CLIMATE POLICY INITIATIVE

Impact of Reductions and Exemptions in Energy Taxes and Levies on German Industry

CPI Brief

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Executive Summary

Between 2002 and 2007, Germany introduced its National Strategy for Sustainable Development and its Integrated Climate Protection Program, which both defined clear energy and climate-related objectives, setting an emissions reduction trajectory of 40% below the 1990 level by 2020. This spurred the development and refinement of a set of policies to create incentives for energy efficiency improvements, to reduce labour costs, and to raise funds to finance energy security and climate policy objectives. Special tax and levy reductions and exemptions were introduced for each policy for a transitional period.

In this report, CPI presents a tool that it developed to help analyze the impact of tax exemptions and levy reductions on energy prices, which in turn impact energy efficiency and climate related goals. In developing this tool, we studied the impact of four major sets of energy policies and their related exemptions to determine the net impact on industry players, differentiated by the size of the industrial concern (as expressed by energy usage) and by the industrial sub-sector. The four energy policies are:

- The Environmental Tax Reform;
- The Combined Heat and Power Act;
- The EU Emission Trading Scheme; and
- The Renewable Energy Act.

Key Findings

1. **The impact of tax exemptions and levy reductions is significant.** For the regular electricity consumer, taxes and levies on electricity resulting from the electricity tax law, the Renewable Energy Act, and the Combined Heat and Power Act, add up to 56€/MWh. For the manufacturing industries, however, tax and levy rate reductions can lower the policy-induced component of the electricity price by up to 96%.

   Standard energy tax rates for oil, natural gas, and coal, lie below standard electricity tax and levy rates. Since electricity accounts for only 30% of the energy mix on average, lower energy tax rates compensate for the higher electricity tax and levy rates. Moreover, standard energy tax rates for fossil fuels (used for heating purposes), are lower than standard energy tax rates for fossil fuels used for other purposes. Further, reductions and exemptions apply to the energy tax rates for manufacturing industries, which can lead to reductions of up to 33%, 62% and 55% for oil, natural gas and liquefied petroleum gas, respectively.

Figure 1: Summary of electricity and energy tax rate reductions by fuel type

(EUR/MWh)	Fossil fuels	Fossil fuels used for heating and electricity					
Fuel type	1 Stand. tax and levy rate	2 Stand. tax and levy rate	*Δ 1 and 2*	3 Reduc. tax and levy rate	*Δ 2 and 3*	4 Min. tax and levy rate	*Δ 2 and 4*
Electricity*	-	56	*0%*	16	*-71%*	2	*-96%*
Fuel oil (light)	49	6	*-87%*	5	*-25%*	4	*-33%*
Fuel oil (heavy)	12	2	*-81%*	2	*0%*	2	*0%*
Natural gas	14	6	*-60%*	4	*-25%*	2	*-62%*

LPG	32	5	*-83%*	4	*-25%*	2	*-55%*
Coal/ Petrol coke	1	1	*0%*	1	*0%*	1	*0%*

* Includes Environmental Tax Reform, Renewable Energy Act, and Combined Heat and Power Act

This study finds that the potential impact of tax exemptions from the Environmental Tax Reform, the Renewable Energy Act, the Emission Trading Scheme, and the Combined Heat and Power Act is greatest for high-energy consumption companies. For companies consuming more than 600GWh of energy, the policy-induced component of the energy price is decreased by 45% on average compared to companies that consume only 1MWh of energy. For companies that qualify for all exemptions, the policy-induced component of the energy price can be reduced by up to 75% (industry average), compared to companies that are not granted any exemption.

These significant net impacts are rarely communicated in the public policy debate. The quarterly publication of the International Energy Agency, "Energy Prices and Taxes," is only one example of this; although it states the reduced tax and levy rates for manufacturing industries, the energy prices it reports do not reflect the full set of exemptions granted to German industries. This could result in investors overestimating energy costs when locating plants, thus undermining the primary objective of the rebate, which is to attract investment with preferential energy prices.

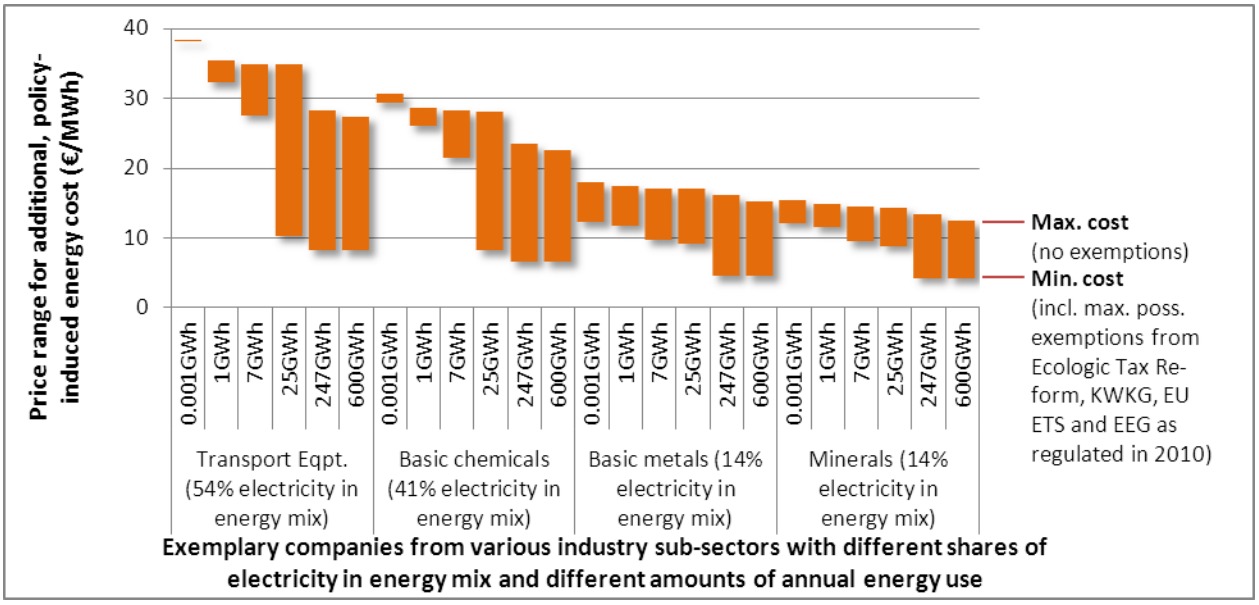
Implications: Significant tax exemptions and levy reductions reduce the incentive for manufacturing industries to pursue energy efficiency improvements.

2. The policies and exemptions create significant differences in energy costs between companies and introduce complexity in energy pricing. The potential price difference is largest for the largest companies and for those in electricity-intensive sectors.

The different provisions for exemptions and reductions (relating to non-wage labour costs, electricity costs, turnover, gross value added, carbon costs, or trade intensity) result in potentially huge differences in energy costs, thus creating complexity in pricing and complicating political debates on taxes and levies. These observations are summarized in the figure below. The variation in energy prices is shown for each industry sub-sector and scale of annual energy usage.

Implication: The complex policy design complicates the political discussion.

Figure 2: Variation in policy component of the energy price by company scale and industry sub-sector



The next step of this analysis would be to analyze the real impacts that these policies have had on energy consumption and carbon emissions. Additional analysis on the impact that these energy price differences have had on the operational and investment decisions of industrial concerns could also shed light on the effectiveness of these policies.

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1 Introduction

Between 2002 and 2007, Germany introduced its National Strategy for Sustainable Development and its Integrated Climate Protection Program, which both set an emissions reduction trajectory of 40% below the 1990 level by 2020. In order to achieve this goal, the German government uses a set of policies that includes taxes and levies on energy and electricity use. This in turn creates incentives for energy efficiency improvements and raises funds to finance energy security and climate policy objectives. German energy prices for industrial activities thus include a policy-induced component in addition to basic fuel costs.

For industrial energy users, a set of reductions and exemptions were introduced for energy and electricity related taxes and levies. They are now the subject of continuing political debates on whether they are necessary to ensure the economic success of the manufacturing sector, which contributes 23.1% of the gross value added in Germany (BMWi, 2010). The debates have also raised concerns about how the reductions and exemptions impact incentives for improving energy efficiency in a sector that accounts for 27.8% of Germany's final energy demand (AG Energiebilanzen, 2010). To date, however, many of the discussions have not fully considered the aggregate impact of the various taxes, levies, reductions and exemptions – a shortcoming this paper aims to address.

