therefore, the subsidy classification may be a little more hazardous than for other countries. No data have been collected at province level. Consequently, exhaustiveness of the subsidy is not ensured.

India

Alignment with OECD

Alignment with OECD inventory is ensured, except R&D subsidies.

General observation

Data are mainly available for 2013 onwards since we have used data from IISD that regularly carries out a thorough inventory of subsidies in India (<https://www.iisd.org/library/india-energy-transition-2020>). They report some subsidies that we couldn't find from official publications.

Although it is out of the scope of the study, it is to be noticed that the government of India is providing funds to many energy companies (Public Service Undertakings) through the Internal and Extra Budgetary Resources (IEBR) program. In 2018, funds flowed through the IEBR represented €25.7bn, including €9.2bn for power companies, €12.4bn for O&G companies, €2bn for coal companies, €0.9bn for nuclear companies and €1.3bn for RES companies. These amounts are not included in the current inventory.

Indonesia

Alignment with OECD

The data from the OECD have been used a primary data because of the lack of data.

General observation

Data on energy subsidies other than for final consumer of petroleum products are missing. Data other than OECD's have been collected by Enerdata using local sources and from an ADB report that provided data up until 2013, with no means to know if the subsidies have been extended and, if so, in which extent.

Consequently, exhaustiveness of the subsidy is not ensured.

Japan

Alignment with OECD

Alignment with OECD inventory is ensured, except R&D subsidies.

General observation

Comments from the expert:

"The number of subsidies considered to be applicable to this survey is around 100 per year, but some subsidies are small. There are many changes, splits, and mergers of subsidies, so it is not possible to grasp the changes since 2008 for each project. Therefore, we picked up programs which have 5 billion

yen or more budget in the latest available official data (FY2017), and entered the data since 2008.

Sum of these subsidies covered approximately 80% of the total amount of subsidies in 2017.”

Costs related to the Renewable Portfolio Standard (RPS) in force until 2012 have not been found and are therefore missing in the database. The scheme has been replaced by a feed-in tariff scheme in 2012.

Mexico

Alignment with OECD

Alignment with OECD inventory is ensured.

General observation

Few information on the amounts of subsidies for energy efficiency and renewable were found.

Subsidy data covering the central government investment program are available since 2016 only.

Uncertainty on the level of subsidy related to tax exemption on the carbon tax.

Russia

Alignment with OECD

Alignment with OECD inventory is ensured.

General observation

Data included are a mix of data from the Ministry of Financial and estimation by country experts.

Subsidies for electricity seems rare. The main subsidy is a cross-subsidy from large energy consumers to households.

Saudi Arabia

Alignment with OECD

No included in the OECD inventory.

General observation

All the subsidies reported have been estimated by the country expert and duly controlled by the core team (Enerdata). Instead of subsidy, it would be more appropriate to talk about “opportunity costs” because the considered amounts have been calculated comparing regulated prices in Saudi Arabia compared to that that observed in Europe over the timeframe considered.

The State doesn’t provide tax expenditures report or anything similar for the energy sector. However, we have benchmarked our data against estimations by local official institutions up until 2013.

Publications since then do not include subsidy data. However, the country expert estimations matched with data provided until 2013, therefore we have considered that the estimations where relevant for the whole period, including from 2014 to 2018.

South Africa

Alignment with OECD

Alignment with OECD inventory is ensured.

General observation

RD&D data are not available under the IEA database for South Africa. We have then taken Energy ministry program as a whole for nuclear, energy efficiency and renewable assuming they cover part of the R&D spending.

The flagship program supporting the development of RES (REIPPP) is not transparent enough to provide the subsidy amount, if any.

Similarly, we suspect that electricity price for households are subsidised, at least cross-subsidised within customers, but the country expert lack of data to estimate the subsidy amounts.

Although it is out of the scope of the study, it is to be noticed that the government of South Africa is regularly providing funds and equity to the national power company Eskom.

South Korea**Alignment with OECD**

Alignment with OECD inventory is ensured.

General observation

Amounts reported under the title Renewable Energy Price Support correspond to the subsidy amounts from the feed-in tariffs and RPS scheme. Amounts are reported under the feed-in tariffs instrument in the current inventory. The breakdown by energy source is available from 2017 onwards only.

Turkey**Alignment with OECD**

Alignment with OECD inventory is ensured

Alignment with IEA policies database

Alignment with IEA policies (financial measures) is ensured

General observation

Data are mainly available for 2015 onwards, therefore analysis across years is not relevant.

Several subsidies are average annual amounts from the SHURA report (https://www.shura.org.tr/wp-content/uploads/2020/05/raporweb_ENG-.pdf).

“Gain or loss on natural gas sales to Botas”: This subsidy is due to lower cost for consumers as compared to import costs, which changes year to year depending on exchange rate fluctuation and natural gas price adjustments. Loss to Botas can be considered a subsidy, but Botas also makes profits in some years, which should be subtracted from this subsidy. This is estimated as follows:

1. the yearly average Botas price is calculated;
2. the yearly average import cost is calculated;
3. the difference is taken, if negative it is a subsidy and if positive it is a profit to Botas;
4. total sales are collected;
5. difference is multiplied by sales amount to get the net gain or loss per year to Botas.

United States of America**Alignment with OECD**

Alignment with OECD FFS inventory is ensured

General observation

Data includes two levels of information:

1. Federal:
 - a. tax expenditures: all the energy-related (and some fossil fuel mining-related) subsidies hare covered by the current inventory;
 - b. Department of Energy programs;
 - c. Capacity markets: Four ISO/RTO zones have implemented capacity market mechanisms, namely NYISO, MISO, PJM and ISO NE;
 - d. Renewable Portfolio Standard: many states have implemented such scheme. We have reported amounts “Aggregate U.S. RPS Compliance Costs” provided by the Berkeley Lab.
2. States:
 - a. Tax expenditures: we have extrapolated the level of tax expenditure for the 51 States based on the level of 5 states.
 - i. States selection: the 5 States have been selected based on their respective shares of the total energy expenditures within the USA and their representativeness of all the States. The selection comprises California (the State recording the second largest energy expenditures in the USA in 2017), Florida (third largest state, energy consumption mix and pattern representative of the Southern States), New York (fourth largest state, energy consumption mix and pattern representative of the Northern States), Pennsylvania (fifth largest state, energy producing States), Illinois (sixth largest state, industrial representative of the Midwest States). The 5 States represented 39% of the USA energy expenditure in 2017. Because of a lack of data transparency, Texas tax expenditures data have not been included, although it the State was the largest energy expenditures in 2017.
 - ii. Estimation:
 1. The 5 States tax expenditures from 2008 to 2018 have been aggregated by fuel (oil, gas, coal, electricity, biofuels and RES). It is expressed in USD;
 2. The converted into a ratio corresponding to the share of tax expenditures within the total energy expenditure per fuel using the year 2017 as a proxy because it was the only year for which the USA energy expenditure was broken down by both States and fuel. This ratio is expressed in %;
 3. This ratio has later been multiplied the share of energy expenditure (in USD) of the remaining 46 States and extrapolated for the year 2008-2016 and 2018.
 - b. We assume that this methodology under-estimates the level of support for RES technologies as the tax expenditures report do not give information on grants provided, and no database gather information grant for all the State in the USA.

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