Germany's effort to phase out and rationalise its fossil-fuel subsidies

A report on the G20 peer-review of inefficient fossil-fuel subsidies that encourage wasteful consumption in Germany

Prepared by the members of the peer-review team: China, Indonesia, Italy, Mexico, New Zealand, the United States, and the OECD (Chair of the peer-review).

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Acronyms and Abbreviations

APEC	Asia-Pacific Economic Cooperation
ARegV	Incentive Regulation Ordinance
BGR	The Federal Institute for Geosciences and Natural Resources
BMF	Federal Ministry of Finance
BMUB	Federal Ministry for the Environment, Conservation and Nuclear Safety
BMWi	Federal Ministry of Economic Affairs and Energy
BNetzA	Federal Network Agency or Bundesnetzagentur
CHP	combined heat and power
DHW	Domestic hot water
EEG	Renewable Energy Sources Act
ETD	Energy Tax Directive
G20	Group of Twenty
GHG	greenhouse gas
GSR	German self-report
GVA	gross value-added
GWh	Giga-Watt hours (109 Watt-hours)
HVAC	Heating, ventilation, air-conditioning
IEA	International Energy Agency
IMF	International Monetary Fund
LPG	Liquefied petroleum gas
Mtoe	Million Tonnes of Oil Equivalent
OECD	Organisation for Economic Co-operation and Development
TFC	total final consumption (of energy)
TPES	total primary energy supply
VAT	value-added tax

Executive Summary

Germany and Mexico announced in 2016 that they would undertake a reciprocal peer review of their fossil-fuel subsidies under the auspices of the G20. With China and the United States setting the precedent for these peer reviews as the first countries to participate in such an undertaking, Germany and Mexico are the second pair of countries to follow suit. The two countries negotiated terms of reference in the months that followed their decision, and proceeded to invite other countries and international organisations to take part in the review. In the case of Germany, those invited participants (in addition to Mexico) were China, Italy, Indonesia, New Zealand, the United States, and the OECD. The OECD was also asked to chair the review, and to act as a co-ordinator and facilitator among the participants.

This report is an outcome of this peer-review process, reflecting the review team's in-person discussions with German officials, but also deliberations among the review team itself. After summarising the key aspects of Germany's energy landscape, the report addresses each stage of the supply chain for fossil fuels, discussing in detail the subsidies (and other measures) that Germany and the review team have identified in the course of the review process, as per the terms of reference negotiated between Germany and Mexico, and on the basis of the report that Germany produced on its own subsidies (i.e. its self-report, or GSR).

Throughout the last two decades, Germany's energy policy has shifted gears in two major ways. First, in the early 1990s, the decision to scale down and eventually close its hard-coal mining industry resulted in a significant structural change to the country's energy landscape. Second, the *Energiewende*, Germany's energy transition to a low-carbon economy, has shaped much of the developments in the energy sector since year 2000, propelling the deployment of renewable-energy sources for electricity production and heat as well as energy efficiency. From the introduction of energy and electricity tax reforms to feed-in tariffs for renewable energy, Germany's energy policy has made significant strides in addressing its climate change objectives. Bearing in mind the above developments, 22 fossil-fuel measures[1] benefitting the upstream activities (extraction of coal) and downstream activities (agriculture, manufacturing, and transport of fossil fuels) were identified by Germany in its self-assessment. In its self-report, only its measures to support hard-coal mining – already close to being completely phased out – were classified as being inefficient subsidies. The German Federal Government maintains the rest of the support measures (mainly tax exemptions or reductions) on the grounds that they ensure the competitiveness of its industry and prevent emissions from relocating to less environmentally stringent countries. Germany does acknowledge, however, that many of these measures favour the consumption of fossil fuels.

Discussion between the review team and Germany revolved around the question of the efficiency of its tax expenditure measures and the need to analyse the effects of reforms on industry competitiveness and carbon leakage. The tax benefits granted to industrial and agricultural consumers of fossil fuel raised the issue of the misalignment that can arise between climate policy objectives and economic policy. The review team

1. Germany and Mexico worked under different definitions of subsidies, the former using a broader definition that encompasses both direct budgetary transfers and tax expenditures, whereas the latter limited its definition of subsidies to direct budgetary transfers. In Mexico's self-report, tax expenditures were nevertheless included. Because of the definitional differences, we will use the notion of "support" measures to allow for greater flexibility.

encourages the German Administration to take an additional step beyond taking stock of their support measures and assess the sensitivity of their industry competitiveness and carbon leakage to the reform. In doing so, the German Administration could consider alternative measures that are less distortive for achieving their objectives of maintaining industry competitiveness and preventing emissions relocation. Literature on the contribution of environmental regulation to industry performance thus far does not yield consensus, often showing that supply and demand conditions dominate; the German case thus needs to be studied more closely.

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Introduction

Background and context

In an effort to further facilitate the sharing of experience and mutual learning among G20 members, G20 Finance Ministers announced in February 2013 that they would seek to develop a framework for voluntary peer reviews for rationalising and phasing out inefficient fossil-fuel subsidies that encourage wasteful consumption. This led in December 2013 to a joint announcement by the People's Republic of China and the United States of America that the two countries would undertake a reciprocal peer review of their fossil-fuel subsidies under the G20 process. Other countries – Germany, Mexico, Italy, and Indonesia – have since joined China and the United States in agreeing to undertake peer reviews of their own subsidies under the G20. A similar exercise is taking place in the context of Asia-Pacific Economic Cooperation (APEC), with Peru, New Zealand, the Philippines, and Chinese Taipei each having already undergone a peer review of their subsidies in, respectively, 2014, 2015, 2016 and 2017, while Viet Nam is expected to have completed its peer review in 2017.

As indicated in the terms of reference prepared by Germany and Mexico, the purpose of G20 peer reviews is to:

1. find out the basic situations, differences and experience of fossil fuel subsidies in various countries;
2. push forward the global momentum to identify and reduce inefficient fossil fuel subsidies;
3. improve the quality of available information about inefficient fossil fuel subsidies; and
4. share lessons and experience of relevant reform.

To that purpose, Germany has prepared a self-report (henceforth the GSR, for "German self-report") describing the measures that the country submitted to the peer-review team in November 2016. This review team comprised the representatives from different countries and international organisations that Germany invited to participate in its peer review under the G20, namely China, Indonesia, Italy, Germany, New Zealand, the United States and the Organisation for Economic Co-operation and Development (OECD). At the request of Mexico and Germany, the OECD chaired their peer reviews.

The composition of the review team for Germany was as follows:

- Mr. Han Wenke (China, National Development and Reform Commission)
- Mr. Feng Shengbo (China, National Development and Reform Commission)
- Ms. An Qi (China, National Development and Reform Commission)

- Mr. Xu Wen (China, Ministry of Finance)
- Mr. Shi Wenpo (China, Ministry of Finance)
- Mr. Rofyanto Kurniawan (Indonesia, Ministry of Finance)
- Ms. Zulvia Dwi Kurnaini (Indonesia, Ministry of Finance)
- Mr. Gionata Castaldi (Italy, Ministry of the Environment)
- Mr. Wolfgang D'Innocenzo (Italy, Ministry of Economic Development)
- Mr. Carlos Muñoz Pina (Mexico, Ministry of Finance and Public Credit)
- Mr. David Buckrell (New Zealand, Ministry of Business, Innovation and Employment)
- Ms. Jessica Isaacs (United States, U.S. Treasury)
- Mr. David Gottfried (United States, U.S. Treasury)
- Ms. Assia Elgouacem (OECD, Trade and Agriculture Directorate)
- Ms. Aleksandra Paciorek (OECD, Trade and Agriculture Directorate)
- Mr. Ronald Steenblik (OECD, Trade and Agriculture Directorate): Chair

The scope of fossil-fuel subsidies

Although the G20 has not adopted a formal definition of what constitutes a fossil fuel subsidy, the terms of reference prepared by Mexico and Germany take note of the studies carried out by international organisations such as the International Monetary Fund, OECD, and the World Bank, as well as the Global Subsidies Initiative. These relevant reports provide references for Germany and Mexico. Based on these expert reports, the most common forms of subsidies include:

- direct budgetary support;
- tax code provisions;
- government provisions of auxiliary goods or services either at no charge or for below-market rates to facilitate fossil fuel use or production; and,
- requirements that non-government entities provide particular services to fossil fuel producers at below-market rates, or that require non-government entities to purchase above market quantities of fossil fuels or related services.

The terms of reference indicated that the focus of the exercise should be on national-level subsidies but may also consider state- and municipal-level subsidies.

An overview of Germany's energy sector: resources, market structure, prices, and taxes

Energy resources and market structure

Energy resources

Germany is the world's largest producer and consumer of lignite, but produces only small amounts of other fossil fuels. Lignite is extracted from three fields located in Rhineland, Central Germany and Lausitz (BGR, 2015[1]).. Its hard-coal mining industry — the remaining open mines are all located in the *Land* of North Rhine-Westphalia — has been uncompetitive for decades, due to its high extraction costs, and has had to rely on government assistance. Germany will soon have to import all of its hard coal as its domestic production will cease by the end of 2018.

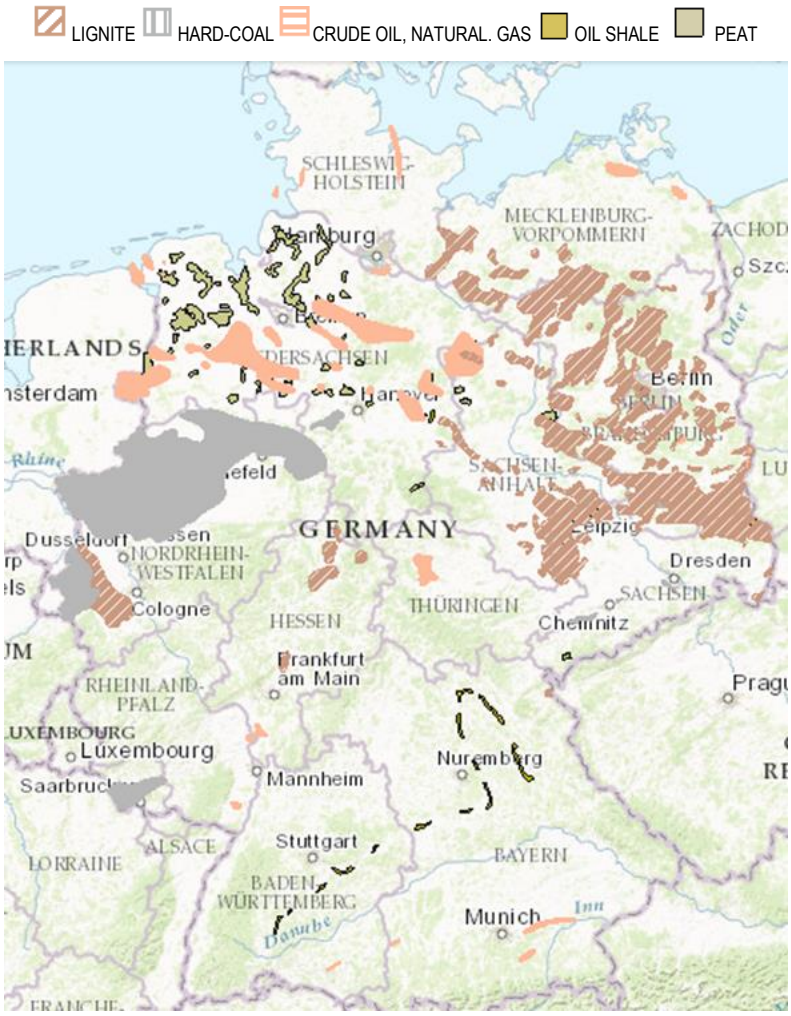
Germany's proven reserves of oil and natural gas, located mainly in Lower Saxony,[2] are modest and have been declining in recent years following decades of production. In 2014 Germany's domestic production met only 3.5% of its domestic consumption of crude oil, and 13.7% of its natural gas.

Fossil fuels still make up the lion's share of Germany's primary energy supply: oil accounts for 33%, coal for 26%, and natural gas for 22% (Figure 2). Renewable energy has contributed an increasingly important part of the country's energy mix, reaching 14% in 2015, whereas nuclear energy (8% of TPES) will be completely phased-out by 2022. Between 2006 and 2015, per capita primary supply of fossil-fuel-derived energy declined by 12%. This trend is present for all fuel types — petroleum, hard coal, and natural gas — with the exception of lignite, the use of which has remained steady over the last decade.

Currently, Germany's electricity and heat generation is dominated by fossil fuels, with renewable resources producing a third of the country's electricity and slightly less than 15% of heat. Under the Federal Government's Energy Concept of 2010, Climate Action Programme 2020 and the National Energy Efficiency Action Plan, put forth in December 2014, the goal is to reduce GHG emissions by at least 80% relative to the 1990 level by 2050. In order to achieve this target, the German Federal Government aims to increase the share of renewable energy in final energy consumption to 60%, and to 80% in electricity generation. Although natural gas will continue to dominate the heating market, the fuel also plays an important role in electricity generation and storage, helping to smooth fluctuations in the supply of electricity generated by renewable energy. Lignite's role in electricity generation will need to diminish if emission reduction targets are to be met, but the pace of that change will depend on developments in CO_2 prices and successful structural reforms in regions that depend heavily on economic activities related to lignite extraction.

2. There are also minor oil reserves in Schleswig-Holstein.

Figure 1. Germany's fossil energy resources



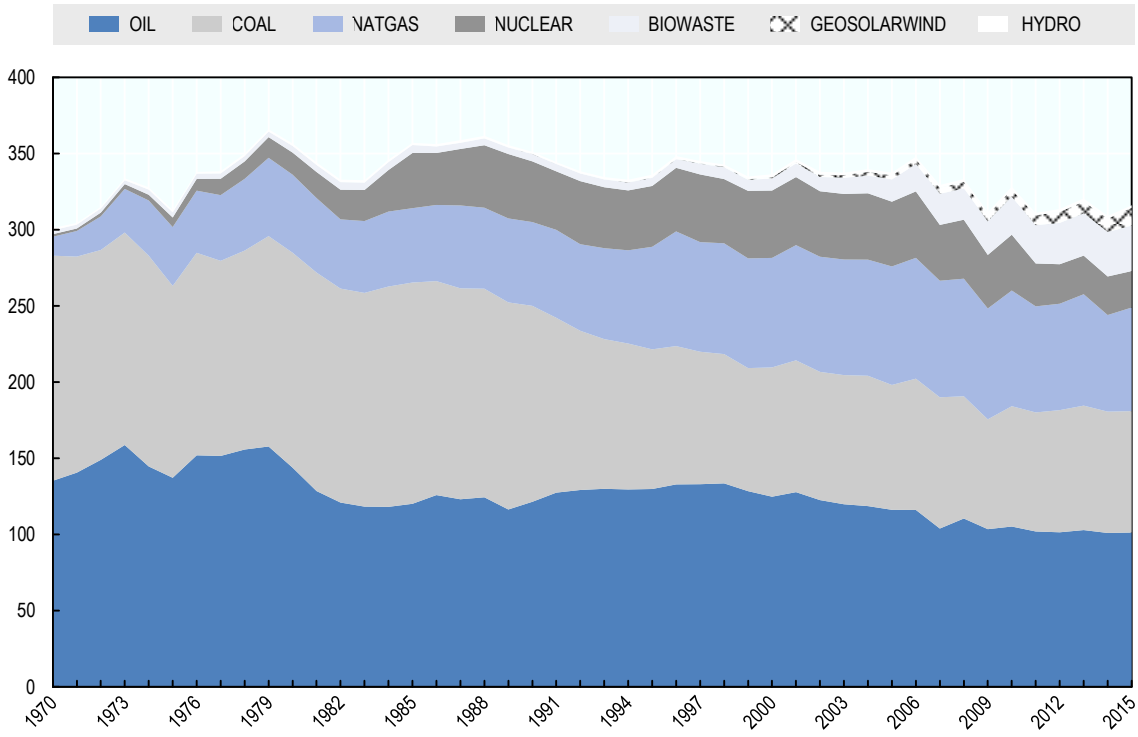
Source: BRG (2017).