This paper quantifies the net impact of taxes and levies across the different sets of energy policies for firms of different sizes (as expressed by energy usage) and in different industrial sub-sectors.

The structure of the report is as follows: first, we describe the purpose and design of each policy instrument; we then apply the key legal provisions to representative industry sub-sectors, estimating the net impact of the energy policy mix. Lastly, we describe differences in taxation among these industry sub-sectors.

2 German energy policies

There are currently four important economic policy instruments being implemented within the German climate policy framework that influence energy prices for industrial companies, both directly and indirectly:

- The Environmental Tax Reform introduced taxes on energy and electricity (consumption tax with direct influence on energy price);
- The Combined Heat and Power Act (levy with indirect influence on energy price);
- The EU Emission Trading Scheme (direct influence on ETS installations and indirect influence when electricity providers pass on the cost to electricity consumers); and
- The Renewable Energy Act (levy with indirect influence on energy price).

These policies result in a policy-induced component of the energy price. Energy-intensive industries can apply for various tax and levy reductions and exemptions from this energy policy mix. In 2010, these reductions and exemptions added up to €7.1 billion (BMF 2010/ BMU 2011). The requirements for granting reductions and exemptions vary from one policy to the next. These requirements are described in the following, and a more detailed interpretation of the legal provisions is given in the Annex.

2.1 Environmental Tax Reform

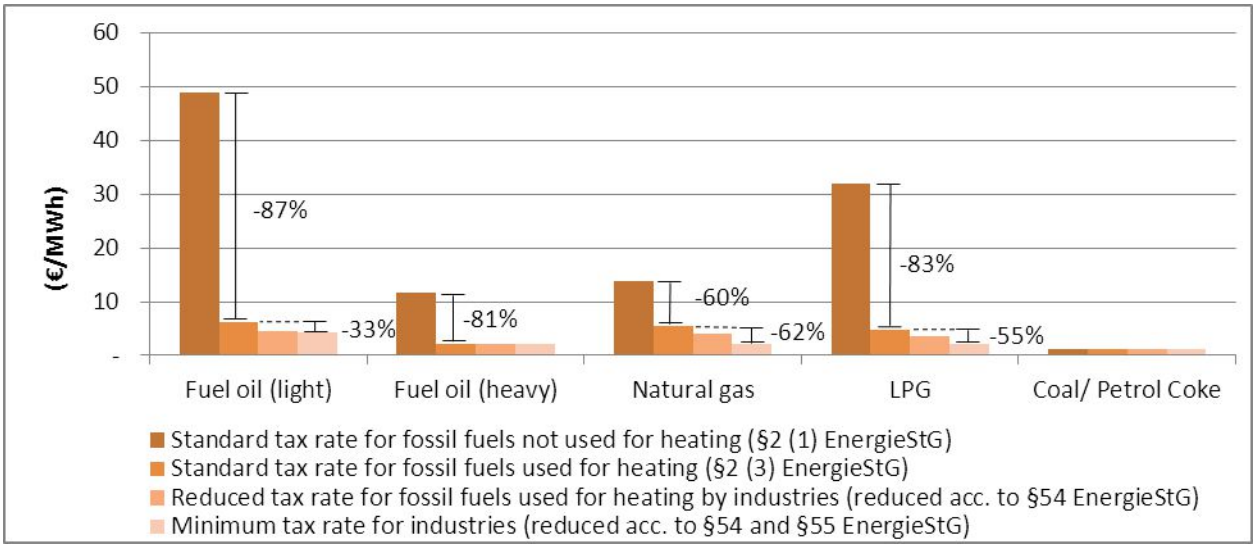
Reductions and exemptions from the Environmental Tax Reform are granted to companies with a low ratio of non-wage labour costs to total tax payment.

The basic motivation behind the Environmental Tax Reform was that previous tax instruments did not (or did not sufficiently) reflect environmental criteria when taxing economic activity. By implementing an environmental tax system, the German government aimed inter alia to internalise external effects, such as environmental pollution, while generating tax revenues. The Environmental Tax Reform called for an incremental increase in taxes on fossil fuels and also introduced a tax on electricity use. The anticipated increase in energy price was expected to incentivize more efficient energy use and encourage the deployment of renewable energies. The standard tax rates imposed by the Environmental Tax Reform on electricity, oil, natural gas, and coal are 21€/MWh, 49€/MWh, 32€/MWh, and 1€/MWh, respectively (regulated in §3 electricity tax law and §2(1) energy tax law). Oil and natural gas that are used for heating are given lower standard tax rates of roughly 6€/MWh (regulated in §2(3) energy tax law). The tax revenues from energy and electricity taxes are used to reduce non-wage labour costs, in particular the rate of employers' contribution to the public pension fund – a provision that is expected to create incentives for an increase in the employment rate and keep the Environmental Tax Reform revenue-neutral.

Manufacturing industries are granted reduced tax rates (regulated in §9b electricity tax law and §54 energy tax law). In addition, the Environmental Tax Reform was designed so that energy-intensive companies that employ relatively few workers, and thus do not benefit from the reduction of non-wage labour costs, can apply for a tax reimbursement (in German "Spitzenausgleich" as regulated in §55 energy tax and §10 electricity tax). Minimum industry tax rates, which apply if all reductions and exemptions are granted, are as low as 2€/MWh, 4€/MWh, 2€/MWh and 1€/MWh for electricity, oil, natural gas and coal, respectively. Exemptions and tax rate reductions for manufacturing industries granted under the Environmental Tax Reform added up to €4.4 billion in 2010 (BMF, 2010).

The following figure shows the four different types of energy tax rates as described above: standard tax rates, standard tax rates for fossil fuels used for heating purposes, reduced tax rates for fossil fuels used for heating purposes by industries, and the minimum tax rate, which applies only if a company qualifies for all reductions and exemptions. The energy tax law is mentioned under its abbreviation in Germany: EnergieStG.

Figure 2.1: Summary of energy tax reductions for industrial users



2.2 Combined Heat and Power Act (KWKG)

A reduction of the KWKG levy is granted to companies with a high ratio of electricity costs to turnover.

The aim of the Combined Heat and Power Act is to promote electricity produced from combined heat and power (CHP) plants. Network operators are obliged to purchase CHP electricity from CHP plant operators at market price plus an additional premium. Network operators can pass on the cost of this premium to the end users (including industrial sector users) as a levy. In 2011 network operators reported a KWKG levy of 0.30€/MWh for the regular electricity end user. Manufacturing companies with a high ratio of electricity costs to turnover pay a reduced levy of 0.25€/MWh (as regulated in §9 KWKG).

2.3 European Union Emission Trading Scheme (EU ETS)

The bulk of permits are allocated for free to companies with relatively high ratios of trade intensity[1] or carbon costs to gross value added.

The European Union Emission Trading Scheme is the overarching mechanism being used to manage and achieve the EU greenhouse gas emissions reduction target. Large carbon-intensive industry

[1] Trade intensity of a product or industry sub-sector is defined as the ratio between the balance of trade (value of exports to non-EU countries plus value of imports from non-EU countries) and the total market size for the Community (annual turnover plus total imports).

installations emitting more than 25.000t CO_2 annually are covered by the EU ETS. Before the start of the first (2005 – 2007) and second (2008 – 2012) trading periods, each EU Member State had to decide how many carbon allowances to allocate in total for the trading period and how many allowances each installation covered by the EU ETS would receive. If the amount of verified greenhouse gas emissions from an installation exceeded the amount of allocated allowances, the installation had to purchase additional allowances at market price. However, due to concerns about the potentially negative impacts of carbon pricing on the international competitiveness of European industries, a large number of permits was allocated for free during the first two phases of the EU ETS.

For the third trading period (2013 – 2020), there will no longer be any national allocation plans. Instead, the allocation will be determined directly at EU level. For the industry sectors, free allowances will be allocated to 5% of the most efficient installations (using greenhouse gas performance benchmarks) in the EU. Installations that meet the benchmarks will in principle receive all the allowances they need. Installations that do not meet the benchmark will have a shortage of allowances and will thus need to either lower their emissions or purchase additional allowances to cover their excess emissions.