Germany's total final consumption (TFC) of energy is dominated by oil products (43%), followed by natural gas (23%); coal and coal products take up only 3% of the country's TFC. Oil products are used mostly in the transport sector (55%), and natural gas consumption is evenly split between residential use and industrial use, at 37% each. Coal is mostly reserved to industrial use, 65% of which goes to the metals industry—ferrous and non-ferrous—followed by chemical and petrochemical production at around 9%; residential consumption of coal accounts for slightly less than 9% of the total.

Germany places great emphasis on improving the energy efficiency of its economy. Industrial consumption of electricity and heat accounted for 45% of total final consumption in Germany in 2014, the bulk of which came from the chemical and petrochemical, machinery, pulp, paper and print as well as and iron and steel industries. The power consumption of six energy-intensive industries (chemicals, paper, steel, aluminium, copper and textiles) accounts for 70% of electricity consumption in the manufacturing sector, and about 27% of total electricity consumption of Germany (Ecofys and Fraunhofer, 2015). Residential consumption takes up 27.8% of the demand

for heat and electricity. Total final energy consumption has declined by 7% since 2000 mainly due to significant reductions in consumption from the iron and steel, mining, nonferrous metals and textile industries. This trend was in large part mitigated by energy consumption increases from the chemical and petrochemical industry, machinery manufacturing, and paper production.[3]

Figure 2. Germany's primary energy supply in mtoe (1970-2015)



Source: IEA (2016).

Market structure

Germany's energy industry has been fully liberalized since 1998, but remains dominated by the four biggest utility companies, which make up a little less than 70% of the market share in conventional electricity generation.[4] The retail electricity market is for the most part privately owned, apart from a few small electricity and gas distribution companies that are entirely or partially owned by municipalities. The Federal Ministry of Economic Affairs and Energy (BMWi) formulates and implements the country's energy policy, including for renewable energy and energy efficiency, and the Federal Ministry for the Environment, Nature Conservation, Building, and Nuclear Safety (BMUB) is

3. IEA Energy Balances (2016).

4. E.ON, RWE, EnBW, and Vattenfall are referred to as the Big Four utility companies in Germany and comprise the largest market share in the first sale of electricity (BNetzA, 2016). Their share in the electricity retail market has shrunk to a little more than 30%. Note: The Bundeskartellamt considers Germany's and Austria's energy markets as one since there are no bottlenecks at the border (BNetzA, 2016).

responsible for climate policy, building and nuclear safety. Both gas and electricity operators are subject to regulation by the Federal Network Agency or Bundesnetzagentur (BNetzA) and by German state (*Länder*) regulatory agencies. BNetzA facilitates the liberalisation and deregulation and further development of the gas and electricity markets.[5] The Incentive Regulation Ordinance (ARegV) is the main regulatory text governing the electricity and gas-distribution system operators. It lays out policies for the expansion of the network and stipulates the grid fees that operators can pass on to end users and efficiency improvement targets for each operator in the network.

The structure of Germany's electricity sector has been largely disrupted by the shutting down of nuclear power plants – eight of the seventeen had already been closed as of 2011, and the remaining ones are planned to be closed by 2022. This change has reduced the market share of the "Big Four"; it will reduce their market shares even further once the rest of nuclear plants close down. The loss in capacity has been made up for by newly installed capacity in conventional power plants and additional renewable energy capacity. The once big-utility-company market has morphed into a much more competitive market with the support of the feed-in-tariffs for renewable energy producers. In 2015, a German household had a choice from among 90 electricity suppliers on average, [6] compared with a dozen in 2007 (BNetzA, 2016).

The natural gas sector comprises a large number of operators responsible for managing networks, storage operations and gas trading. In 2007, it was simplified to function under a two-contract model governing access to the network: a feed-in agreement and take-off agreements between gas suppliers and network operators within two market areas (NCG and Gaspool).

Although E.ON and RWE remain the two dominant players in the natural-gas and electricity markets, their structure continues to evolve. Electricity generated from renewable energy comes from different sources (wind, solar, etc.) that are dispersed throughout the country. With a goal of transitioning to 80% renewable energy sourced electricity, network modernisation and expansion will be needed to facilitate this transition.[7]

Activities associated with the mining of hard coal were consolidated into a single company, RAG AG, in the late 1990s. More than three quarters of the hard-coal and 90% of the lignite consumed in the country is used for power generation; together these two solid fuels generated around 40% of the country's electricity in 2016.[8]

The oil industry is fully liberalised, and comprises a relatively large number of operators. Germany's refining capacity is the second-largest in Europe (after Italy), and ranks among the top 10 in the world. Upstream crude-oil production is dominated by a handful of companies, but there are many companies, including a large number of independents, operating in the refining and retail sectors. The German government has no ownership stake in any oil company.

5. IEA (2013), Energy Policies of IEA Countries: Germany.

6. These are suppliers on the conventional market–determined by supply and demand–and not electricity generation under the feed-in-tariffs under the EEG (BNetzA, 2016).

7. See www.bmwi.de/Redaktion/EN/Dossier/conventional-energy-sources.html

8. See www.bmwi.de/EN/Topics/Energy/Conventional-energy-sources/coal,did=676536.html

Energy prices and taxes

In 1999, Germany implemented an environmental tax reform by increasing taxes on heating and motor fuels. In the same year it introduced the *Electricity Tax Act* to govern the country's electricity taxation. These levies were established, on the one hand, to meet the country's climate policy objective, and, on the other, to lower and stabilise labour costs incurred by German businesses.[9] The 2006 *Energy Tax Act* replaced the *Mineral Oil Tax Act*, and transposed the EU Energy Tax Directive (ETD) into national law.

Following EU competition law, all retail energy prices are set freely by the market. An energy tax is levied in accordance with the Federal *Energy Tax Act*, adding to the basis for the standard 19% value added tax (VAT). The same is valid for the electricity tax. Between 2000 and 2003, the tax rate on energy products was increased each year, but it has remained unchanged since then (Table 1). The *Energy Tax Act*, introduced in 2006, also encompassed coal and lignite used as energy products.

Table 1. Energy taxes in Germany

Motor fuels				
Product	Tax rate per GJ (EUR)	Equivalent tax rate per kg of CO2(EUR)	Tax rate per litre (EUR)	Emission rate (kg of CO2/l)
Diesel	13.2	0.72	0.48	2.71
Petrol	19.9	0.29	0.69	2.42
Natural gas and other hydrocarbon gases	3.86	0.07	-	-
LPG	3.92	0.06	0.09	1.52
Heating fuels				
Product	Tax rate per GJ (EUR)	Equivalent tax rate per kg of CO2 (EUR	Tax rate per litre (EUR)	Emission rate (kg of CO2/l)
Light heating fuel	1.60	0.02	0.06	2.72
Heavy fuel oil	0.62	0.01	0.02	0.2.42
LPG	1.32	0.02	0.03	1.52
Natural gas and other hydrocarbon gases	1.53	0.03	-	-
Coal	0.33	0.004	-	-

Source: tax rates: An ABC of Taxes (2016); • emission conversion factors: IEA (2004, 2016).

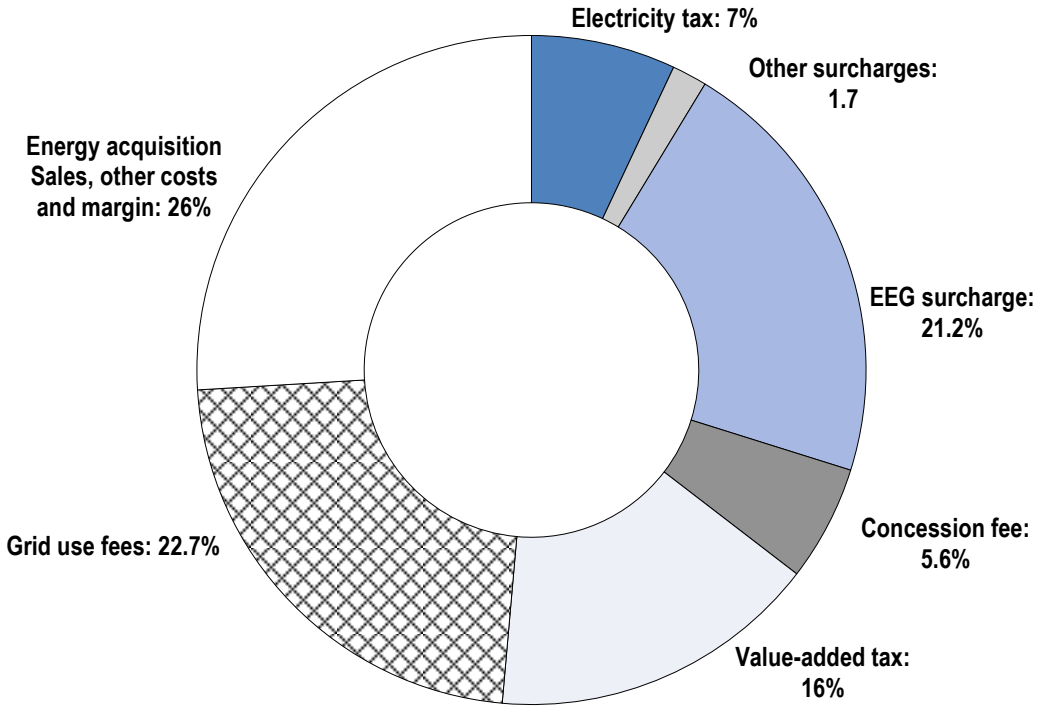
1. The electricity price in Germany comprises several components (Figure 3). Half of the retail electricity price is determined by state-imposed components such as taxes, and surcharges to finance the *Renewable Energy Sources Act* (EEG) and *Combined Heat and Power Act* (KWKG). The standard tax rate on electricity consumption is EUR 0.0205 per kilowatt hour. Following the introduction of feed-in-tariffs for electricity generated from renewable energy, in the early 2000s, the added costs of deploying renewable energy to the electricity system have been passed on to consumers in the form of a surcharge. The EEG surcharge changes every year to account for the change in the cost of

9. See http://www.bmwi.de/Redaktion/EN/Textsammlungen/Energy/strompreise.html?cms_artId=255734

integrating renewable energy into the grid. From 2012 to 2014, the standard rate of the surcharge rose from EUR 0.0359 per kWh to EUR 0.0624 per kWh. In 2014, the *Renewable Energy Sources Act* was amended to stabilise the amount of the surcharge, which since then has fluctuated around the 2014 level; it accounts for approximately 20% of the average price paid by residential consumers of electricity.

The rest of the electricity price is determined by demand and supply conditions and grid fees, which vary across the country. The variation stems from differing costs incurred and demand in different regions of the country. Whenever grid operators use public land for laying pipelines and operating the grid, they must pay concession fees to the local authorities for using rights of way. These fees are negotiated between the operators and the corresponding local authorities, but are capped by the Concession Fee Regulation.

Figure 3. Composition of the electricity price for residential customers with an annual consumption of 3 500 kWh, as of 1 April 2015



Note: The shares are expressed as a percentage of the gross electricity price. Other surcharges include: surcharge under the Combined Heat and Power Act (0.9%), surcharge under Section 19 of the Grid Fee Ordinance (0.8%), surcharge for interruptible loads (0.02%).
Source: BMWi (2017).

In conformance with the 2003 EU Energy Tax Directive, Germany is subject to minimum tax regulation on energy products and electricity and has the right to apply exemptions and reductions as permitted within the purview of the directive. The dual use of energy products and electricity as well as their use in mineralogical processes, and energy products used in air and sea navigation, are exempt from taxation throughout the EU, including Germany. Combined heat and power generation (CHP) benefits from preferential treatment. Additional exemptions or tax preferences can be granted to

agricultural and forestry businesses, energy-intensive businesses or businesses partaking in a tradable permit schemes or equivalent arrangements leading to environmental protection objectives or to improvements in energy efficiency.

Notwithstanding the minimum tax rates for motor fuels used for industrial and commercial purposes, these values, for the most part, exceed the corresponding harmonised minimum tax rate set in Article 8 of the EU Energy Tax Directive and Annex I. Additionally, businesses that produce or import transport fuels pay a contribution (0.3 euro cents per litre for diesel fuel and 0.27 euro cents per litre for petrol) to the Petroleum Stockpiling Association, which stores petroleum products for times of crises. These taxes and fees are, in turn, passed on to consumers.

All producers of primary energy (coal, lignite, crude oil, natural gas), and suppliers of electricity and natural gas, in Germany are subject to the standard corporate income tax of 15%.They pay also a 5.5% solidarity surcharge on their income tax, to make an effective income tax rate of 15.825%. And they pay a trade tax that is determined by the local authorities where the business has a permanent residence. This tax can vary between 7% and 18.2% of net income, with an average rate of 14%.

Royalties (*Förderabgaben*) on extracted resources are levied by the individual *Land*. Federal guidelines recommend setting royalty rates at a minimum of 10%, but states are free to deviate from those guidelines. Producers of crude oil and natural gas, pay royalties in the range of 0% and 40% of the market value of the produced oil or gas **Invalid source specified.**. The royalties can be subsequently deducted from the tax basis of the corporate income tax and trade tax. Most Länder charge no royalties on coal or lignite extraction, however (OECD, 2015).

Germany's broader policy objectives

Germany's overall energy policy is in large part conceived within the framework of their energy transition policy, or *Energiewende*. The country's first priority is to restructure the energy supply in Germany. To that end, it aims is to cut greenhouse gas emission by 40% below 1990 levels by 2020 compared to 1990 emissions, phase out nuclear energy by 2022, and safeguard the country's energy security and competitiveness. The strategy to attain these goals of energy transition is set out in the Energy Concept of 2010 and the decisions of the Bundestag in 2011. The main routes to achieving these objectives are to expand the use of renewable energy and to boost energy efficiency. These two actions target the central areas of electricity, heat and transport. Various measures are used to attain these goals all the while ensuring that energy remains affordable for consumers during the process of restructuring the country's energy supply.