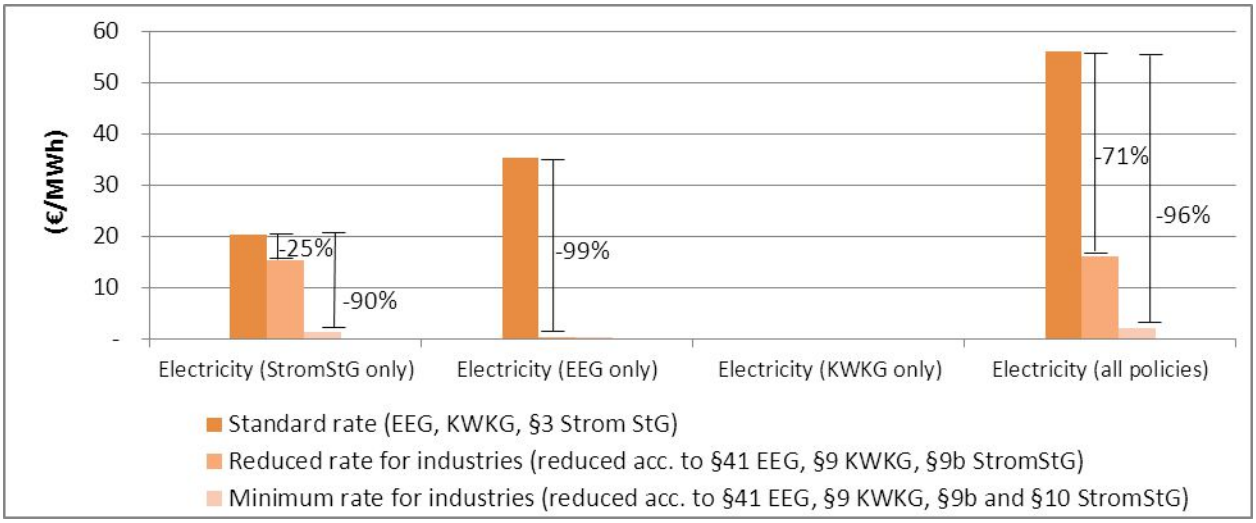
2.4 Renewable Energy Act (EEG)

A reduction of the EEG levy is granted to companies with a high ratio of electricity costs to gross value added.

The Renewable Energy Act was designed to help increase the market penetration of electricity produced from renewable energy. According to the EEG, certain renewable energy sources are prioritised for the generation of grid-supplied electricity. Network operators are obliged to purchase electricity generated from renewables at a fixed price – the Feed in Tariff (FIT). Additional costs beyond this price can be passed through to the end users (industry as well as other sectors). In 2011, the EEG levy for the regular electricity end user amounted to 35.3€/MWh. Manufacturing companies with a high ratio of electricity costs to gross value added pay a reduced levy rate of 0.5€/MWh (as regulated in §40, §41 EEG) if their annual electricity consumption exceeds 10MWh. Since companies consuming less than 10MWh currently pay the standard rate and there is no threshold set by this provision, these companies have an incentive to increase their electricity usage.

The following figure summarizes the reductions and exemptions granted to industries from the electricity tax law (German: StromStG), the KWKG and the EEG. Mainly, three tax rates can be differentiated: standard tax rate; the reduced tax rate for industries; and the minimum tax rate, which applies only if a company qualifies for all reductions and exemptions.

Figure 2.2: Summary of electricity tax and levy reductions for manufacturing industries



2.5 Energy policy mix

Tax exemptions and levy reductions create complexity for energy pricing.

In general, manufacturing industries pay reduced tax rates.

- Standard tax rates and levies on electricity resulting from the electricity tax law, the Renewable Energy Act, and the Combined Heat and Power Act add up to 56€/MWh. Tax and levy rate reductions for manufacturing industries can cut that total by up to 96%, if all exemptions apply.
- Standard tax rates for fossil fuels lie below the tax and levy rate for electricity.[2] Industrial users can benefit from tax and levy rate reductions and exemptions of up to: 33% for oil, 62% for natural gas, and 55% for liquefied petroleum gas.
- Electricity usage accounts for 30% of the energy mix on average. Since tax rates for other energy sources are significantly lower than the tax rate and levies on electricity, high electricity fees are balanced by lower energy fees for the greater part of the energy mix.

[2] In political discussions energy tax reduction rates of 26.7% for oil and 40.0% for electricity and gas are often mentioned (UBA, 2010). These reduction rates describe the difference, between the standard tax rate for industry users (regulated in §3 electricity tax law and §2 (3) energy tax law) and the reduced tax rate for industry users (regulated in §9b electricity tax law and §54 energy tax law). With the latest revision of the Environmental Tax Reform these reduction were lowered to 25% independent of the energy type.

Figure 2.1: Summary of electricity and energy tax rate reductions by fuel type

(EUR/MWh)	Fossil fuels	Fossil fuels used for heating and electricity					
Fuel type	1 Stand. tax and levy rate	2 Stand. tax and levy rate	*Δ 1 and 2*	3 Reduc. tax and levy rate	*Δ 2 and 3*	4 Min. tax and levy rate	*Δ 2 and 4*
Electricity*	-	56	*0%*	16	*-71%*	2	*-96%*
Fuel oil (light)	49	6	*-87%*	5	*-25%*	4	*-33%*
Fuel oil (heavy)	12	2	*-81%*	2	*0%*	2	*0%*
Natural gas	14	6	*-60%*	4	*-25%*	2	*-62%*
LPG	32	5	*-83%*	4	*-25%*	2	*-55%*
Coal/ Petrol coke	1	1	*0%*	1	*0%*	1	*0%*

* Includes Environmental Tax Reform, Renewable Energy Act and Combined Heat and Power Act

In addition to the unequal taxation of different energy sources, the different provisions for exemptions and reductions relating to the following result in a complex policy landscape:

- non-wage labour costs,
- electricity costs,
- turnover,
- gross value added,
- carbon costs, or
- trade intensity.

Due to policy interactions, energy prices differ between individual actors. The net impacts of tax exemptions and levy reductions, however, are rarely communicated in the public policy debate. The quarterly publication of the International Energy Agency, “Energy prices and taxes,” is one of the only examples of this. And, although it states the reduced tax and levy rates for manufacturing industries, the energy prices it reports do not reflect the full set of exemptions granted to German industries. This inaccurate reflection of the net impact of these tax exemptions and reductions complicates the political debate. In addition, it potentially causes investors to overestimate energy costs when locating plants, which undermines the primary objective of the rebate - impairment of German industries’ competitiveness and sustaining Germany’s importance as an industry location.

3 Quantitative analysis of the impact of tax exemptions and levy reductions on industry sub-sectors

In this section, we select a set of representative industry sub-sectors to illustrate the impact of the German energy policy mix. Instead of searching and verifying micro-data on energy use, we create six fictitious companies within each industry sub-sector to model the impacts on each one. We assume that

- these companies are representative of companies in that sector,
- these companies face similar conditions, such as energy mix,
- these companies differ in the amount of energy they use annually – the smallest company uses 1MWh of final energy per year, whereas the largest company uses 600.000MWh of final energy per year.

We then apply the legal provisions of the energy policies in focus to each of the six fictitious companies to estimate the resulting policy component of the energy price. We summarize impacts for each industry sub-sector by illustrating the variation in the policy component of the energy price for each company scale. Furthermore, we attempt to describe the reason for energy price differentials.

Since we assume the six fictitious companies in each industry sub-sector to be quite homogenous (except for the amount of annual energy use), outlying exemptions might not be illustrated sufficiently in this document.

3.1 Representative industry sub-sectors

We classify industry sub-sectors according to the German industrial classification standard "WZ 2008" of the Federal Statistical Office of Germany (DESTATIS, 2008). Inter alia, these sub-sectors differ in amount of energy used, energy cost, and energy mix, which describes the mix of different types of fossil fuels and electricity used in the production process. We explore the net impact of the various legal provisions on the energy mix of four manufacturing sub-sectors:

- Transport equipment: covering the manufacture of motor vehicles, trailers and semi-trailers, and other transport equipment (WZ 29, 30);
- Basic chemicals: covering the manufacture of basic chemicals, fertilizers and nitrogen compounds, plastics, and synthetic rubber in primary forms (WZ 20.1);
- Basic metals: covering the manufacture of basic iron and steel and of ferro-alloys (WZ 24.1); Mineral processing: covering the manufacture of other porcelain and ceramic products, cement, lime and plaster, articles of concrete, cement and plaster, abrasive products and non-metallic mineral products n.e.c., and the cutting, shaping, and finishing of stone (WZ 23.4 - 23.9).

Sub-sector specific energy mix categories were derived from Germany's energy balance report 2008 (AG Energiebilanzen, 2010). As illustrated in the table below, the production processes of transport equipment and basic chemicals rely mainly on the use of electricity and natural gas. In contrast, manufacturers of basic metals and minerals, including cement, utilize primarily coal for electricity and heat production.

Figure 3.1: Energy mix of industry sub-sectors in Germany in 2008 (AG Energiebilanzen, 2010)

Sub-sector	Coal	Fuel oil light/ Diesel oil	Fuel oil heavy	Petroleum products*	Nat. gas	Renew able energy	Others	Electri-city
Transport equipment	1%	2%	0%	0%	31%	0%	12%	54%
Basic chemicals	3%	0%	2%	2%	27%	6%	19%	41%
Basic metals	47%	0%	3%	0%	17%	0%	19%	14%
Mineral processing	33%	3%	2%	5%	22%	4%	17%	14%

* includes petroleum coke, LPG, other petroleum products

3.2 Assessment of tax exemptions and levy reductions

To assess the net impact of energy policies in Germany, we estimate the impact of policies on energy prices. The policy component of the energy price is illustrated using two elements: the minimum policy component and the maximum exemption component.

The minimum policy component is the additional energy cost that the company must pay when no tax exemptions or levy reductions apply. In Figures 3.3 – 3.6, we calculate the policy component for companies of different energy usage levels in the four identified sub-sectors. The minimum policy component is marked in darkened full colours.

The maximum exemption component assumes the granting of the maximum number of tax exemptions and levy reductions possible. In Figures 3.3 – 3.6, the maximum exemption component is marked in lightly shaded colours.

The following table summarises the assumptions for both components.

Figure 3.2: Assumptions for estimation of net cost induced by German energy policy mix

Energy policy	Assumption for estimation of min. policy component of energy price	Assumption for estimation of max. tax exemption & levy reduction
Env. Tax Reform (energy, electricity tax)	• Reduced industry tax rate • Non-wage labour costs derived from a total annual labour cost of €100mil.	• Reduced industry tax rate • Non-wage labour costs derived from a total annual labour costs o €1mil.
KWKG	Ratio of annual electricity costs to turnover less than or equal to 4%	Ratio of annual electricity costs to turnover greater than 4%
EU ETS	• Indirect cost passed on by electricity providers for each unit of supplied electricity: 11€/MWh • Carbon price: 20€/t CO_2 • Electricity-grid emission factor	• Companies emitting less than 25.000t CO_2 per year exempted • Free allocation of 85% of permits • Carbon price: 20€/t CO_2 • Industry sub-sector specific emission factor
EEG	Ratio of annual electricity costs to GVA less than 15%	Ratio of annual electricity costs to GVA greater than or equal to 20%

In reality, only a few companies receive this full tax exemption and levy reduction. The average company in Germany pays an additional energy price that falls between the minimum policy component and the maximum exemption.

The following figures show the results of the quantitative analysis of the policy instruments and in particular, the exemptions granted from the Environmental Tax Reform (energy tax, electricity tax), EU ETS, and EEG. The figures show the variation of energy prices for each industry sub-sector. Currently, the additional charge on the energy price due to the KWKG equals 0.3€/MWh (for the average user). This value is too small to significantly impact the full policy component of the energy price, so we have not included impacts from the Combined Heat and Power Act in Figures 3.3.–3.6.

Figure 3.3: Policy component of the energy price for manufacturers of transport equipment (WZ 29, 30)

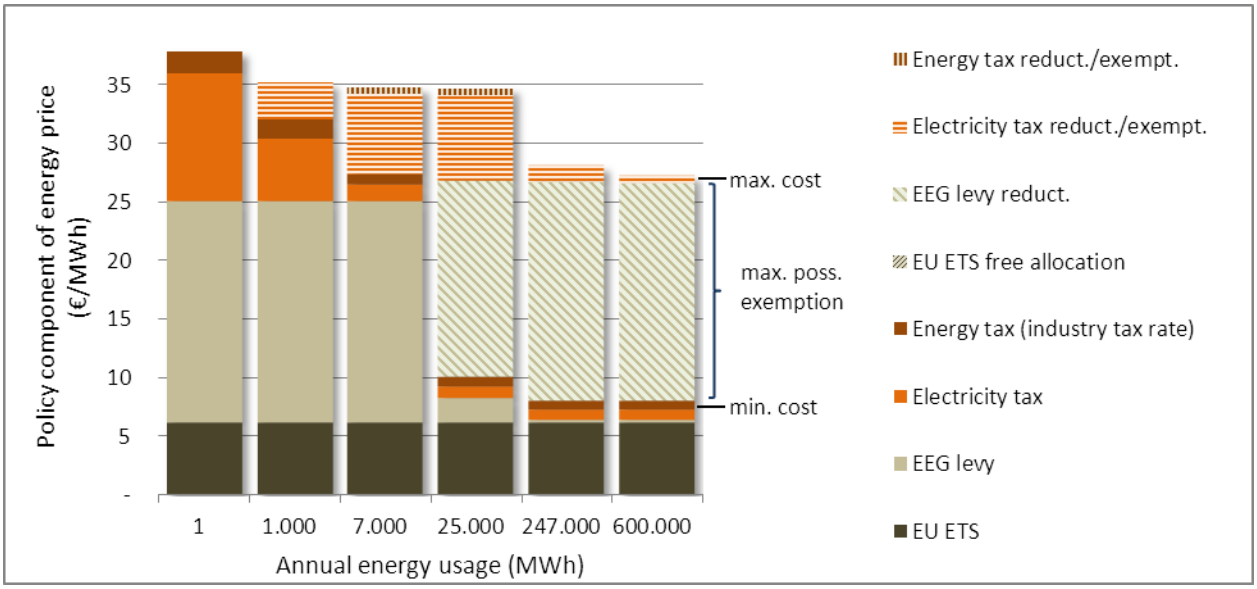


Figure 3.4: Policy component of the energy price for manufacturers of basic chemicals (WZ 20.1)

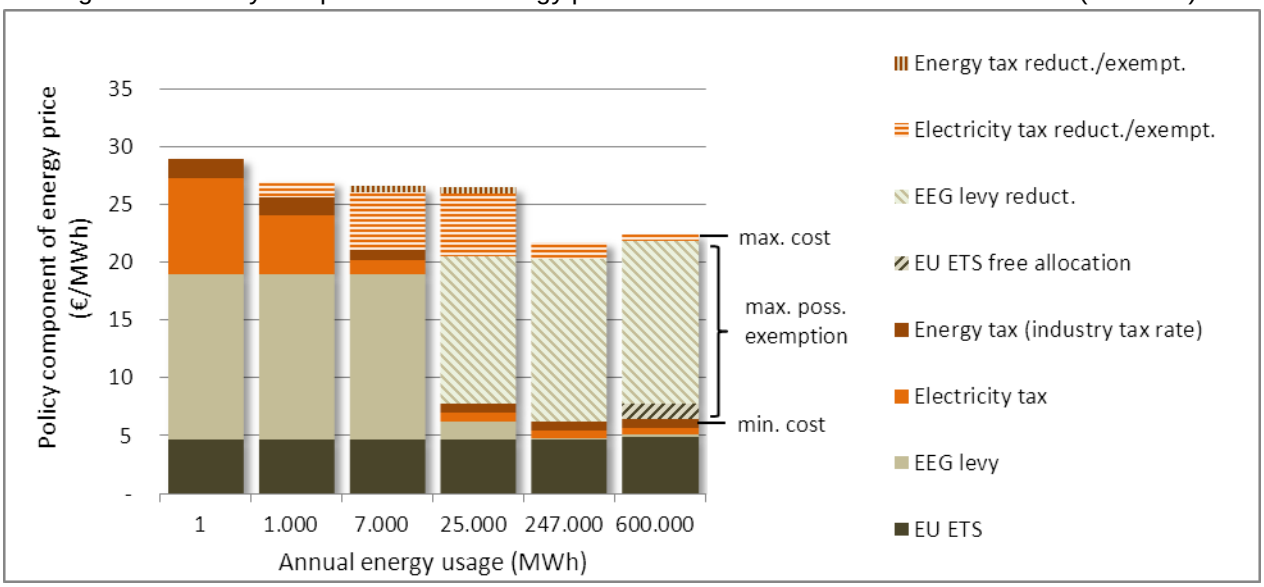


Figure 3.5: Policy component of the energy price for manufacturers of basic metals (WZ 24.1)