The *Energiewende* is expressed in specified targets for greenhouse-gas emissions, renewable energy and energy consumption to be met by 2050. On 8 July 2016, Germany moved towards a more integrated approach when the Bundestag and Bundesrat adopted three pieces of legislation: on the further development of the electricity market, on the digitalisation of the energy transition, and on the revision of the Renewable Energy Sources Act.[10] The new legislation allows for a more integrated approach to energy market reform as it simultaneously addresses the role of renewable energy, the functioning of the energy market, the strategy towards more energy efficiency and the expansion and modernisation (e.g. digitalisation) of electricity grids. Already, Germany's

10. See http://www.bmwi.de/Redaktion/EN/Artikel/Energy/target-architecture.html

GHG emissions have declined by 27% (compared with 1990 levels) and the share of renewable energy has edged upwards to 30% as of 2014.[11]

The rapid take-up of renewable sources of energy is largely attributed to the feed-in-tariffs for renewable energy installations laid out in the Renewable Energy Sources Act (EEG).[12] This scheme provided long-term contracts for renewable energy providers and was funded by an electricity surcharge passed down to consumers. With the objective of strengthening market forces in Germany's energy market, feed-in-tariffs will be set by competitive auctions as of 2017, while the additional costs will still be borne by energy consumers. The increased competition, coupled with incentives to innovate in the sector, would also ensure a cost-effective energy transition.

Accompanying the change in the country's energy mix, flexible power plants will be crucial to securing the supply of electricity. While nuclear energy will be completely phased-out, fossil fuels will remain part of the country's energy mix; however, their role will change. From being the primary source of electricity generation, fossil fuels will take a backseat as a complement to the less reliable renewable energies along with increased storage capacity. This new energy supply landscape will rely on the efficiency of the grid infrastructure and the effective integration of renewables. To this end, the growing share of wind (offshore) energy and decentralised plants using photovoltaic and biomass will change the shape of the network. Currently, electricity generation takes place close to centres of consumptions, but these newer developments will require more connections at sea and the coastal regions, and greater integration of disparate sources of energy. These expansions are specified and organised under the 2009 *Power Grid Expansion Act*.

Widespread energy efficiency gains will also be key to the success of the country's long-term vision for the energy market. A multifaceted approach to increasing energy efficiency for both households and the industry is an integral part of Germany's Energy Concept. Information dissemination, incentives to adopt energy management systems, R&D funding, among others, are some tools deployed to bring down energy consumption. The building stock will be especially targeted to receive energy upgrades and new buildings will be subject to standards established in the 2012 Energy Saving Ordinance, which requires that they be climate neutral. Buildings account for 40% of final energy consumption and about a third of CO_2 emissions (BMWi, 2010).[13]

Addressing externalities

Germany's *Energiewende* has resulted in a policy mix that favours renewable energy and aspires to relegate fossil fuels to a transitory energy source for electricity generation. The peer-review team sees much merit in the progress Germany has made in

11. The EU-wide impact of reduced GHG emissions in Germany is limited, since the lower emissions in one country reduce prices for allowances and drives up fossil-fuel use in other EU countries.

12. The first iteration of the act was introduced in 2000. It has changed several times, with the current version adopted in 2014.

13. Residential buildings make-up 23% of TFC and commercial and public services buildings 15% (IEA, 2016). Commercial and public buildings include schools, restaurants, hotels, hospitals, museums, etc. and like residential buildings they cover a wide variety of uses and energy services (heating, ventilation and air conditioning (HVAC), domestic hot water (DHW), lighting, refrigeration, food preparation, etc.).

its transition towards a low-carbon economy. In order to meet Germany's state climate change objectives, Germany will need to go beyond eliminating the hard-coal subsidies discussed above and setting energy efficiency conditionality for granting tax benefits.

Addressing environmental externalities that stem from the production and consumption of fossil fuels entails an efficient pricing of energy products that sends a clear signal to consumers. Efficient energy prices (or "corrective taxation") can steer consumers towards cleaner and more energy efficient sources. The 2003 EU Energy Tax Directive set the stage for greater energy tax harmonisation among EU Member States by instituting minimum tax rates for energy products and electricity. In 2011, a proposal to revise the minimum tax rates to reflect both their carbon content and energy efficiency was introduced. Although it was dismissed in 2015, it brought to the fore issues related to differentiated energy taxation. This discussion goes back to the question of efficient energy pricing in the EU, and in the case of this peer review process, in Germany. Setting tax rates on energy products based on their CO_2 emissions and energy content can be effective in "correcting" for some of the externalities[14] generated by their consumption. However, in the European context, the overlapping of national regulations with the EU ETS needs to be in order to ensure that the additional instruments can allow for future reductions in the cap on emissions.

According to the IMF's work on corrective taxation (Parry et al., 2014), Germany has managed to set efficient tax rates to internalise environmental externalities related to gasoline and has come fairly close to offsetting the costs from diesel consumption.[15] IMF staff estimates suggest that the largest gains from reforming its energy taxation would be from adequately adjusting its coal tax.[16]

14. The "corrective" taxation could go also address environmental costs related to local air pollution for which diesel is a major culprit (Harding, 2014).

15. Nitrogen oxide is still a major source of air pollution, and old diesel vehicle are its main source in cities. See https://www.umweltbundesamt.de/en/press/pressinformation/air-quality-2016-nitrogen-dioxide-still-the-top .

16. This is the case for most countries assessed in (Parry et al., 2014[6]). In the German case, a corrective carbon tax of about USD 10 per gigajoule can lead to 30% less air pollution related deaths, 15% reduction in carbon emissions, and a 1% gain in government revenue.

Government support for fossil fuels in Germany

General observations

The German energy market has been greatly transformed over the last decade and will continue to experience significant changes. Germany's *Energiewende* has shaped much of the developments in the energy sector as the country continues to wean itself from fossil fuels and nuclear power; this process started in 2000. The growing capacity of renewable energy and the waning role of fossil fuels and nuclear power in electricity generation and primary consumption are at the forefront of Germany's strategy. This transition picked up even more speed after the catastrophic accident at the Fukushima[17] nuclear power station in Japan in 2011. Germany's transition towards renewable energy and greater energy efficiency is formalised in the Federal Energy Concept of 2010 and subsequent legislation set out by the Bundestag and the EU.

The German Federal Government releases an official biannual "Subsidy Report" taking stock of its subsidies, their rationale, and more recently their sustainability. In 2015, the report was released along with Subsidy Policy Guidelines that set out a framework for assessing the efficiency of a subsidy, and for promoting transparency and accountability. Among the goals of these subsidy policy guidelines is to establish degression rules — i.e. rules for phasing out — for outlays and tax benefits that are already in place.

Section 12 of the Act to Promote Economic Stability and Growth of 1967 specifically describes financial assistance as federal funds used to: *(i)* support particular sectors; *(ii)* help certain sectors with structural adjustment; or *(iii)* increase productivity or growth for business and economic sectors. Tax benefits are any tax rules that reduce public revenue and they are classified in the same way.

The German Self-Report (GSR) lists 22 subsidies, both direct budgetary transfers and tax expenditures, the majority of which rank among the largest financial assistance and tax benefit items enumerated in the 26th Subsidy Report of the Federal Government (Table 2). Only those measures enacted by the Federal Government are mentioned in the GSR. The GSR classifies each support measure along the three categories enumerated above, whether it is budgetary transfer or tax benefits. For support measures that do not fall under any of the three categories, they are listed as miscellaneous financial assistance. The bulk of the policies included in the GSR are energy and electricity tax preferences given to the manufacturing and agricultural sectors. Apart from the two direct subsidies that benefit the hard-coal mining industry, no reform-plan exists for the other policies identified in the GSR.

The phasing-out of the subsidies to the hard-coal mining industry was set into motion several years ago (Box 1). The other measures, the tax benefits granted to

17. The use of nuclear power in electricity generation will end in 2022. See: http://www.bmwi.de/Redaktion/EN/Dossier/electricity-market-of-the-future.html

Germany's industrial and agriculture sectors, are, however, not considered inefficient by the German administration. In its view, these measures ensure the international competitiveness of German industry and prevent carbon leakage to countries with less stringent environmental regulation. The peer-review team suggests that it would be helpful to have quantitative evidence on the extent of the risk to competitiveness and of carbon leakage that would result from tax preferences reforms.

Table 2. The 22 policies that Germany identified in the German Self-Review

Full name of the measure	Measure identifier	Estimated annual fiscal cost (2016) EUR millions
Subsidies for the exploration, development and extraction of fossil fuels		
Grants for the sale of German hard-coal for electricity generation, for sale to the steel industry and to offset the impact of capacity adjustment	S-1	1287.5
Granting of adjustment benefit to employees in the hard-coal mining industry	S-2	107.3
Subsidies for the refining and processing of fossil fuels		
Tax advantage for energy products used to produce other energy products for the maintenance of operations (producer?s privilege)	T-1	350
Subsidies for power and heat generation		
Energy tax advantage for electricity generation	T-2	1700
Tax advantage for energy products used to power gas turbines and internal combustion engines at advantaged installations in accor?dance with section 3 of the German Energy Tax Act (electricity generation, combined heat and power, gas transportation and storage)	T-3	-
Subsidies for fossil fuels used in transport		
Tax advantage for energy products used in inland shipping operations	T-4	180
Energy tax advantage for local public transport	T-5	72
Tax advantage for energy products used in the domestic aviation industry	T-6	570
Electricity tax advantage for rail and trolleybus operations	T-7	143
Tax advantage for liquefied gas and natural gas used as fuels	T-8	134
Subsidies for fossil fuels used in the manufacturing, agricultural and forestry sectors		
Electricity price compensation	T-9	245
Energy tax advantage for certain processes and procedures	T-10	553
Tax advantage for agricultural and forestry businesses (agricultural diesel)	T-11	450
Energy tax advantage for companies in the manufacturing sector, and agricultural and forestry businesses	T-12	153
Energy tax advantage for companies in the manufacturing sector in special cases (tax cap)	T-13	172
Electricity tax advantage for certain processes and procedures	T-14	836
Electricity tax advantage for companies in the manufacturing sector, and agricultural and forestry businesses	T-15	1052
Electricity tax advantage for companies in the manufacturing sector in special cases (tax cap)	T-16	1614
Miscellaneous tax benefits		
Special equalisation scheme to reduce the surcharge levied to finance the additional costs of the deployment of renewable energies in electricity generations (EEG surcharge)	T-17	4800
Special equalisation scheme to reduce the surcharge levied to finance the additional costs of the deployment of combined heat and power plants (CHP surcharge)	T-18	493
Relief on grid charges	T-19	No estimate provided
General state measures in the social field	T-20	No estimate provided -

The remainder of this section presents the policies that Germany has described and nominated for reform in the GSR, and the questions and comments raised by members of the peer review team. In what follows, discussions of particular measures are organised according to their incidence along the fossil-fuel supply chain, starting with the upstream exploration and development of fossil-fuel resources, and progressing downstream to refining and their use in power and heat generation, transport, and the manufacturing, agricultural and residential sector. The text boxes below describing individual measures are based on those prepared by Germany and reported in its self-review report.

Subsidies for the exploration, development and extraction of fossil fuels

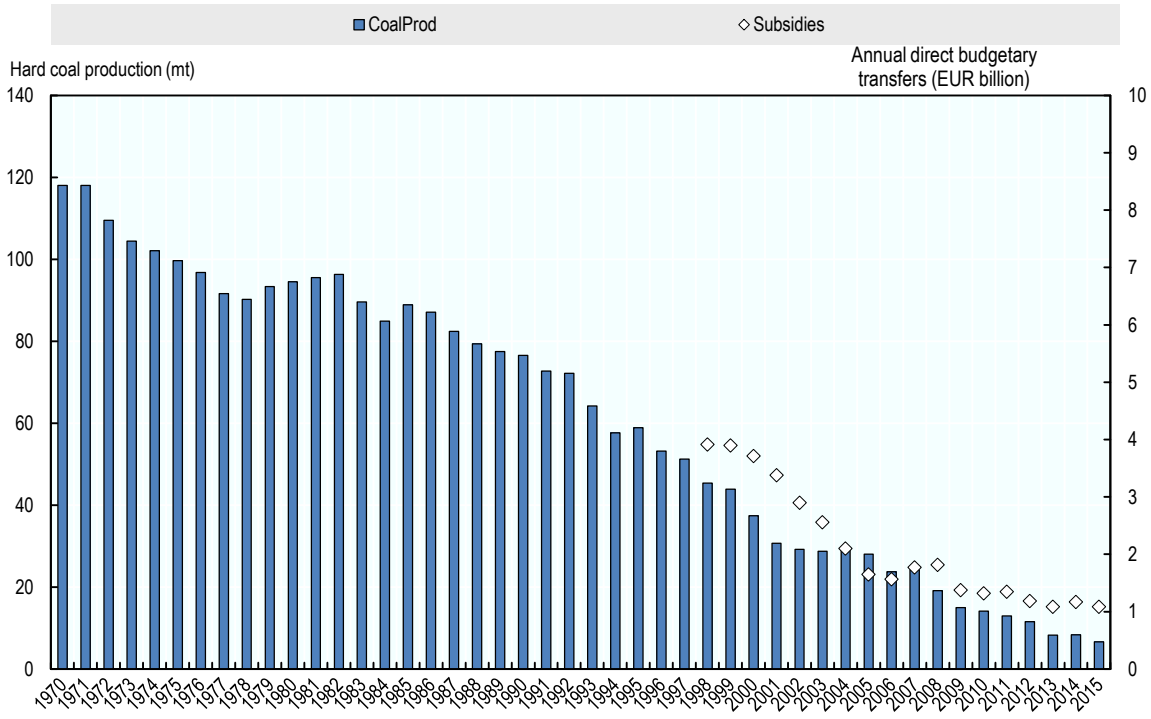
The reported subsidies under this category pertain only to the hard-coal industry. This industry faces extraction costs that are among the highest in the world, owing to unfavourable geological conditions. Up until 2015, the hard-coal mining industry was the biggest recipient of government outlays.[18] The industry has been struggling for decades and government assistance has been instrumental in keeping it afloat. The Federal Government, and the coal mining states of North Rhine-Westphalia and Saarland, grant financial assistance to close the gap between the revenues the industry recovers from the sale of hard-coal and the costs of producing it. Hard-coal consumption is mostly used for electricity generation (78%) and for the steel industry (20%).[19]

The German hard-coal mining industry is nearing the end of a decades-long process of restructuring, with the government scaling down its assistance. It will cease to exist by the end of 2018 (Figure 4). As the supply of electricity from renewable-energy sources has grown, Germany's energy system has less and less relied on domestic hard-coal production. Support to the industry in recent years has been provided mainly to assist in the gradual phasing-down of production.