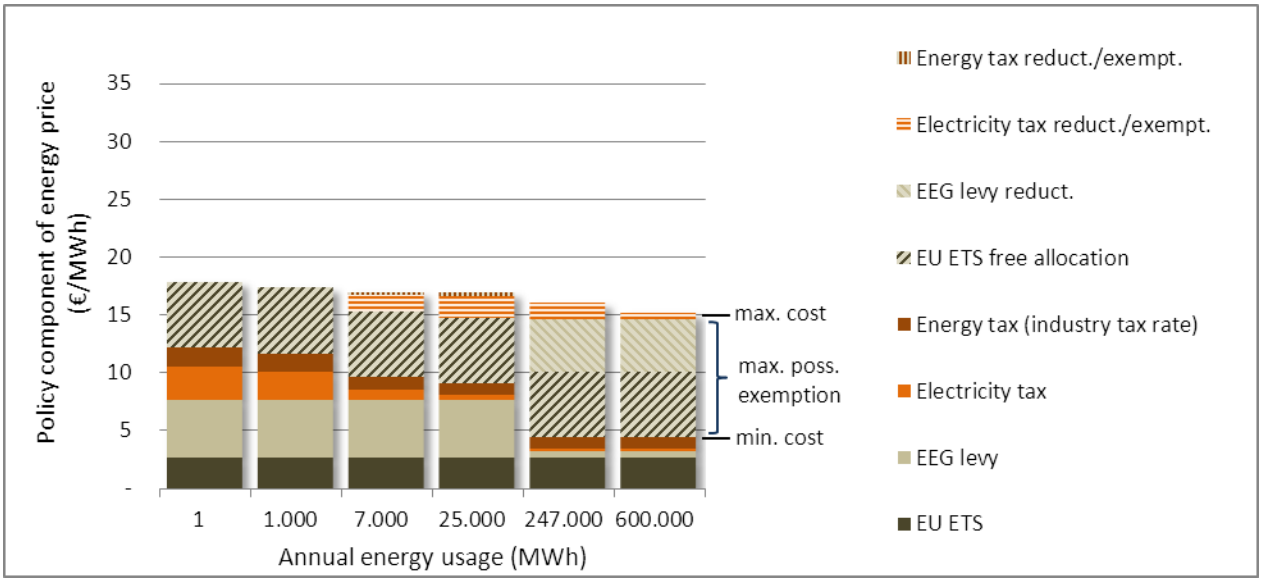
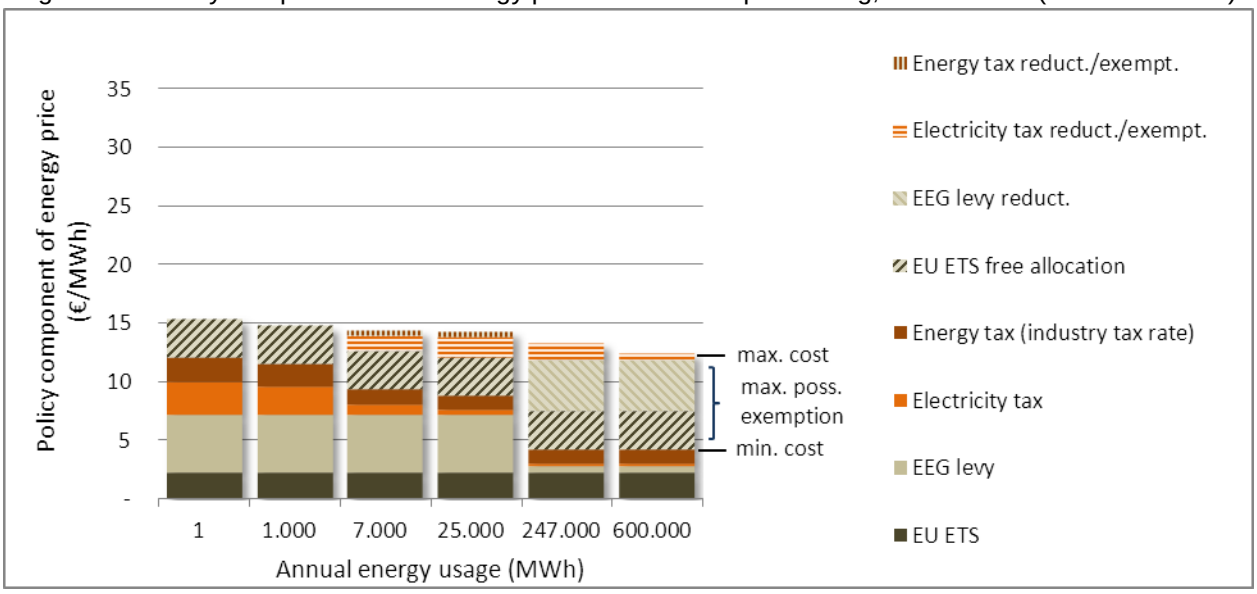
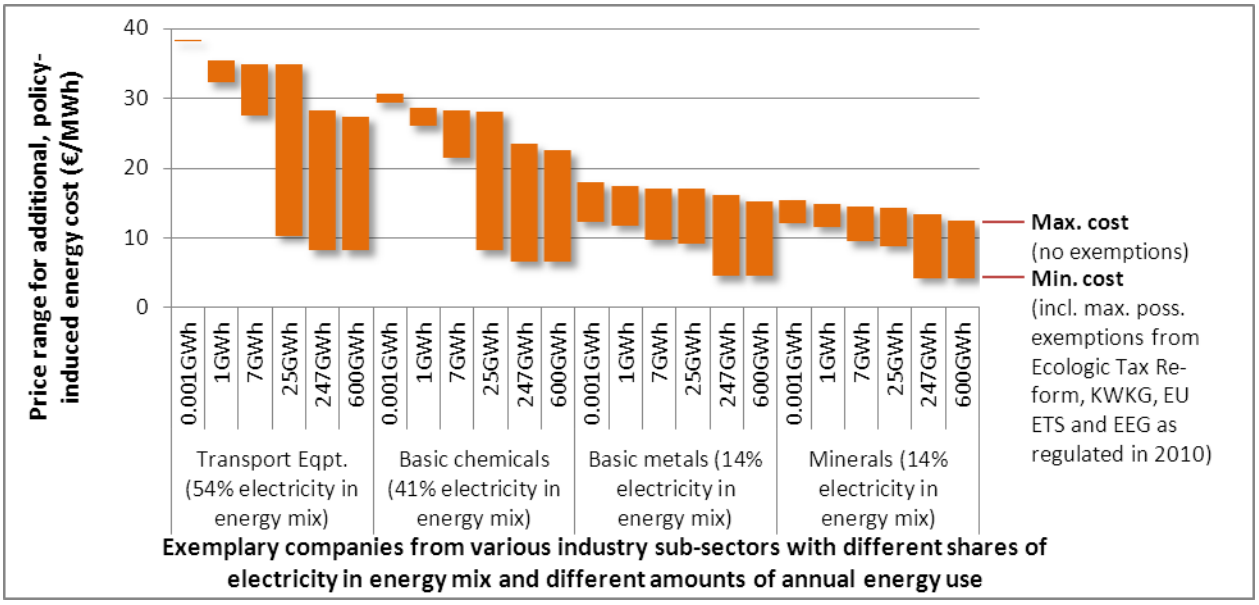


Figure 3.6: Policy component of the energy price for minerals processing, incl. cement (WZ 23.4 – 23.9)



We also compile Figures 3.3 through 3.6 into one chart that highlights the minimum and maximum possible policy component of the energy price for each of the six companies (differentiated by energy usage) in the four sample industry sub-sectors. The bars indicate the variation in policy-induced energy prices; the company pays the minimum price (the lower boundary of the bar) if they receive the full set of exemptions and reductions and pays the maximum price (the higher boundary of the bar) if no exemptions or reductions apply.