18. 25th Subsidy Report of the Federal Government, 2015

19. See www.bmwi.de/Redaktion/EN/Dossier/conventional-energy-sources.html

Figure 4. Germany's hard-coal production



Data Source: IEA (2017), BMF (2015).

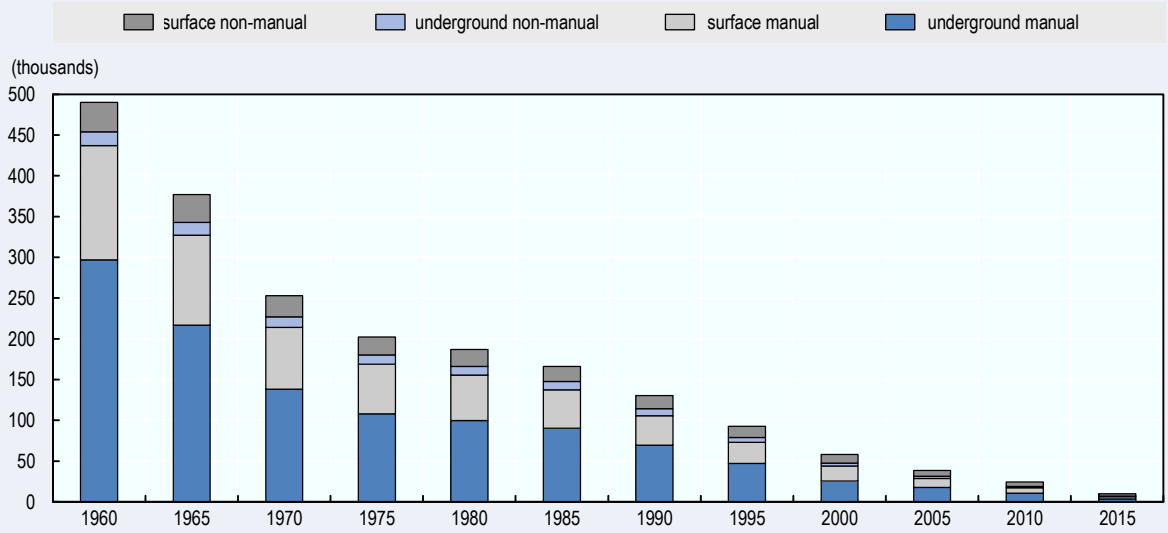
In 2007, the Federal Government, the *Länder* of North Rhine-Westphalia and Saarland, as well as the German Hard-Coal Corporation (RAG Corporation) and the Mining, Chemical and Energy Industrial Union (IG BCE), reached an agreement on the socially acceptable phasing-out of subsidies for hard-coal in Germany by the end of 2018.[20] At the EU level, in 2010, Decision 2010/787/EU established that subsidies for hard-coal mines should be phased out by 2018. The steps to winding down the industry are set out in the *Coal Financing Act*. The three parties listed above, government authorities and RAG AG, have produced a plan to phase out the subsidies granted to hard-coal mining activities in a socially acceptable manner that also does not cause major economic disruption to the region.

20. This was the last in-depth review of the hard-coal industry.
See www.bmwi.de/EN/Topics/Energy/Conventional-energy-sources/coal.html

Box 1. A brief history of Germany's hard-coal industry

Coal mining bolstered Germany's industrial revolution and secured its place as one of the world's top coal producers. Its production peaked in the middle of the 20th century, reaching 150 million tonnes of hard-coal and employing 600 000 workers. In 2016Today, the country's production of hard-coal had fallen is down to just 47 million tonnes —2.5% of its 1956 level—and 7 500 employees (Figure 5). The decline in mining-related jobs was accompanied by a special support programme for employees and companies to ensure that workers could quickly find new employment. The Ruhr industrial region in the Land of North Rhine-Westphalia once produced three-quarters of the country's hard coal, followed by the Saar Land. The region's steel and hard-coal industry developed in tandem, which provided favourable conditions for their mutual growth. But the heydays of the hard-coal mining industry are long gone.

Figure 5. Employment in Germany's hard-coal mining industry, 1960-2015



Data Source: Statista (2017).

For most of the last 60 years, Germany's hard-coal mines have been unable to survive without subsidies. From the late 1950s until the early 1970s, oil was a cheaper energy source. Since the 1980s, the development of hard-coal mines with cheaper extraction costs elsewhere has made it difficult for the domestic industry to compete against imports. According to the German Federal Institute for Geosciences and Natural Resources, BRG, the average production cost for hard-coal mines is EUR 180/tonne — two to three times the world price. To prevent a complete collapse of the industry, the German government has been subsidising a gradually declining output. As of early 2017, only two three mines remained open in the whole country, and all were located in North Rhine-Westphaliathe Ruhr region .

The first period of structural change in the country's energy supply resulted in pit closures, leading to social unrest. In 1968, the Federal government passed the Coal Adjustment Law, Kohleanpassungsgesetz, to consolidate the hard-coal mining industry and manage the closure of the least profitable pits. Ruhrkohle AG, whose current incarnation is RAG AG, was created that year as an umbrella company joining together several companies from the region. In 1987, a Kohlerunde took place gathering different stakeholders in the coal mining industry to come to an agreement to the downsizing of the sector through 1995.

At the time, Ruhrkohle AG was deemed essential to securing the country's energy supply, since Germany depends heavily on imports of crude oil and natural gas. In the late 1980s and early 1990, the European Commission intervened several times to underline the incompatibility of coal subsidies with policies within the European Community.

After the unification of East and West Germany in 1990, coal subsidies resurfaced as an issue due to the added pressure on public finances of integrating East Germany. In 1991, another Kohlerunde was called to extend the agreement beyond 1995, resulting in the Coal Concept 2005, which mapped out the phasing-out of subsidies to the mining sector and further capacity adjustment.

Finally, the German government and the hard-coal mining trade union came to an agreement on the phasing-out and eventual termination of the financial assistance by the end of 2018. This last agreement, established in 2007, guarantees a socially and regionally acceptable phasing-out programme such that no lay-offs result from the closing of the mines and that those who are close to retirement age are covered by the financial assistance. To carry out this plan, the mining industry was consolidated under one entity, RAG AG, and the post-termination liabilities and operations were delegated to the RAG Foundation. Prior to the agreement, RAG AG consisted of two entities: a hard-coal mining unit and a chemical, energy and property division. After the restructuring, the chemical, energy and property division was renamed Evonik Industries. The shareholders at the time, E.ON, RWE, ThyssenKrupp and ArcelorMittal, transferred their shares to the RAG Foundation, which proceeded to purchase Evonik and sell 25% of its shares to British investor CVS in 2008. The RAG Foundation owns RAG AG and is responsible for implementing the phasing-out process, the closing of the hard-coal sector, and the longer-term operations.

Underground workers aged at least 50 and surface workers aged at least 57 who lose their jobs due to the closing down of mines prior to 1 January 2023 will receive adjustment benefits as a form of transitional assistance for a maximum of five years until they are eligible for pension-insurance benefits. The long-term liabilities (e.g. the treatment of drainage water) will be under the responsibility of the RAG Foundation, and when necessary, the Länder of North Rhine-Westphalia and Saarland and the Federal Government would step in to cover any financial shortfall: Two-thirds of the costs would be covered by the *Land* and one third by the Federal government.[21]

21. See www.bmwi.de/Redaktion/EN/Artikel/Energy/coal.html

The GSR identifies two subsidy measures, S-1 and S-2, pertaining to coal production as adjustment assistance. The support measures compensate RAG AG for losses on the sale of coal for electricity generation, for the sale to the steel industry, and for costs incurred in making capacity adjustments. Only the aid for rehabilitation of mines and employee retirement will continue past 2018. In addition to the outlay granted by the Federal Government, the *Land of North Rhine-Westphalia*, contributes an additional amount of around 20%.

The gradual scaling-down of the industry did not result in any employees being laid-off; a company had to retain employees for alternative employment or relocate them to other sectors.[22] As of 2006, there were 3000 employees who were deemed too young to qualify for benefits, but most have since been relocated; only 500 of them did not have the skills to find employment in other sectors. For those who qualify, benefits usually amount to more than what the workers would receive from unemployment insurance, but they represent a reduced salary.

RAG AG manages and sells the premises after pit closure and will sell off any remaining coal stockpiles, left after 2018. The company also sells the existing mining equipment and is trying to monetise its inventory and use the freed land for other uses, such as solar photovoltaic panels. The company also uses the grants for water management. RAG Foundation was set up as a separate company to raise funds for the legacy debt, with a supervisory board of public officials and trade-union representatives.

There are additional subsidies that benefit the production of hard coal and lignite, yet have not been included in the GSR.[23] Many Länder exempt coal or lignite production from paying royalties, in contrast with Federal guidelines that recommend that royalty rates for resource extraction be set at a minimum of at least 10%. Another support measure that benefits lignite production is the exemption from payment of the fee to extract ground water amount to a yearly EUR 47 million from 2005 to 2014 (OECD, 2015).

Since the reunification of the German Democratic Republic with the rest of Germany, federal and state governments have collectively provided more than EUR 9.3 billion to help pay the cost of rehabilitating land in the east of the country disturbed by past lignite mining. These expenditures do not benefit current production. The Federal Mining Act of 1982 (BBergG), which governs the licensing and exploration rules for the extraction of resources does not specify who would be responsible for the permanent legacies of the mining industry, but in the case of the previously state-owned enterprises, the Federal Government assumed the responsibility.[24] For example, after the reunification, all mines in southern Lausitz were closed and the Federal government set

22. The German Administration explained that the scaling-back in employment, from 1997 to 2015, was attributed to early retirement (50%), successful occupational re-training and transition aids (30%), relocation within the corporate group (3%), and the remaining 14% from natural fluctuations. Those who were able to relocate were hired mainly by small and medium sized companies in the electrical and metallurgical industry, in the services sector or by municipal fire brigades.

23. Although the following measures involved subnational support measures, they confer large benefits to coal producers.

24. See https://www.umweltbundesamt.de/en/mining-law

up Lusatia and Middle Germany Mining Administrative Company, or LMBV, in 1994, with the mission to rehabilitate all the mines from the GDR period.[25]

25. See https://www.theguardian.com/environment/2014/sep/10/lusatia-lignite-mining-germany-lake-district

[S-1] Grants for the sale of German hard-coal for electricity generation, for sale to the steel industry and to offset the impact of capacity adjustments

Objective	The subsidies are intended to help ensure the hard-coal mining industry is wound down in a socially acceptable manner by the end of 2018.
Legal basis	Hard-coal Financing Act of 20 December 2007, amended by Article 1 of the Act of 11 July 2011; Guidelines of the Federal Ministry of Economics and Technology on the granting of assistance to mining companies for the production of electricity from coal, coking coal and expenditure on decommissioning (Coal Guidelines) as amended on 6 July 2011. The Council Decision of 10 December 2010 on State aid to facilitate the closure of uncompetitive coal mines (2010/787/EU) and the authorisations issued by the European Commission on the basis of this decision constitute the basis in European law for the granting of this aid.
Budget item	Chapter 09 03, item 683 11
Type of budgetary funds	Grant

Annual tax expenditure (EUR million)	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
	3 912.4	3 894.4	3 712.0	3 379.6	2 896.2	2 558.7
	2004	**2005**	**2006**	**2007**	**2008**	**2009**
	2 101.9	1 645.2	1 561.9	1 771.6	1 815.9	1 375.3
	2010	**2011**	**2012**	**2013**	**2014**	**2015**
	1 319.4	1 348.4	1 181.8	1 082.4	1 168.7	1 084.8
	2016	**2017**	**2018**			
	1 287.5	1 053.6	1 020.3			

Co-financed by local authorities	Yes
Time limit	An agreement has been reached between the German Federation, the hard-coal mining Länder (North Rhine-Westphalia and Saarland), RAG AG and the Mining, Chemical and Energy Industrial Union (IG BCE) that subsidised hard-coal mining is to be phased out in a socially acceptable manner by 2018. In addition to this, a declining number of employees will still be required for the decommissioning of the pits. Against this background, the adjustment benefit guidelines in force at present will apply until 2027.
Degression	The assistance provided to the hard-coal mining industry has fallen since 1998. Federal assistance approximately halved from 1998 to 2005 and shrank once again by approximately 25% from 2006 to 2014. Deviations from this downward trend have been seen, above all, as a result of year-on-year fluctuations in world market prices for hard-coal.
Outlook	The downward trend in levels of assistance and the discontinuation of the subsidies for the sale of hard-coal by 2018 were the inevitable implications of the decision that subsidised hard-coal mining would be wound down in Germany by the end of 2018.

[S-2] Granting of adjustment-benefit to employees in the hard-coal mining industry

Objective	The payments made serve the socially acceptable management of the necessary reduction in support for hard-coal production
Legal basis	Guidelines of the Federal Ministry of Economics and Technology on the granting of adjustment benefit to employees in the hard-coal mining industry of 12 December 2008
Budget item	Chapter 09 03, item 683 11
State Aid (EU)	No
Type of budgetary funds	Grant

Annual tax expenditure (e = estimated, EUR million)	**2013**	**2014**	**2015**	**2016**	**2017e**
	114.9	116.6	116.0	107.3	108.7

Co-financed by local authorities or EU	Yes
Time limit	An agreement has been reached between the German Federation, the hard-coal mining Länder (North Rhine-Westphalia and Saarland), RAG AG and the Mining, Chemical and Energy Industrial Union (IG BCE) that subsidised hard-coal mining is to be phased-out in a socially acceptable manner by 2018. In addition to this, a declining number of employees will still be required for the decommissioning of the pits. Against this background, the adjustment benefit guidelines in force at present will apply until 2027.
Degression	On account of the degressive structuring of the assistance to support sales of coal, the number of employees is going down as well. This trend is also being followed with a time lag by a decline in the number of adjustment benefit cases.
Outlook	The downward trend in levels of assistance and the discontinuation of the subsidies for the sale of hard-coal by 2018 were the inevitable implications of the decision that subsidised hard-coal mining would be phased out in Germany by the end of 2018.

Support measures for the refining and processing of fossil fuels

Germany has about a dozen crude-oil refineries and is, along with Italy, among the biggest centres of petroleum refining in Europe. Crude oil is transported into the country via four transnational pipelines and also from its ports. Petroleum refiners own the pipeline infrastructure; the pipelines are in turn operated by joint ventures of oil companies. About half of Germany's imported crude oil is exported as refined products. Despite the large capacity of the German refining sector, the waning consumption of petroleum products at the national and EU level, coupled with increasing non-European competition, has led to the sale and decommissioning of several refineries. Today, most German refineries are owned by foreign multinational energy companies. Given the challenges facing the refining sector in Germany and at the EU level, the then EU

Commissioner for Energy established an EU Refining Roundtable in early 2012. Representatives of European refineries, trade unions and members of the European Parliament discussed the structural changes of the sector and the impact of the European regulatory framework.