Figure 4.1: Variation in policy component of the energy price by company scale and industry sub-sector

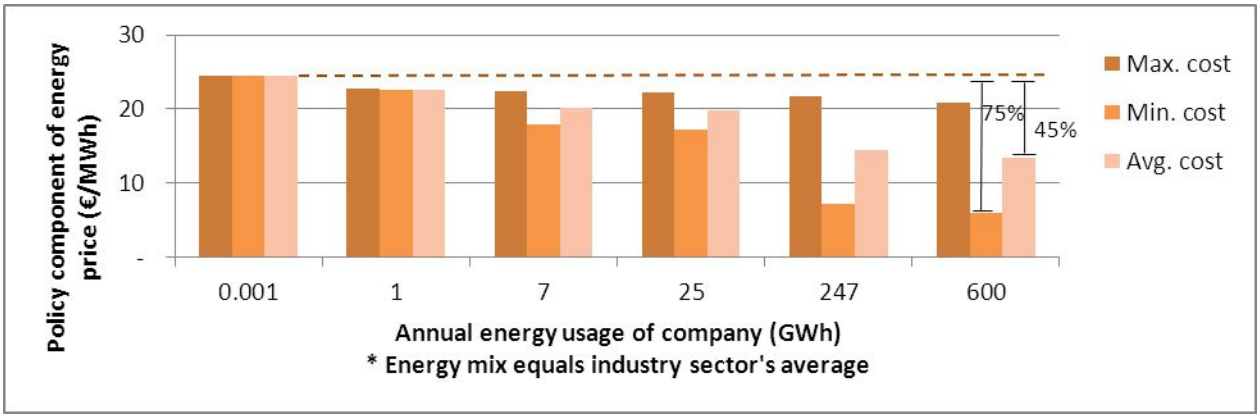


The potential difference in additional energy price is largest for the largest companies and for those in electricity-intensive sectors.

Figure 4.1 shows that companies with a relatively high annual energy use pay, on average, less per unit of energy than smaller companies, even though they operate in the same industry sub-sector. For companies that consume more than 600GWh of energy, the policy component of the energy price decreases by an average of 45% compared to companies that consume only 1MWh of energy.

Furthermore, tax reductions and exemptions vary greatly, depending on the energy mix. For companies that qualify for all exemptions, the policy component of the energy price can be reduced by up to 75% (industry average) compared to companies that are not granted any exemptions. While we do not know where exactly companies fall within the range of energy costs, we note that industry sub-sectors with a high share of fossil fuels in their energy mix (e.g. manufacturers of basic metals or minerals) face lower policy components of energy costs than those using mainly electricity (e.g. manufacturers of transportation equipment or basic chemicals).

Figure 4.2: Average variation in policy component of the energy price



4 Conclusion

The German government introduced a set of energy policies to increase energy efficiency and the use of renewable energy, and to raise funds to finance energy security and climate policy objectives. These policies have added to the basic fuel costs faced by industry.

Significant tax exemptions and levy reductions from energy policies exist for manufacturing industries.

Because of concerns that higher energy prices could potentially have an undesirable impact on the international competitiveness of German industries, significant tax exemptions and levy reductions from energy policies exist for manufacturing industries for a transitional period. By taking advantage of reductions and exemptions from the Environmental Tax Reform, the Renewable Energy Act, and the Combined Heat and Power Act, standard energy and electricity tax rates can be reduced for industrial consumers by up to 33% for oil, 62% for natural gas, 55% for liquefied petroleum gas and 96% for electricity.

In addition, the policy-induced component of the energy price declines with the volume of energy consumed, reducing charges for large consumers (annual energy usage of 600GWh) by 45% on average compared to the charges of small consumers (annual energy usage 1MWh). For companies that qualify for all exemptions, the initial policy component of the energy price can be reduced by up to 75% (industry average), compared to companies that are not granted any exemption and use only a small amount of energy.

Furthermore, tax reductions and exemptions vary depending on the energy mix, and energy mixes are industry sub-sector specific. The quantitative analysis showed that those industry sub-sectors with a high share of electricity in their energy mix (e.g. manufacturers of transport equipment or basic chemicals) face higher additional policy-induced energy costs than those that use mainly fossil fuels (e.g. manufacturers of basic metals or mineral processing).

As a next step, the policy component of the energy price should be compared to the total cost of energy. Furthermore, it is of interest to policy makers whether and how much policy-induced energy costs impact energy efficiency in the industry sector. Finally, studies indicate that the total amount of tax exemptions and levy reduction of €7 billion in 2010 were distributed to a relatively small number of large, energy-

intensive companies from certain industry sub-sectors (BMF, 2010/ BMU, 2011). This raises the question of whether and to what extent the energy policy mix continues to provide incentives for improving energy and carbon efficiency among these large installations, and, if necessary, what policy options could improve the situation.

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Appendix A: Environmental Tax Reform

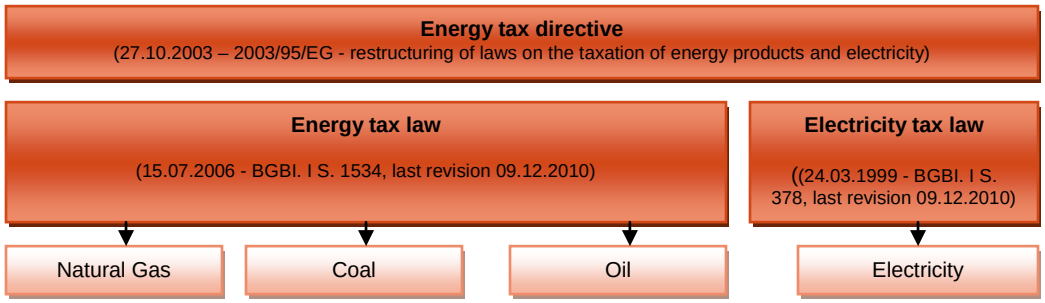
In German: “Ökologische Steuerreform”/ “Gesetz zur Fortführung der Ökologischen Steuerreform”/ „Energiesteuergesetz“ (EnergieStG)/ „Stromsteuergesetz“ (StromStG)

Basic Idea

The motivation for the Environmental Tax Reform was that previous tax instruments did not (or did not sufficiently) reflect environmental criteria when taxing economic activity, which (unintentionally) led to environmentally harmful behaviour. By implementing an environmental tax system, the German government aimed to internalise external effects such as environmental pollution while generating tax revenues.

The reform called for an incremental increase in taxes on fossil fuels and introduced a tax on electricity. This energy price increase is expected to incentivize more efficient energy use and the deployment of renewable energy. The tax revenue is used to reduce non-wage labour costs – a provision that is expected to create incentives for an increase in the employment rate and keep the Environmental Tax Reform (as a whole) revenue-neutral. Figure 5.1 shows the connection between the European energy tax directive and the Environmental Tax Reform.

Figure 5.1: Environmental Tax Reform: Implementation of energy and electricity tax law



Current regulation: Energy tax law

§ 2 (1) Energy tax rate
Regular tax rates are determined for diesel oil/ fuel oil light, fuel oil heavy, other petroleum products, refinery gas/ natural gas (petroleum gas), liquefied petroleum gas, coal, and petrol coke.

§ 2 (2) Temporary energy tax rate reduction for gas
Furthermore, it is regulated that only a reduced tax rate has to be paid for refinery gas/ natural gas (petroleum gas) and liquefied petroleum gas until 31st December 2018. After that the regular tax rate according to § 2 (1) applies to these types of fossil fuels.

§ 2 (3) Energy tax rate reduction for advantaged facilities

For those fossil fuels which are used for heating and for driving gas turbines or combustion motors in advantaged facilities, a reduced tax rate is defined.

§ 3 Advantaged facilities
A definition of advantaged facilities is given. CHP installations and facilities used for electricity generation are examples of such facilities.

§ 51 Energy tax exemption for certain processes
As the energy tax is only meant to apply to heating and fuel use, manufacturing industries can apply for an energy tax exemption for the share of fossil fuels used in certain processes, such as:

- production of glass and glass products, ceramic products […], or
- production and processing of metal, as well as the production of metal products […], or
- chemical reduction processes etc.

§ 53 Energy tax exemption for electricity generation and CHP
Fossil fuels used in facilities for electricity generation or for combined heat and power generation are excluded from the application of the energy tax if their utilization ratio exceeds 70% per month or year.

§ 54 Energy tax rate reduction for manufacturing industries
Manufacturing industries can apply for a reduction of the tax rate for diesel oil/ fuel oil light, fuel oil heavy, other petroleum products, refinery gas/ natural gas (petroleum gas), and liquefied petroleum gas by the defined tax rate reduction if the total amount of granted tax reduction exceeds 250€ per year.

§ 55 Energy tax reduction “Spitzensteuerausgleich”
A tax portion is defined for diesel oil/ fuel oil light, fuel oil heavy, other petroleum products, refinery gas/ natural gas (petroleum gas), and liquefied petroleum gas. The tax reduction granted to manufacturing industries can equal 90% of the total tax portion (sum for all fossil fuels) reduced by 750€. Furthermore, the tax reduction is capped; it can equal at most 90% of the difference between the company’s tax amount and the company’s share of the reduction in pension insurance. Energy-intensive companies, if they employ only a relatively low number of workers and did not benefit from the reduction of the pension insurance contributions in the past and did not receive sufficient tax relief from the electricity tax after § 10 of the electricity tax law, are eased through this “Spitzensteuerausgleich”.

The figure below shows the algorithm for the calculation of the energy tax derived from the above legal provisions. All tax exemptions and reductions are mapped.

Figure 5.2: Environmental Tax Reform: Energy tax law - Calculation of tax amount

Condition 1	Condition 2	Formula	Variable description
Eco tax reform: Energy tax			
$Min\left\{\left\{\sum_i (MWh_{EnFav_i}^{NonProc} * Tax_{EnFav_i}^{Ind§55}) - 750€\right\}, \left\{\sum_i (MWh_{EnFav_i}^{NonProc} * Tax_{EnFav_i}^{Ind§55}) + (MWh_{Elec}^{NonProc} - 48.8MWh) * Tax_{Elec}^{Ind§9} - 750€ - 0.4\% * Wage\right\}\right\} < 0$	$\sum_j (MWh_{EnFav_j}^{NonProc} * Tax_{EnFav_j}^{Ind§54}) \leq 250€$	$Cost_{EnTax} = \sum_i (MWh_{En_i}^{NonProc} * Tax_{En_i}^{§2.3})$	$Cost_{EnTax}$: Energy tax $Tax_{En_i}^{§2.3}$: Tax rate for certain fossil fuel types (En_i) - §2 (1) coal, petrol coke and §2 (3) diesel oil/ fuel oil light, fuel oil heavy, refinery gas/ natural gas (petroleum gas), liquefied petroleum gas $MWh_{En_i}^{NonProc}$: Annual energy use per fossil fuel type (En_i) used for processes, which are NOT exempt from the tax (§1) $MWh_{EnFav_i}^{NonProc}$: Annual energy use for each fossil fuel type mentioned in (§54, §55) ($EnFav_i$) - diesel oil/ fuel oil light, fuel oil heavy, refinery gas/ natural gas (petroleum gas), liquefied petroleum gas - used for processes, which are NOT exempt from the tax (§1) $Tax_{EnFav_i}^{Ind§54}$: Tax rate reduction granted to manufacturing industries for those fossil fuel types, which are mentioned in (§54) ($EnFav_i$) 250€: Threshold for tax reduction (§54) $Tax_{EnFav_i}^{Ind§55}$: Reducible tax portion for manufacturing industries in special circumstances, applied to those fossil fuel types, which are mentioned in (§55) ($EnFav_i$) 750€: Threshold for tax reduction (§55) 0.4% * Wage: "Spitzenausgleich" - Company's share of the reduction in pension insurance (§55) $(MWh_{Elec}^{NonProc} - 48.8MWh) * Tax_{Elec}^{Ind§9}$: refers to electricity tax §10 (1), taxable electricity use
	else	$Cost_{EnTax} = \sum_i (MWh_{En_i}^{NonProc} * Tax_{En_i}^{§2.3}) - \left\{\sum_j (MWh_{EnFav_j}^{NonProc} * Tax_{EnFav_j}^{Ind§54}) - 250€\right\}$	
else	$\sum_j (MWh_{EnFav_j}^{NonProc} * Tax_{EnFav_j}^{Ind§54}) \leq 250€$	$Cost_{EnTax} = \sum_i (MWh_{En_i}^{NonProc} * Tax_{En_i}^{§2.3}) - 90\% * Min\left[\left\{\sum_j (MWh_{EnFav_j}^{NonProc} * Tax_{EnFav_j}^{Ind§55}) - 750€\right\}, \left\{\sum_j (MWh_{EnFav_j}^{NonProc} * Tax_{EnFav_j}^{Ind§55}) + (MWh_{Elec}^{NonProc} - 48.8MWh) * Tax_{Elec}^{Ind§9} - 750€ - 0.4\% * Wage\right\}\right]$	
	else	$Cost_{EnTax} = \sum_i (MWh_{En_i}^{NonProc} * Tax_{En_i}^{§2.3}) - \left\{\sum_j (MWh_{EnFav_j}^{NonProc} * Tax_{EnFav_j}^{Ind§54}) - 250€\right\} - 90\% * Min\left[\left\{\sum_j (MWh_{EnFav_j}^{NonProc} * Tax_{EnFav_j}^{Ind§55}) - 750€\right\}, \left\{\sum_j (MWh_{EnFav_j}^{NonProc} * Tax_{EnFav_j}^{Ind§55}) + (MWh_{Elec}^{NonProc} - 48.8MWh) * Tax_{Elec}^{Ind§9} - 750€ - 0.4\% * Wage\right\}\right]$	

Current regulation: Electricity tax law

§ 3 Electricity tax rate
The regular rate of taxation on electricity according to the electricity law equals 20.5€/MWh (40-times the European minimum rate of 0.5€/MWh).

§ 5 Electricity tax debtor
The tax debtor is the electricity provider, who is allowed to pass-through the cost to the end user.

§ 9 Electricity tax exemption and tax rate reduction for manufacturing industries
A tax exemption applies for electricity that

- originates from a grid that relies purely on renewables;
- is used for electricity production (to avoid double burden);
- is produced from facilities with a nominal capacity of less than 2MW for personal or local use (to protect small and local electricity producers);
- originates from emergency power systems; or
- is produced and used in shipping, aviation, and railway traffic.

As the tax is only meant for heating and fuel use, manufacturing industries can apply for a tax exemption for that share of electricity used for certain processes, such as:

- electrolysis,
- production of glass and glass products, ceramic products […], or
- production and processing of metal as well as the production of metal products […], or
- chemical reduction processes.

A tax rate reduction can be applied for by manufacturing industries for the share of their consumption rate that exceeds 48.8MWh. The reduced tax rate for that share is 15.37€/MWh.

§ 10 Electricity tax reduction
A tax reduction can be applied for by companies in the manufacturing sector for the tax amount that exceeds the threshold of 1,000€ ("Sockelbetrag," which results from the minimum taxed

amount of 48.8MWh * 20.5€/MWh = 1,000€). Companies can receive a maximum refund of 90% of that tax amount. Furthermore, the tax refund is capped; it can equal at most 90% of the difference between the company's tax amount and the company's share of the reduction in pension insurance contributions attributable to the eco tax reform. Energy-intensive companies, if they employ only a relatively low number of workers and did not benefit from the reduction of the pension insurance contributions in the past, are eased through this "Spitzensteuerausgleich."