The refining sector is exempt from the energy tax in Germany. This is the case at the European level, as stipulated in The EU ETD,[26] which rules out taxation of self-produced energy sources in order to avoid double taxation.[27] Energy products purchased outside of the immediate vicinity of the refining and processing plant are also exempt from excise taxes. Following this directive, the *Energy Tax Act* precludes refineries, gas producers and coal plants from paying the tax on energy products.

This producer privilege is obligatory for self-produced energy products throughout the EU. The tax advantage granted to producers of energy products, in Germany, according to the *Energy Tax Act*, correspondingly applies to self-produced energy products. Fuel refining, an energy-intensive activity, is subject to high energy costs. Thus this measure is deemed in the GSR necessary to ensure the international competitiveness of this sector and prevent relocation of production and therefore of emissions. The level of taxation applied to the refining and processing sector, according to the GSR, is comparable to both European countries and the rest of the world. The measure is, however, recognised by the German Administration as encouraging the use of such fuels. Given the obligatory benefit, a change would be necessary at the EU level.

[T-1] Tax advantage for energy products used to produce other energy products for the maintenance of operations (producer's privilege)

Objective	Ensuring the competitiveness of production plants			
Legal basis	Sections 26, 37, 44 and 47 Energy Tax Act			
Financing formula	German Federation: 100%			
Annual tax expenditure (e = estimated, EUR million)	**2013**	**2014**	**2015**	**2016e**
	350	350	350	350
Degression	No provision has been made for degression.			
Outlook	There are no plans at present for fundamental changes to this arrangement.			

26 Article 21(3) of Council Directive 2003/96/EC of 27 October 2003.

27 . "Double" taxation is the wording used in the GRS to refer to taxation of both inputs and outputs in energy or fuel production.

Support measures for power and heat generation

In Germany, approximately half of electricity is generated from fossil fuels,[28] and natural gas serves as a major source of heat, making up 40% of household demand. As a typical excise duty the energy tax levied on the consumption of energy products is collected from the producers and suppliers of energy for their own consumption and for the consumption of their clients and consumers on which the tax is finally passed. Energy tax is levied on light heating oil,[29] heavy fuel oil, liquefied petroleum gas, natural gas and other hydrocarbon gases and coal.[30] To avoid double taxation of energy products, energy products used in electricity generation are exempt from energy tax (T-2).

[T-2] Energy tax advantage for electricity generation

Objective	Preventing the double taxation of electricity generation.			
Legal basis	Sections 37 and 53 Energy Tax Act			
Financing formula	German Federation: 100%			
Annual tax expenditure (EUR million)	**2013**	**2014**	**2015**	**2016**
	1 800	1 800	1 800	1 700
Degression	No provision has been made for degression because the objective of the measure is to remain in place.			
Outlook	There are no plans at present for fundamental changes to this arrangement.			

While the progression towards a low-carbon economy relies on the increase of energy from renewables and greater energy efficiency, energy supply in Germany is expected to rely on electricity from conventional power plants for many years to come. To ensure that the country's energy supply is consistent with the goals of the *Energiewende*, combined heat and power generation (CHP) plays an important role as a complement to the intermittent renewables generated electricity. Natural gas qualifies for the tax advantage, T-3, if it is used for combined power and heat generation and if the average efficiency of the CHP plant is at least 60%. Under these conditions, efficient installations benefit from a reduced tax rate, set at the minimum rate of the EU Energy TaxDirective.[31,32] This preferential treatment (T-3) intends not only to avoid double taxation but also to support low-carbon energy generation while securing the country's electricity supply. This tax advantage allows lower tax rates, whereas a full tax refund can

28. 23.9% comes from lignite, 18.2% from hard-coal, 9.6% natural gas, and 1.0% from petroleum production in 2015. See: www.bmwi.de/Redaktion/EN/Dossier/electricity-market-of-the-future.html

29. Red dyestuff and a chemical marker are added to light heating oil to prevent its illegal use as fuel for diesel engines.

30. German Ministry of Finance, An ABC of Taxes, 2015.

31. Ibid.

32. The EU Energy Taxation Directive grants the right to member state to either totally or partial exempt energy products from the tax or to set a reduced rate.

be granted for energy products used in electricity production under Sections 37, 53 Energy Tax Act (T-2).

[T-3] Tax advantage for energy products used to power gas turbines and internal combustion engines at advantaged installations in accordance with section 3 of the German Energy Tax Act (electricity generation, combined heat and power, gas transportation and storage)

Objective	1960: Equal tax treatment of the operation of fixed gas turbines for the generation of power and heat with the operation of steam turbines 1978: Extension of this tax advantage to fixed internal combustion engines 1992: For environmental reasons, support exclusively provided for combined heat and power plants with annual utilisation ratios of at least 60 per cent 2006: The transposition of Council Directive 2003/96/EC of 27 October 2003 (Energy Tax Directive) led to the adaptation and extension of the previous tax advantage. "Purely" electricity-generating plants are now also included in the category of installations that are advantaged			
Legal basis	Section 2 subsection (3) in conjunction with section 3 Energy Tax Act			
Annual tax expenditure	**2013**	**2014**	**2015**	**2016**
	Not available	Not available	Not available	Not available
Financing formula	German Federation: 100 per cent			
Degression	No provision has been made for degression.			
Evaluations	No evaluations have been conducted to date.			
Outlook	There are no plans at present for fundamental changes to this arrangement.			

Support measures for fossil fuels used in transport

Motor fuels make up the largest category of taxable energy products in Germany and also yield the most revenue.[33] The GSR identifies four measures, T-4 to T-8, benefitting the transport sector. To encourage the use of public transport and low-carbon modes of transport, tax advantages are granted to the public transport sector and to rail and trolleybus operators. In these two cases, the tax advantages strengthen the competitiveness and thereby encourage the use of cleaner modes of transportation. Additionally, the tax reduction to rail and trolleybuses aims to lower congestion by moving road traffic onto rails. Public transport (both motor vehicles and rail) benefits from a reduction in the energy tax of about 7% to 11.5 % depending on the used fuel. Passenger transport by rail, and trolleybuses, benefit from a 44% reduction in the electricity tax.

33. An ABC of Taxes, 2016.

Energy products used for inland shipping and aviation operations are exempt from the energy tax. Article 14 of the EU ETD[34] grants full exemption to energy products used for commercial air navigation and commercial navigation within Community waters (including fishing). At the international level, Article 24 of the International Civil Aviation (Chicago Convention) bans the taxation of kerosene use for international commercial flight. According to the GSR, tax exemptions T-4 and T-6 are meant to meet existing international obligations and to maintain the competitive position of European Community companies. Both commercial domestic and foreign carriers benefit from either a full exemption, by purchasing tax-free fuels, or a full tax refund. Under the aforementioned directive, taxation of aviation (for intra-Community flights) and shipping fuel would be possible were Germany to enter into bilateral agreements with other EU member states to set a positive tax rate.[35]

Gaseous fuels (i.e. LPG, natural gas and other hydrocarbon gases) benefit from a reduced rate of energy tax, which is approximately 55% below the standard rate. Since gaseous fuels can serve as substitutes for mineral-based liquid fuels, this measure is intended to encourage diversification of energy supply away from the fuel's more carbon-intensive and more polluting counterparts. In the GSR, the tax preference, by creating a larger market share for gaseous fuels, helps reduce GHGs, particularly when used in combination with renewable fuels (e.g. biogas).

[T-4] Tax advantage for energy products used in inland shipping operations

Objective	Harmonisation of competitive conditions for shipping operations on other waterways with the exemption from taxes and duties that applies for the Rhine basin on the basis of international treaties			
Legal basis	Sections 27 subsection (1) and 52 subsection (1) Energy Tax Act			
Annual tax expenditure (EUR million)	**2013**	**2014**	**2015**	**2016**
	160	160	180	180
Financing formula	German Federation: 100 per cent			
Degression	In view of the extant agreements and the different levels of taxation on shipping operations in the Community, it will only be possible for subsidies to be phased out in cooperation with the other EU states and the states party to the relevant treaties.			
Outlook	There are no plans at present for changes to be made to this arrangement.			

34 Council Directive 2003/96/EC

35 The tax rate set under these bilateral agreements can be below the minimum level set out in the directive.

[T-5] Energy tax advantage for local public transport

Objective	Ensuring and strengthening the competitiveness of local public transport			
Legal basis	Section 56 Energy Tax Act			
Financing formula	German Federation: 100 per cent			
	2013	**2014**	**2015**	**2016**
Annual tax expenditure (e = estimated, EUR million)	72	76	76	72
Degression	The 2004 Budget Support Act reduced the level of this advantage with effect from 1 January 2004. Further degression would not be expedient.			
Outlook	There are no plans at present for fundamental changes to this arrangement.			

[T-6] Tax advantage for energy products used in the domestic aviation industry

Official objective	Ensure the competitiveness of Germany's aviation industry			
Legal basis	Sections 27 subsection (2) and 52 subsection (1)Energy Tax Act			
Financing formula	German Federal Government: 100 per cent			
Annual tax expenditure (e = estimated, EUR million)	**2013**	**2014**	**2015**	**2016e**
	530	530	570	570
Degression	None planned			
Outlook	No changes are planned.			

[T-7] Electricity tax advantage for rail and trolleybus operations

Objective	Relieving the burden of electricity tax on rail and trolleybus operations			
Legal basis	Section 9 subsection (2) Electricity Tax Act			
Financing formula	German Federation: 100 per cent			
Annual tax expenditure (e = estimated, EUR million)	**2013**	**2014**	**2015**	**2016**
	119	120	141	143
Degression	The 2004 Budget Support Act raised the reduced tax rate of 50% of the standard rate to approx. 55% with effect from 1 January 2004. No provision has been made for further degression.			
Outlook	No changes are planned.			

[T-8] Tax advantage for liquefied gas and natural gas used as fuels

Objective	Support for the increased deployment of gas-powered engines on environmental and climate-policy grounds			
Legal basis	Section 2 subsection (2) Energy Tax Act			
Financing formula	German Federation: 100%			
Annual tax expenditure	2013	2014	2015	2016
(EUR million)	147	143	128	134
Degression	This tax advantage was partially reduced by the 2004 Budget Support Act.			
Outlook	Legislation passed in July 2017 extends the tax relief for natural gas used as a transport fuel (in the form of CNG or LNG) past 2018 to the year 2026. This tax incentive will be successively reduced from 2024 onwards. The tax relief for liquefied petroleum gas (LPG) will also be extended past 2018. From 2019 onwards, this tax relief will be reduced on a degressive basis by 20% per year, expiring at the end of 2022. The regular tax rate will be applied from 2023 onwards.			

Support measures for fossil fuels used in the manufacturing, agricultural and forestry sectors

Industrial sectors benefit from the largest share of subsidies, amounting to 53% of total subsidies; energy-intensive sectors benefit from lower tax rates on their energy and electricity consumption. Total (fossil fuel and non-fossil fuel related) subsidies for the manufacturing and agricultural sectors are expected to increase, but financial assistance

targeting energy efficiency and renewable energy would be the main factor driving this trend.[36]

The GSR identifies eight subsidies, T-9 to T-16, that benefit various sectors such as manufacturing, agriculture and forestry. The electricity price compensation is granted as budgetary aid. Whereas the other subsidies are granted as tax relief or a tax exemption on the energy tax or electricity tax. Two of the tax benefits, T-13 and T-16, are conditional on meeting energy efficiency standards and on the adoption of an operating energy or environmental management system according to international standards in DIN EN ISO 50001 or EMAS. In the case of SMEs, they are required to put in place an alternative system to improve energy efficiency. Efficiency criteria are set at the industrial sector level.

The electricity price compensation policy (T-9) aims to compensate for indirect CO_2-emission costs based on a benchmark system that incentivises efficiency improvements. Indirect CO_2–emission costs are caused by electricity generators passing on the costs of emission allowances to their customers through the price of electricity. Facilities eligible under the compensation scheme are defined as the electricity-intensive sectors and subsectors mentioned in Annex II of the EU State Aid Guidelines.[37] Eligibility is therefore linked to the electricity consumption of installations. Participation of the recipients in the EU-ETS is not a precondition for eligibility. The European Commission has specified which industries qualify for the State Aid under the premise that the cost burden places the industries under risk of relocation. To qualify, the cost of electricity for a sector must in principle exceed a set threshold and its sector must be exposed to international competition. The compensation covers the ETS-related electricity cost and is degressive. It was set initially for the period 2013 to 2015 to cover 85% of the indirect costs, and then lowered to 80% for the years 2016 to 2018, and it is scheduled to be reduced to 75% for 2019 and 2020. The cost of the purchase of one gigawatt hour per year and installation is deducted from the total aid amount of a company.

The affected industries are identified according to both their energy and trade intensities. To discourage any increase in electricity consumption, the electricity price compensation is determined based on European Commission product-group-specific (e.g. non-ferrous metals, steel, basic chemicals) energy efficiency benchmarks. Consequently, only the amount of electricity required in the production of the product, as determined by the benchmark, is compensated through this measure. Electricity price compensation is financed by funds raised from the auctioning of emission allowances via the so called Energy and Climate Fund.

36. 26th Subsidy Report of the Federal Government, 2017

37. "European Commission Guidelines for certain State aid measures in the context of the greenhouse gas emission allowance scheme post-2012" (Communication 2012/C 158/04, *Official Journal of the European Union* (OJ. EU) C 158, 05/06/2012, p. 4), amended by Communication 2012/C 387/06 (OJ. EU C 387, 15/12/2012, p. 5), as corrected by Communication 2013/C 82/07 (OJ. EU C 82, 21/03/2013, p. 9).

Box 2. Germany's electricity price compensation

The aid amount for one installation for products with a product-specific electricity consumption efficiency benchmark can be calculated as follows:

$$A_t = A_i * C_t * P_{t-1} * E * Out = 0.85 * 0.76 * 6.17 * 2.461 * 55\,621 = \text{EUR } 545\,593\,119.10$$

where

A_t: aid per installation for the manufacture of products within the sector and the subsectors eligible for state aid;

$A_{i,t}$: aid intensity at year *t*, expressed as a faction (in 2015 = 0.85);

C_t: applicable CO_2 emission factor (tCO_2/MWh) at time *t.* For Western Europe as a whole, the factor in 2015 was 0.76 tCO_2/MWh *;*

P_{t-1}: EUA forward price at year *t-1* (EUR 6.17/ tCO_2) for 2015;

E : applicable product-specific electricity consumption efficiency benchmark;

Out: relevant output, the actual output of the accounting year or the baseline output (average of the years 2005-2011), depending on which results in a small aid amount.

When there is no product-specific electricity consumption efficiency benchmark, then instead a fallback benchmark is used. Per installation, a retention of the CO_2 costs of 1 Gigawatt hour of electricity (EUR 4 689.2 for 2015) is subtracted from a company's total aid amount.

Source : GSR

[T-9] Electricity price compensation

Objective	Relieving the burden of indirect CO_2 costs on electricity-intensive industries to support their international competitiveness.				
Legal basis	Federal Ministry of Economics and Technology Directive on State Aid to undertakings in sectors and subsectors deemed to be exposed to a significant risk of carbon leakage due to EU ETS allowance costs passed on in electricity prices (State Aid for Indirect CO_2 Costs). The Federal Ministry of Economics and Technology Directive on State Aid for Indirect CO_2 Costs was published on 30 January 2013 and approved by the Commission on the basis of the ETS Guidelines in July 2013.				
Budget item	Chapter 60 92, item 683 03				
State Aid (EU)	Yes				
Financing formula	German Federation: 100%				
Type of budgetary funds	Grant				
Annual tax expenditure	**2013**	**2014**	**2015**	**2016**	**2017e**
	0	321.8	203.2	244.8	300
Degression	Yes				
Outlook	Electricity price compensation has been approved for the third trading period of European Emissions Trading (2013-2020). The compensation will gradually be reduced to 75% .in 2019 and 2020				

Sectors enumerated in Article 2(4) of the EU Energy Tax Directive — mineralogical processes, metallurgical processes, chemical reduction and electrolytic processes — are exempt from the energy and electricity tax (T-10, T-14) in Germany. These blanket exemptions are not compulsory by EU law, but the German Government's view is that, as long as other EU Member States apply these exemptions, not providing these exemptions to companies operating in Germany would harm the competitiveness of its domestic industry.

Other manufacturing industries and the agricultural and forestry sector benefit from a 25% reduction on the tax applied to both heating fuels and electricity, provided they pay a yearly deductible of EUR 250 (T-12 and T-15). In addition, in the case of the manufacturing sector, if the tax burden remains greater than the pension payment reduction compensated by the contributions from the energy and electricity tax revenues, then the company can get further tax reductions (T-13 and T-16 - up to 90 % of the remaining tax). This system puts a cap on the energy and electricity taxes paid by German businesses.[38] The tax cap on energy products and electricity is conditional on the firm

38. The environmental tax reform implemented starting 1999, increased energy taxes and introduced an electricity tax to fund the reductions in pension contributions. The reduction in employers' pension contributions is calculated based on 1998 levels. See Annex 2 for a hypothetical example from the BMF on the calculation of the tax cap.

adopting an approved environmental management system to meet energy efficiency targets set for manufacturing. Under the tax cap measure for energy products (T-13), the manufacturing sector must still pay a deductible of about EUR 750 on their energy consumption, and EUR 1000 for electricity (T-16).

[T-10] Energy tax advantage for certain processes and procedures

Objective	Ensuring and improving the international competitiveness of particular sectors of manufacturing industry			
Legal basis	Sections 37 and 51 Energy Tax Act			
Financing formula	German Federation: 100%			
Annual tax expenditure (e = estimated, EUR million)	**2013**	**2014**	**2015**	**2016**
	548	589	571	553
Degression	No provision has been made for degression because the objective of this measure is to remain in place.			
Outlook	There are no plans at present for fundamental changes to this arrangement.			

The agricultural and forestry sectors benefit from a reduced diesel tax (T-11) when used in agricultural machinery and vehicles for the purposes of land management or land-related animal husbandry. Farmers purchase diesel at the market price and file for reimbursement.[39] In the GRS, the German Administration explains that the reduced tax rate is meant to protect Germany's agriculture and forestry business. However, it recognises that this measure to some extent favours the use of fossil fuel.

[T-11] Tax advantage for agricultural and forestry businesses (agricultural diesel)

Objective	Ensuring the competitiveness of German agricultural and forestry businesses			
Legal basis	Section 57 Energy Tax Act			
Financing formula	German Federation: 100%			
Annual tax expenditure (e = estimated, EUR million)	**2013**	**2014**	**2015**	**2016**
	430	400	440	450
Degression	No provision has been made for degression because the objective of this measure is to remain in place.			
Outlook	There are no plans at present for fundamental changes to this arrangement.			

39. Following the implementation of a diesel tax relief in the agricultural diesel law (*Agrardieselgesetz—AgrdG*) on 21 December 2000, the tax on diesel for agricultural use was lowered from its standard rate of EUR 0.47 per litre to EUR 0.256 per litre.

[T-12] Energy tax advantage for companies in the manufacturing sector, and agricultural and forestry businesses

Objective	Preventing distortions of competition			
Legal basis	Section 54 Energy Tax Act			
Financing formula	German Federation: 100%			
Annual tax expenditure (e = estimated, EUR million)	**2013**	**2014**	**2015**	**2016**
	145	153	159	153
Degression	No provision has been made for degression.			
Outlook	There are no plans at present for fundamental changes to this arrangement.			

[T-13] Energy tax advantage for companies in the manufacturing sector in special cases (tax cap)

Objective	Preventing distortions of competition			
Legal basis	Section 55 Energy Tax Act			
Financing formula	German Federation: 100%			
Annual tax expenditure (e = estimated, EUR million)	**2013**	**2014**	**2015**	**2016**
	167	197	185	172
Degression	No provision has been made for degression because it is assumed this arrangement will continue to be required.			
Outlook	There are no plans at present for fundamental changes to this arrangement.			

[T-14] Electricity tax advantage for certain processes and procedures

Objective	Ensuring and improving international competitiveness in certain parts of the manufacturing sector			
Legal basis	Section 9a Electricity Tax Act			
Financing formula	German Federation: 100%			
Annual tax expenditure (e = estimated, EUR million)	**2013**	**2014**	**2015**	**2016**
	727	738	767	836
Degression	No provision has been made for degression.			
Outlook	There are no plans at present for changes to this arrangement.			

[T-15] Electricity tax advantage for companies in the manufacturing sector, and agricultural and forestry businesses

Objective	Preventing distortions of competition			
Legal basis	Section 9b Electricity Tax Act			
Financing formula	German Federation: 100%			
Annual tax expenditure (e = estimated, EUR million)	**2013**	**2014**	**2015**	**2016**
	975	1 038	1 073	1 052
Degression	No provision has been made for degression because it is assumed this measure will continue to be required.			
Outlook	There are no plans at present for fundamental changes to this arrangement.			

[T-16] Electricity tax advantage for companies in the manufacturing sector in special cases (tax cap)

Objective	Preventing distortions of competition			
Legal basis	Section 10 Electricity Tax Act			
Financing formula	German Federation: 100%			
Annual tax expenditure (e = estimated, EUR million)	**2013**	**2014**	**2015**	**2016**
	1 870	1 911	1 735	1 614
Degression	No provision has been made for degression because it is assumed this measure will continue to be required.			
Outlook	There are no plans at present for fundamental changes to this arrangement.			

Another set of benefits, T-17 to T-19, relieves companies from the additional surcharges associated with deploying renewables and combined heat and power plants for electricity generation as well as grid charges. The EEG surcharge reduction, also known as the Special Equalisation Scheme, applies to electricity-intensive sectors deemed to have a significant exposure to international competition. Companies in eligible sectors qualify if their electricity intensity is at least 17% — in certain cases 14% —on average over the last three full business years and if they possess an energy management system and if they consumed at least 1 GWh of power during the last full business year. These companies pay a reduced rate, between 15% and 20% of the EEG surcharge, depending on their electricity intensity. The surcharge payment is also capped at 4% of a company's gross value added (GVA) if its electricity intensity falls between 17% and 20%, and to 0.5% of GVA if its electricity intensity exceeds 20%.[40] EEG relief is estimated to have

40. Electricity intensity is defined the electricity cost as a share of GVA.

reduced revenues from the EEG-surcharge in 2016 by EUR 4.8 billion that have to be compensated by a higher surcharge. According to the GSR, the EEG surcharge reduction is meant to insulate German industry from paying for the support given to renewable energy in Germany.

As of the 1 January 2017, the Special Equalisation Scheme was extended to the CHP surcharge for qualifying industries. In addition to the similar electricity intensity requirements and caps, the CHP surcharge is bounded from below, and all companies must pay at least EUR 0.001 per kWh. The revenue shortfall in 2016 from the relief on the CHP surcharge was EUR 493 million. Germany uses the same rationale as for the EEG surcharge to justify the CHP surcharge relief.

Last is the relief on grid charge for companies that purchase electricity from the electricity grid for their own consumption for at least 7 000 hours per calendar year, and whose electricity consumption over the same period amounts to at least 10 GWh. In 2010, 23 electricity-intensive firms benefited from the reduction in the grid charge. Once the eligibility criterion was lowered, from 7500 hours to 7000 hours in 2010, more firms qualified for the relief. Also, both the grid charge and the associated reductions have been rising over time. Therefore, firms had a greater incentive to apply for the relief. In 2016, about 350 firms benefited from the reduced tariffs, with a total projected annual reduction in revenues of grid operators of about EUR 750 million in 2017. These reductions are compensated by increased grid charges for other electricity consumers.

The peer-review team's evaluation

Preamble

In reviewing the efforts of Germany and Mexico to reform their inefficient fossil-fuel subsidies, the peer-review team followed a process similar to that followed in the first G20 peer reviews, of China and the United States. This involved:

Reviewing the self-reports of the two countries, and sending a list of questions and requests for clarification to each country.

- The countries providing written responses (in one case) to the peer-review team's questions.
- The peer-review members meeting in person with officials from the two countries; in the event, these meetings took place in Berlin during the week of 6 February 2017.
- The OECD writing the first drafts of the peer reviewers' reports, and circulating those to other members of each review team for comments.
- The OECD, on behalf of the team, submitting the revised drafts of the peer reviewers' reports to the countries for comments and factual corrections.
- The OECD, on behalf of the team, revising the reports, taking into consideration the comments of the reviewed countries, and eventually producing final reports that could be agreed to by all parties.

Readers should bear in mind that, in reviewing the efforts of Germany and Mexico to reform their inefficient fossil-fuel subsidies, the peer-review teams were bound by both the G20's collective views on the initial reform mandate and on the conduct of the peer reviews, which are voluntary, and the specific terms of reference agreed between the two countries under review.

The 2009 G20 Leaders' Communiqué admonishes its members to "rationalize and phase out over the medium term inefficient fossil fuel subsidies that encourage wasteful consumption", while recognising "the importance of providing those in need with essential energy services, including through the use of targeted cash transfers and other appropriate mechanisms". The challenge confronting review-team members is that none of the key terms in this instruction — neither medium term, inefficient, nor fossil-fuel subsidies — have been defined by the G20. The question of whether the term "fossil fuel subsidies" includes subsidies to electric power production (to the extent that it is based on the combustion of fossil fuels) or to the consumption of electricity was also not specified. China and Germany included measures relating to electricity in both of their respective self-reports; Mexico and the United States did not.

The question of which types of subsidies encourage wasteful consumption has also been left to interpretation by the G20 members themselves. The first pair of G20 voluntary peer reviews of inefficient fossil fuel subsidies highlighted the intentions of the

reviewed countries, China and the United States, at that time to phase out certain tax measures that benefitted fossil-fuel production, on the argument that in so doing prices were reduced, thus encouraging wasteful consumption. Likewise, Germany, in its self-report, highlights the reform of its support measures for domestic production of hard-coal.

What all G20 countries undergoing reviews have agreed on, to date, is the types of policies that fall under the purview of the review. These are listed in the terms of reference (Annex 1) as including:

- direct budgetary support;
- tax-code provisions;
- government provisions of auxiliary goods or services either at no charge or for below-market rates to facilitate fossil fuel use or production; and,
- requirements that non-government entities provide particular services to fossil fuel producers at below-market rates, or that require non-government entities to purchase above market quantities of fossil fuels or related services.

A point that the G20 has stressed on several occasions is that the reform of inefficient fossil-fuel subsidies is a sovereign issue dependent on the unique situation and priorities of the individual countries.[41] Moreover, the issue should be considered within the context of the common but differentiated responsibilities of developed and developing countries. In short, it is the prerogative of the reviewed countries themselves to identify which subsidies they wish to reform, and which they deem not necessary to reform, most commonly because the country considers those subsidies to not be inefficient, but sometimes for other reasons.

That said, the role envisaged for the review teams is more than simply to acknowledge and document the reviewed countries self-reports. One contribution they are expected to make is to recognise any successful recent reform of fossil fuel subsidies and identify lessons learned. In this case, the main successful reforms are those relating to the phasing-out of German's subsidies to its hard-coal mining industry, and to consider any proposed action that could accelerate the reform process in each country.

Successful reforms of fossil-fuel subsidies and lessons learned

The phasing-out of subsidies to the hard-coal mining industry by the end of 2018 marks a new chapter in Germany's broader subsidy-reform strategy. The peer review team agreed that many lessons can be derived from Germany's experience in reforming subsidies to the hard-coal mining industry. The phasing-out process, designed to be socially and regionally acceptable, provides an important example for other countries wishing to carry out similar reforms. From the consolidation of coal companies to the various stakeholder meetings, and workforce retraining, the winding down of an unprofitable industry that once served as an economic engine for Germany lasted several decades.

41. For example, at the 2010 G20 Summit in Seoul, Korea, Leaders reaffirmed their commitment to rationalise and phase-out over the medium term inefficient fossil fuel subsidies that encourage wasteful consumption, with timing based on national circumstances, while providing targeted support for the poorest. (emphasis not in the original).

The first step taken was to consolidate the industry under one umbrella company. During the years that followed, there were various rounds of meetings, among all stakeholders in the coal industry (Box 1). This resulted in a slow but a socially accepted capacity adjustment. These meetings served to lay out the scaling-down of the industry—i.e. fix the schedule, and determine the sequencing of mine closures, and the benefits granted to the workers. At the last meeting, in 2007, the phasing-out process was adopted into a law to provide greater foresight and less uncertainty about the anticipated outlays. Among the decisions made, the maximum amount of the subsidy to cover the costs of production (and decommissioning) was based on a forecast of coal price being EUR 55/tonne.[42]

The review team was particularly interested in the professional training and the successful relocation of the labour force that accompanied the winding-down of production. Manual labourers working underground comprised the largest share of the labour force employed in the hard-coal mining industry (Figure 5). The specificity of the skill set of an underground worker gives way to a greater risk of unemployment; however, since there was great emphasis on retraining the younger workforce for successful relocation, there were no lay-offs of workers because of the mine closings. Research on the impact and hence the contribution of the benefits and retraining for workers on their employment prospects could shed light on the factors that rendered this reform socially acceptable and inform other countries pursuing similar reforms.

Additionally, the restructuring of the RAG AG itself and the creation of the RAG Foundation, as a private entity to manage the post-closure legacy debt, the long-term liabilities and restoration of mine areas, is a good case study for an industrial reform.

Improving the transparency of other fossil-fuel subsidies, Germany, like Mexico, is to be commended for listing in its self-report not only the inefficient fossil fuel subsidies that it is in the process of reforming, but also other measures that it considers to confer support to the production or consumption of fossil fuels, but deems to be not inefficient.

In the previously completed voluntary peer reviews, of China and the United States, considered different criteria to determine whether or not a measure qualified as "inefficient". In the event, the two countries reported as inefficient mainly features of their tax codes that favoured fossil-fuel producers.

In the current round of voluntary peer reviews, Mexico, in deeming none of its tax exemptions and reductions related to consumption as inefficient, evaluates the tax burden of energy product on welfare without taking into account the welfare immiserating effects of environmental externalities from the consumption of energy products, nor the question of whether the exemption improves the efficiency of the tax-collection system, including costs associated with administering the exemptions. According to this framework, any tax reduces economic welfare, and therefore any relief from a tax increases welfare. Mexico, nevertheless, acknowledges that externalities should be taken into account and once measured appropriately, then an improved evaluation of the policies could be provided.

42. In the case that the price is above this forecasted value the firm is still compensated for the shortfall, but in a correspondingly lower amount. In 2015, the Northwest Europe coal marker price was USD 56.64 per tonne. See: https://www.statista.com/statistics/383500/northwest-europe-coal-marker-price/

Germany, in its self-report, generally makes a more micro-economic argument, based on whether not granting relief from the full rate of energy or environmental taxes would threaten the international competitiveness of the affected industry, or lead to the migration of CO_2 emissions or pollution to another country with less-stringent environmental regulations. In a few cases, a tax exemption is justified on the need to avoid double taxation.

Various reports to the G20 — notably, the joint report to the G20 of the IEA, the OECD, OPEC, and the World Bank (2011) — have acknowledged that not all fossil-fuel subsidies are inefficient. They have also stressed, however, that to properly distinguish between those fossil-fuel subsidies that enhance the well-being of an economy and those that can be classified as inefficient requires weighing their social costs and benefits. This latter guidance suggests that the evaluation of fuel-tax exemptions and reductions, when taking into account social costs and benefits (including environmental externalities), involves both an enquiry into the design of the measures (compared with alternatives) and the questions regarding whether the measures are periodically adjusted in light of changing circumstances and priorities. It is in this light that the peer-review team offers its observations on the measures mentioned in Germany's self-report that were documented but deemed to be not inefficient, and therefore in no need of reform.

Germany has been reporting its budgetary transfers and tax expenditures, including fossil-fuel subsidies, since the introduction of the 1967 Stability and Growth Act (*Gesetz zur Förderung der Stabilität und des Wachstums der Wirtschaft*). Under this legislation, the Federal Government must submit a subsidy report to the Bundestag and Bundesrat along with the government draft of the federal budget, every two years. The report provides an overview of federal financial assistance and estimated revenue shortfalls resulting from tax benefits. This systematic review of federal subsidies is aimed at greater transparency and accountability of public finances. Following the Federal Cabinet decision of 28 January 2015, the Federal Government commits to following the Subsidy Policy Guidelines when introducing and modifying a subsidy. These guidelines place great emphasis on the evaluation of the success of a subsidy in reaching its objective, and on the design of budgetary transfers as transitory and degressive, and on efficiency.

In the same vein, the Federal Environment Agency (UBA) regularly publishes a report, *Environmental Harmful Subsidies in Germany*, reviewing environmentally harmful subsidies (EHS), including fossil-fuel subsidies listed in the Federal Ministry of Finance Subsidy Report mentioned above. The UBA report evaluates these subsidies in terms of their capacity to reach their intended objectives and their implied environmental impacts and prescribes potential reform strategies, calling for greater stringency in allocating tax benefits to manufacturing and agricultural business. However, this report does not express the view of the German Federal Government.

Although these initiatives have raised awareness of fossil-fuel subsidies, the voluntary peer-review process that Germany and Mexico agreed to undertake marks an important step in the direction of greater transparency. By allowing other countries and participating international organisations to ask questions about particular subsidies or support policies, the peer review itself contributes to increasing transparency on fossil-fuel subsidies, which helps promoting further reform discussions and tracking the reform progress. It should also inform the discussion of what ought to be considered an "inefficient subsidy" under the G20 commitment.

The review team encourages the German Administration to take an additional step beyond taking stock of their support measures and assess the sensitivity of their industry competitiveness and carbon leakage to support measure reform. In doing so, the German Administration could consider alternative measures with less distortive effects in order to meet their objectives of maintaining industry competitiveness and preventing emissions relocation. The remaining support measures granted by the Germany Federal Government necessitate additional evaluation to ascertain the extent to which their reform could affect its domestic industry and at the same time lighten the environmental and social costs incurred. Germany, as they state in their self-report, defines an efficient system of taxation as one that takes into account both positive and negative externalities, and measures them against the induced tax-revenue shortfall. In order to do so, it becomes necessary to quantify the economic effects (i.e. the effects on volumes of production, trade and price, and therefore on GDP), and the associated environmental and social costs. Literature on the topic thus far shows that the contribution of environmental regulation to industry performance tends to be thwarted by supply and demand conditions; the German case thus needs to be studied more closely.[43]

One framework to assess the performance of tax measures in achieving policy objectives (Polackova Brixi et al., 2004) suggests answering the following questions in order to establish their relevance, effectiveness and efficiency:

- *Relevance*. Is the tax measure consistent with policy priorities, and does it realistically address the actual need? Energy tax policy in Germany has the dual role of addressing both climate policy objectives as well as reducing the burdens of labour costs on German industry. The tax benefits granted to German industry and its agricultural sector reduce their energy cost burden while eventually resulting in higher rates of consumption of the targeted fuels than would be the case in the absence of the measure. These two opposite effects create a trade-off and a misalignment between economic policies and climate objectives.
- *Effectiveness*. Is the tax measure meeting its objectives effectively, within budget, and without unwanted outcomes? Tax benefits to manufacturing sectors and agriculture business in Germany warrant further investigation to gauge their success in preventing relocation of their production and emissions.
- *Efficiency*. Is the tax measure the most appropriate and efficient means to achieve objectives, relative to alternative design and delivery approaches? First, the cost-effectiveness of the measure should be quantified in terms of the additional net profit generated from the forgone government revenue.[44] For the measure to be efficient, the income generated should be at least as much as the revenue forgone. The costs and benefits of the measure would then be quantified to determine the resulting excess burden in meeting its objective of protecting the competitiveness of the domestic industry and

43. There is evidence of a positive cost pass-through of the EU ETS on Germany industry (European Commission, 2015). The electricity price compensation aims to counter these incurred costs.

44. In the case of Germany's tax expenditures, the objective is to ensure the economic performance of its industry. Therefore, the objective taken here is income generation, notwithstanding that there could be other objectives.

preventing carbon leakage. Therefore, the measure should be able to meet its objectives at the lowest cost possible.

Germany's *Subsidy Policy Guidelines* are a first step in addressing the aforementioned questions by underscoring the need for evaluation and time limits on new and existing subsidies. The guidelines advise issuing *new* subsidies only if they fare better than other measures on cost-benefit basis. Overall, this framework introduces boundaries within which subsidies can be granted based on efficiency and sustainability. However, the application of the guidelines is not obligatory in the case of measures that were already in place prior to publication of the *Guidelines*.

In the recent years, the G20 has reaffirmed the commitment to phasing out inefficient subsidies on several occasions. More recently, at their March 2017 Summit, in Baden-Baden, Germany, the Leaders of the G20 reaffirmed their commitment and encouraged "all G20 countries which have not yet done so, to initiate as soon as feasible a peer review of inefficient fossil fuel subsidies that encourage wasteful consumption". The Leaders of the G7, of which Germany is a member, pledged to eliminate inefficient fossil fuel subsidies by 2025, and encouraged all countries to do so, at their May 2016 Summit, in Ise-Shima, Japan.

The measures left unchanged, nonetheless, raised several questions regarding their rationale, monitoring, and implementation. Throughout the peer review process, it became clear that the EU ETD was a central organising framework for Germany's energy policy. Those sectors outside its purview and exemptions accorded within were adopted into national regulation. Sectors to which the Directive does not apply include the dual use of energy products and electricity in chemical reduction, electrolytic and metallurgical processes. These are processes exempt from taxation in measures T-10, T-14.[45] The review team maintains that while the EU ETD permits the exclusion of these sectors from the stipulated minimum tax rates, it would be nonetheless pertinent to evaluate the effect of this exclusion.

Full or partial exemption can be granted for energy products and electricity used in:[46]

- the refining sector (T-1);[47]
- air and water navigation (T-6 and T-4, respectively);[48]
- rail and trolleybuses (T-7);[49]
- CHP plants (T-3);[50]
- natural gas and LPG used as propellants (T-8);[51]

45. Article 2 (4).

46. The list of exempted sectors is not exhaustive. This discussion is merely to provide the reader an overview of the scope of the grants allowed in 2003/96/EC.

47. Article 21 (3).

48. Article 14 (1)(b-c), Article(15)(1)(f).

49. Article(15)(1)(e).

50. Article 15(1)(c-d).

51. Article 15(1)(i).

- agriculture and forestry (T-11).[52]

While full exemptions are granted to the refining sector, air and water navigation, only partial exemptions are given to energy products and electricity used in rail and trolleybuses, CHP plants, for gaseous fuels and for agricultural diesel.

The reduced tax rates in the transport sector call for further inquiry of the review team as to how the German Administration decided the level at which to set the rates themselves and the extent to which a full tax on energy products would affect domestic fuel prices. Germany's experts argued that in the case of the shipping industry, if it did not benefit from the tax exemption, given its higher operating costs than road transport, it could see its market share shrink and more goods would be transported by lorries, adding congestion to roads.[53]

Germany is to be commended for not fully exempting agricultural use of diesel fuel from excise tax, in contrast with the more common situation in many countries, where agricultural use of diesel is tax-exempt. The cross-country effective carbon tax on agricultural and forestry fuels ranges from zero to 9 EUR/GJ in OECD countries, with the highest effective tax attributed to Ireland, which translates to 125 EUR/tonne of CO_2 (Figure 6).[54] However, the peer review team expressed some concern regarding the monitoring of the specific use of diesel fuel in the agricultural sector. While the administration only audits a small fraction of farms (a minimum of 5% per fiscal year), and checks that the use of diesel corresponds to their agricultural needs, the monitoring process only provides an approximation of the usage and does not take into account improvements in the efficiency of farm machinery over time.[55] The peer-review team asked whether alternative monitoring tools had been considered, such as using special dyes to distinguish agricultural diesel from higher-taxed diesel. Also, decoupling the support from the quantity of crops or livestock products produced was suggested as a way to mitigate the potential for diversion.[56]

52. Article 15(3).

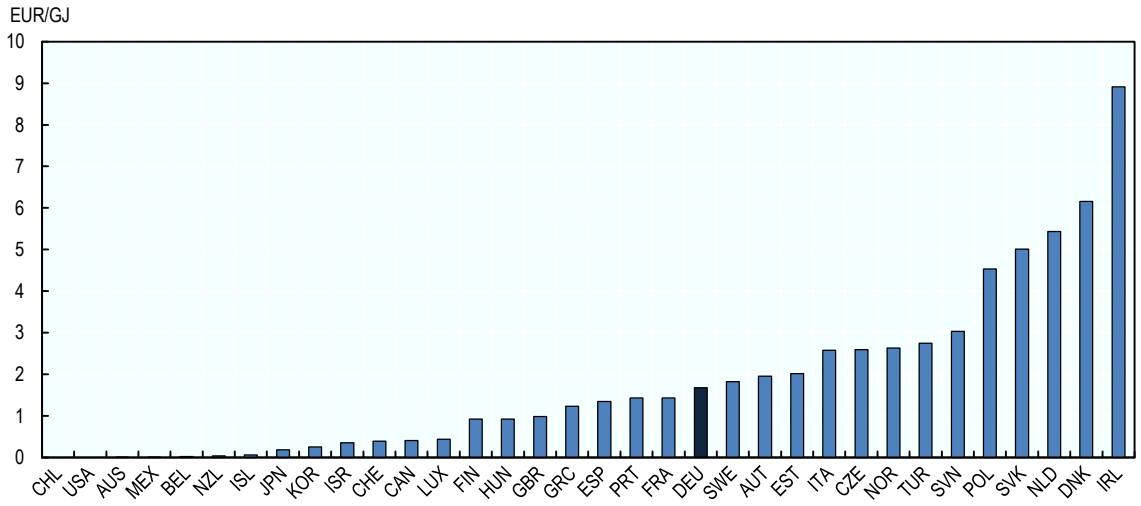
53 . Operating costs related to "preliminary heat and caster (Vorund Nachlaugh)", as well as costs due to the lower speed on waterways render of inland waterway transport (kombinierter Verkehr) more costly than road transport.

54 . Agriculture predominantly uses diesel fuel.

55. The share of farms to be audited for the 2015 fiscal year will be 6.82%.

56. The peer review team also asked what the impact on Germany's food prices would be of eliminating the tax benefit for diesel use in agriculture, and how it would affect the economic decisions of farmers. German experts indicated the impact of removing the tax benefit on food prices would be negligible given that the size of the agricultural sector: there are about 189 000 farmers in Germany, and they contribute less than 1% of the nation's value added. Also, the peer review team asked whether the lag between the purchase of the fuel and the reimbursement influenced farmers' investment and production decisions. German experts did not think that economic decisions would be influenced by this tax reduction, except for the decision on diesel consumption. Since the auditing process relies on assumptions regarding diesel consumption in agriculture, the team suggested that information on trends in energy efficiency in the sector would help in any evaluation of the effectiveness of this policy.

Figure 6. Effective tax rate on agricultural and forestry fuels



Data Source: OECD (2013)

The price compensation scheme for large energy users, while offsetting the added cost of participating in the EU ETS, does encourage the deployment of fossil fuel and is only available to countries with a fiscal capacity to finance it. According to (Köder and Burger, 2016[2]), this measure can lead to unequal competitive conditions since only six countries or regions have implemented it: the Flanders Region of Belgium, Germany, the Netherlands, Norway, Spain, and the United Kingdom.

The German Administration maintains the tax preferences for manufacturing sectors and agriculture in order to protect the international competitiveness of its industries and prevent the relocation of businesses to countries with less environmentally stringent policies. They consider that the implementation of energy efficiency criteria for some energy and electricity tax reductions to German industry constitute a mechanism that creates incentives to reduce consumption of fossil fuels, and therefore offsetting, at least partially, the impact of tax benefits on the firm's energy consumption. That said, some government reports (Köder and Burger, 2016[2]) have pointed out that these efficiency gains are in keeping with what would be expected even without the efficiency targets. A review of energy efficiency performance and readjustment of targets is planned for autumn 2017. According to Germany Administration, manufacturing companies altogether must improve their collective energy efficiency. The target values for the improvement are legally determined from 2013 through 2020, and the energy intensity must decrease every year by 1.3 % (1.35 % from 2016 onwards) compared with the average value in the period 2007-2012.[57] For the tax benefit in 2017, the improvement of energy efficiency is evaluated for year 2015, with a target of 3.9 % improvement relative

57. The energy intensity is subject to a yearly study, published by a scientific institute on behalf of the Ministry for Economic Affairs which is published.

to the average over the period between 2007 and 2012; the realized improvement was 10.8 %.[58]

The discussion of tax efficiency in the GSR underscores the challenge of measuring the costs and benefits of these tax preferences and the difficulty of determining their net effects, making evaluation difficult. The peer review team concluded that the efficiency assessment of the tax preferences calls for further analysis, since the magnitude of the competitiveness and carbon-leakage concerns could be investigated through already available methods, such as quasi-experimental econometrics. Work at the OECD has shown that environmental regulations are not usually major determinants of the international competitiveness of industries.

In the case of Germany, the evidence is mixed. A study carried out on behalf of the BMWi found that removing electricity-related benefits conferred to qualifying firms in Germany compromises their international competitiveness (Fraunhofer & Ecosys, 2015). However, an OECD study (Flues and Lutz, 2015[3]) shows that the tax reduction for firms with large electricity use did not improve the competitive position of German manufacturing. Similarly, Gerster (2017) finds that, while a reduction in energy prices resulting from the special equalisation scheme generates more emissions, they have no impact on the competitiveness of the benefitting industries. Another study (Kozluk and Garsous, 2016[4]) explains that environmental stringency has had limited impact on foreign direct investment in the OECD area, and has not lead to a significant outflow of capital investment.

A report to the EU Commission assessing the potential for environmental reform in its Member States pointed out that, since 2003, the Environmental Tax Reform has been an effective tool to reduce CO_2 emission. However, Germany has not made any changes to its increase of taxes on motor fuels, and since then the increase has been eroded by inflation (Hogg et al., 2016). Therefore, nominal tax rates can mitigate the effectiveness of environmental taxes. Additionally, the differential taxation of diesel and gasoline for road use does not reflect their respective external costs (Harding, 2014[5]). The Nordic model of energy taxation, based on a common rate of tax per unit of energy content and per unit of CO_2 content and of local pollutants can alleviate the distortionary nature of differential fuel taxation (Hogg et al., 2016). To improve further the existing reporting process, the review team encourages Germany's Federal Government to:

- Continue to carry out periodic quantitative assessments of the competitiveness and carbon leakage effects of energy-tax preferences in Germany, including state-of-the-art empirical evidence;
- Improve data regarding the sectoral distribution of the beneficiaries of fossil fuel support measures in Germany.
- Publish more detailed information on the energy efficiency performance of industries and the distribution of tax benefits corresponding to their performance.
- Review support measures to ascertain their role in the energy transition.

The peer review process is a revelatory and a salutary learning experience for both reviewed countries and participating countries. The preparation of the peer reviews

58. http://www.rwi-essen.de/media/content/pages/publikationen/rwi-projektberichte/rwi-pb_effizienzmonitoring_endbericht_2015.pdf

has allowed countries to look thoroughly at their support measures and provide more information on the policies than what is provided in their respective annual reports. Germany's sequencing of coal-subsidy reform and the energy-efficiency conditionality embedded in some of its support measures shows how degressive and conditional support measures can be designed. The definitional differences when it comes to what constitutes a subsidy and what is considered inefficient came at the fore of the discussions and revealed that G20 member states could benefit from further dialogues on these questions.

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ANNEX 1: TERMS OF REFERENCE FOR G-20 VOLUNTARY PEER REVIEWS BY MEXICO AND GERMANY ON INEFFICIENT FOSSIL FUEL SUBSIDIES THAT ENCOURAGE WASTEFUL CONSUMPTION

I. The Purpose of the Peer Review

The G-20 Leaders committed to rationalize and phase out inefficient fossil fuel subsidies that encourage wasteful consumption over the medium term while being conscious of the necessity to provide targeted support for the poorest. To fulfill this commitment, the G-20 developed a voluntary peer review process.

In 2014-2015, Mexico and Germany announced their participation in the G-20 peer review process, in a second round of peer reviews following the China-United States peer reviews.

The purpose of the peer review is to: (1) find out the basic situations, differences, and experience of fossil fuel subsidies in various countries, (2) push forward the global momentum to identify and reduce inefficient fossil fuel subsidies, (3) improve the quality of available information about inefficient fossil fuel subsidies, and (4) share lessons and experience of relevant reform.

This document presents terms of reference and a work plan to carry out the peer review.

II. Preparations for the Peer Review (the "self-reporting process")

To carry out the peer review efficiently, each country is to determine the extent to which fossil fuel subsidies currently exist in its country. This should be done through a self-report. Several G-20 countries have carried out self-reporting in the past. Each country can determine how it wishes to prepare its self-reporting. One means of carrying this out could be through the use of expert panels. **Mexico and Germany** may consider establishing expert panels to study and identify issues such as the definition and scope of the inefficient fossil fuel subsidies in their respective countries, to map-out the current status of inefficient fossil fuel subsidies, and put forward policy measures to reform those subsidies. Each country is to also maintain a designated point of contact in the government who is responsible for overseeing the work of the self-report, then overseeing the work of the subsequent peer reviews, and for communicating with the other country.

Expert panels may contain relevant experts, familiar with issues such as macro-economy, energy pricing, fiscal policy, sociology, poverty, and energy statistics. The expert panels may wish to consult with experts from international organizations, including those who may be members of the peer review teams.

Each country may decide if it wishes to seek external input into its self-review. For example, workshops could be organized to review the self-reporting, to reach common understanding on the self-reporting by respective countries, and to improve the policy reports relating to inefficient fossil fuel subsidies, so as to lay the foundation for the voluntary peer review.

In determining what to include in their respective self-reports, **Mexico and Germany** take note of the studies carried out by international organizations such as the International Monetary Fund, Organization for Economic Cooperation and Development, the Global

Subsidy Initiative, and the World Bank. These relevant reports provide references for **Mexico and Germany**. Based on these expert reports, the most common forms of subsidies include:

1. Direct budgetary support;
2. Tax code provisions;
3. Government provisions of auxiliary goods or services either at no charge or for below-market rates to facilitate fossil fuel use or production; and,
4. Requirements that non-government entities provide particular services to fossil fuel producers at below-market rates, or that require non-government entities to purchase above market quantities of fossil fuels or related services.

The self-reporting and the subsequent peer reviews should focus on national-level subsidies but may also consider state- and municipal-level subsidies.

III. Procedures of the Peer Review

- **Designating *Points of Contact***

The country undergoing a peer review should select a point of contact that is responsible for coordinating the review. The point of contact serves as the interface with the review team. The point of contact may be established as soon as the terms of reference are completed.

- **Setting-up Peer Review Teams**

Relevant experts with experience on the subject of fossil fuel subsidy reform should be selected to carry out the review. As **Mexico and Germany** have announced their intention to undergo a peer review at the same time, both countries are expected to serve on the review team for the other country, respectively. At the same time, the two countries intend to invite experts from G-20 member countries and from international organizations to join the review teams; G-20 member countries who join the review team should commit to undergo a peer review process. International organizations may invite special unpaid technical experts from other countries (including non-G20 countries) to participate on the review teams, and the title and country of the consultants will be listed.

Additionally, **Mexico and Germany** commit to consult each other before inviting reviewers for their respective teams. Some overlap on the two review teams would enhance the consistency of the review results.

- **Conducting the review**

The majority of the work is expected to be carried out remotely (e.g., through conference calls, exchange of information by email, etc.). Face-to-face meetings, as needed, can be scheduled. There also should be at least one in-person meeting in each country undergoing the peer review. Any information that is shared should be done so with all the identified reviewers. The peer review teams are expected to use the self-reporting documents as the basis for the review, seeking to understand why and how the various subsidies were identified and for those to be phased out.

- **Scope of review**

The policies and measures that **Mexico and Germany** have identified in their self-reporting form the basis of the review. The reviewers may inquire about inefficient fossil fuel subsidy issues which are not included in the self-reporting.

- **Finalize a report**

The review team is responsible for writing a report of their work and observations. Each country is expected to concur on the final content prior to release. The reports should, at a minimum:

1. provide a brief summary of the discussions that took place;
2. identify each inefficient fossil fuel subsidy that is being reviewed, per the scope;
3. for those inefficient fossil fuel subsidies that the country has proposed for reform, identify its annual cost and the policy objective of the subsidy;
4. detail the strategies and timeframes for rationalization and phase out of the aforementioned subsidies and describe the current status of the phase-out plan;
5. consider ways to improve transparency in the inefficient fossil fuel subsidies that are discussed;
6. consider any proposed action that could accelerate the reform process in each country; and,
7. recognize any successful recent reform of fossil fuel subsidies and identify lessons learned.

IV. Arrangement of the Peer Review Process

- **Preparation**

Each country prepares its self-report as described above, keeping the other country abreast of the process.

- **Organizing the Peer Review**

Designate points of contact. Set up peer review teams. The self-reporting is given to the peer reviewers. Conduct peer reviews.

- **The peer review teams conduct the review and prepare a report:**

Peer review teams review the self-reporting, seek clarifications, and conduct visits as necessary. Reports are written by the peer review teams. Each country under-going the review is expected to concur on the final content prior to release. A precondition for releasing the report is that at least one G20 member, in addition to China, the United States, **Mexico and Germany** commit to undergo a Fossil Fuel Subsidy Peer Review.

ANNEX 2: EXAMPLE ON THE CALCULATION OF THE ELECTRICITY AND ENERGY TAX ADVANTAGE FOR COMPANIES IN THE MANUFACTURING SECTOR IN SPECIAL CASES (TAX CAP)

Example provided by Germany's Federal Ministry of Finance (BMF)

In calendar year 2017 (accounting period), a manufacturing company draws a total of 10 000 megawatt hours (MWh) of electricity. During the same period, the company burns 1m litres of light fuel oil, 100 000 MWh of natural gas and 10.000 kg of liquefied gas for commercial purposes. The energy products are taxed in accordance with the first sentence of section 2 (3) of the Energy Duty Act (*Energiesteuergesetz*). The other conditions for obtaining tax relief are met. In 2017, the company pays a total of EUR 6m in wages and salaries requiring pension insurance contributions. The contribution rate is 18.7% (and the employer's share is 9.35%). This means that the company pays EUR 561 000 into the general pension insurance system in 2017.

1. Calculating the differential in payments to the pension insurance system (section 10 (2) of the Electricity Duty Act (Stromsteuergesetz) and section 55 (2) of the Energy Duty Act)

Note: Because the contribution rates for the pension insurance system are lower in 2017 than the rates stated in section 10 (2) (2) of the Electricity Duty Act and section 55 (2) (2) of the Energy Duty Act, it is the currently applicable contribution rate – i.e. 18.7% (employer's share: 9.35%) – that must be used when calculating the differential in the employer's share of pension insurance contributions. In the application year 2017, the company pays a total of EUR 6 million in wages and salaries requiring pension insurance contributions. If the contribution rate for the general pension insurance system were 20.3% (employer's share: 10.15%) in 2017, the company would have to pay EUR 609000 to the pension insurance system in 2017. But the actual contribution rate is 18.7% (employer's share: 9.35%), which means that the employer's share of pension insurance contributions amounts to EUR 561 000. Thus the differential between these two amounts is EUR 48 000 (EUR 609.000 minus EUR 561 000).

2. Calculating the possible amount of tax relief under section 9b of the Electricity Duty Act

Before the amount of electricity duty relief under section 10 of the Electricity Duty Act can be calculated, the possible amount of tax relief under section 9b of the Electricity Duty Act must be determined first. The rate of tax relief for electricity used for commercial purposes is EUR 5.13 per MWh. For 10 000 MWh, the amount of tax relief would be EUR 51.300. The deductible of EUR 250 (section 9b (2) of the Electricity Duty Act) must be subtracted from this amount. This means that the possible amount of tax relief under section 9b of the Electricity Duty Act is EUR 51 050.

3. Electricity duty relief under section 10 of the Electricity Duty Act

The company drew 10 000 MWh of electricity, with a tax rate of EUR 20.50 per MWh. First, it is necessary to calculate the amount of tax relief that would result prior to a comparison with the maximum amount defined in section 10 (2) of the Electricity Duty Act.

Calculation of tax relief amount prior to comparison with maximum amount:

Operand	EUR
Electricity duty (10 000 MWh x EUR 20.50 per MWh)	205 000
Reduction under first sentence of section 10 (1) of the Electricity Duty Act	- 1 000
minus possible amount of tax relief under section 9b of the Electricity Duty Act (second sentence of section 10 (1) of the Electricity Duty Act)	- 51 050
Electricity duty under section 10 (1) of the Electricity Duty Act	152 950
90% of this amount **(tax relief amount prior to comparison with maximum amount)**	137 655

However, tax relief can be granted only in the maximum amount defined in the first two sentences of section 10 (2) of the Electricity Duty Act.

Calculation of the maximum amount:

Operand	EUR
Electricity duty under section 10 (1) of the Electricity Duty Act	152 950
Minus differential in contributions to pension insurance system	- 48 000
Subtotal	104 950
90% of this amount **(maximum amount)**	94 455

The amount of electricity duty relief is EUR 94 455.

4. Energy duty relief under section 55 of the Energy Duty Act

Calculation of tax relief amount prior to comparison with maximum amount:

Calculation of tax shares under section 55 (3) of the Energy Duty Act	**EUR**
Light fuel oil 1 000 000 x EUR 5.11/1 000 l	5 110
Liquefied gas 10 000 kg x EUR 19.89/1 000 kg	+198.90
Natural gas 100 000 MWh x EUR 2.28/MWh	+228 000
Subtotal	233 308.90
Reduction under section 55 (3) of the Energy Duty Act	- 750
Tax share under section 55 (3) of the Energy Duty Act	+232 558.9
90% of this amount **(tax relief amount prior to comparison with maximum amount)**	209 303.01

Energy duty relief in the amount of EUR 209 303.01 will be granted only if this amount does not exceed the maximum amount defined in the first two sentences of section 55 (2) of the Energy Duty Act.

Calculation of maximum amount under the first two sentences of section 55 (2) of the Energy Duty Act

	EUR
Tax share under section 55 (3) of the Energy Duty Act	232 558.90
Plus electricity duty under section 10 (1) of the Electricity Duty Act	+ 152.95
Total	385 508.90
Minus differential in contributions to pension insurance system	- 48 000
Reduction under section 55 (3) of the Energy Duty Act	- 337 508.90
90% of this amount **(maximum amount)**	303 758.01

Thus energy duty relief amounts to EUR 209 303.01, because this amount does not exceed the maximum amount.