The figure below shows the algorithm for the calculation of the electricity tax derived from the above legal provisions. All tax exemptions and reductions are mapped.

Figure 5.3: Environmental Tax Reform: Electricity tax law - Calculation of tax amount

Condition 1	Condition 2	Formula	Variable description
Eco tax reform: Electricity tax			
$MWh_{Elec}^{NonProc} \leq 48.8MWh$		$Cost_{ElecTax} = MWh_{Elec}^{NonProc} * Tax_{Elec}^{§2}$	$Cost_{ElecTax}$: Electricity tax $MWh_{Elec}^{NonProc}$: Annual electricity use for processes, which are NOT exempt from the tax (§9a) 48.8MWh: Threshold annual electricity use (§9) $Tax_{Elec}^{§2}$: Electricity tax rate, regulated by law (§3) $Tax_{Elec}^{Ind§9}$: Reduced electricity tax rate for manufacturing industries, regulated by law (§9) 0.4% * Wage: "Spitzenausgleich" - Company's share of the reduction in pension insurance (§10)
$MWh_{Elec}^{NonProc} > 48.8MWh$	$(MWh_{Elec}^{NonProc} - 48.8MWh) * Tax_{Elec}^{Ind§9} - 0.4\% * Wage \leq 0€$	$Cost_{ElecTax} = 48.8MWh * Tax_{Elec}^{§2} + (MWh_{Elec}^{NonProc} - 48.8MWh) * Tax_{Elec}^{Ind§9}$	
	else	$Cost_{ElecTax} = 48.8MWh * Tax_{Elec}^{§2} + (MWh_{Elec}^{NonProc} - 48.8MWh) * Tax_{Elec}^{Ind§9} - 90\% \{(MWh_{Elec}^{NonProc} - 48.8MWh) * Tax_{Elec}^{Ind§9} - 0.4\% * Wage\}$	

Link to other regulations

The Environmental Tax Reform is connected to the voluntary agreement and declaration of German industry on climate protection: *"Regarding tax measures, the Federal Government already took the industry's efforts in climate protection into account during the first steps of the Environmental Tax Reform. It will endeavour to ensure that further development of the Environmental Tax Reform will not cause any competitive disadvantages at the international level for the industries involved in the agreement. Inter alia, in view of the harmonization of energy taxation yet to take place in Europe, the net burden on companies is also to be kept within reasonable limits."*

Appendix B: Combined Heat and Power Act

In German: "Kraft-Wärme-Kopplungsgesetz" (KWKG - Gesetz für die Erhaltung, die Modernisierung und den Ausbau der Kraft-Wärme-Kopplung)

Basic Idea

The KWKG aims to promote electricity produced from combined heat and power (CHP) plants. Network operators are obliged to purchase CHP electricity from CHP plant operators at market price plus an additional premium. Network operators can pass on the cost of the premium to the end users as a levy.

Current regulation

§1 Purpose of law
The KWKG intends to increase the share of electricity produced by CHP to up to 25% of total electricity production. To achieve that, the modernisation of old, and the construction of new CHP plants is promoted, fuel cells are introduced into the market and the heat grid is promoted.

§4 Connection feeding and reward obligation
Network operators are obliged to feed electricity produced by CHP into the grid and to reward CHP plant operators with a financial premium. The network operator can pass on the arising additional cost for electricity to the end user.

§7 Level and duration of bonus
The bonus to be paid to the CHP plant operator depends on the power-to-heat-ratio and therefore varies according to the plant type. It has been progressively reduced from 2004. The total premium paid for CHP electricity should not exceed €750 million per year (exempting premium for heat grids).

§9 Levy cap
The levy is capped at 0.50€/MWh for the use of every kWh above the threshold of 100MWh. For manufacturing industries with a ratio of electricity costs to turnover higher than 4%, the levy is further capped at 0.25€/MWh.

The figure below shows the algorithm for the calculation of the KWKG levy derived from the above legal provisions.

Figure 5.4: Combined Heat and Power Act - Calculation of levy

Condition 1	Condition 2	Formula	Variable description
CHP act			
$Cost_{Elec} \leq 4\%$ Turnover	$MWh_{Elec} \leq 100MWh$	$Cost_{Chp} = MWh_{Elec} * Cost^{All}_{Chp}$	$Cost_{Chp}$: CHP act pass-through cost MWh_{Elec}: Annual electricity use 100MWh: Threshold annual electricity use (§9) Turnover: Turnover (§9) $Cost_{Elec}$: Annual costs for electricity purchase (§9) $Cost^{All}_{Chp}$: Cost passed through for CHP act to regular users, published yearly by transmission network provider (§9) $Cost^{All\S9}_{Chp}$: Cost passed through for CHP act to regular users (reduced rate) (§9) $Cost^{Ind\S9}_{CHP}$: Cost passed through for CHP act to manufacturing industries (reduced rate) (§9)
	$MWh_{Elec} > 100MWh$	$Cost_{Chp} = 100.000MWh * Cost^{All}_{Chp} + (MWh_{Elec} - 100MWh) * Cost^{All\S9}_{Chp}$	
$Cost_{Elec} > 4\%$ Turnover	$MWh_{Elec} \leq 100MWh$	$Cost_{Chp} = MWh_{Elec} * Cost^{All}_{Chp}$	
	$MWh_{Elec} > 100MWh$	$Cost_{Chp} = 100,000MWh * Cost^{All}_{Chp} + (MWh_{Elec} - 100MWh) * Cost^{Ind\S9}_{Chp}$	

Link to other regulations

The KWKG interlinks with the renewable energy sources act and the Environmental Tax Reform. Both policy instruments increase the price of electricity from utilities and hence enhance the profitability of industrial CHP (indirect promotion).

Furthermore, the act serves the voluntary agreement on CHP (2001), which aims to save 10.000t CO_2 by 2005 and 20.000 – 23.000t CO_2 by 2010 (compared to base year 1998). The additional impact of the voluntary agreement on the extension of industrial CHP is estimated to be relatively low, however, since an autonomous extension of CHP capacities for economic reasons already takes place.

Developments

Initially, the KWKG was set to expire in 2010, but in 2008 the expiration was cancelled. Another revision is planned for 2011.

For the year 2011 the transmission system operators estimate the additional KWKG levy at 0.3€/MWh – an amount that is already lower than the levy cap for large end users as regulated by law.

Appendix C: European Union Emission Trading Scheme

In German: “Treibhausgas-Emissionshandelsgesetz” (TEHG - Gesetz zur Umsetzung der Richtlinie 2003/87/EG über ein System für den Handel mit Treibhausgasemissionszertifikaten in der Gemeinschaft)

Basic Idea

The European Union Emission Trading Scheme is the overarching mechanism being used to manage and achieve the EU greenhouse gas emissions reduction target. Large carbon-intensive industry installations emitting more than 25.000t CO_2 annually are covered by the EU ETS. The Emission Trading Act implements the EU-Directive (Directive 2003/87/EC) into German law. For that purpose, the German Emissions Trading Authority (Deutsche Emissionshandelsstelle – DEHSt) was established within the German Environmental Agency. It is responsible for the distribution of emissions allowances, the monitoring of the emissions trading system, and for all national and international communication.

Current regulation

§1 Purpose of the directive
The EU directive 2003/87/EC, which was amended ultimately by directive 2009/29/EC, aims to promote greenhouse gas emissions reductions in a cost-effective and economically efficient manner.

§2 Annex I Scope
The directive applies to emissions from activities in the following sectors: power stations and other combustion plants; oil refineries; cook ovens; iron and steel plants; and factories making cement, glass, lime, bricks, ceramics, pulp, paper, and cardboard.

§ 27 Exclusion from the directive
Small installations may be excluded from the application of the directive. These are installations emitting less than 25.000t CO_2 per year and installations carrying out combustion activities that have a rated thermal input below 35MW (excluding emissions from biomass) in each of the three

years preceding the notification under point.

The figure below shows the algorithm for the application of the EU ETS derived from the above legal provisions.

Figure 5.5: Emission trading scheme – Calculation of emission allowance allocation

Condition 1	Formula	Variable description
Emission Allowance allocation – EU ETS		
Emission $_{CO2} \leq$ 25Mt CO2 OR Rated thermal input $\leq$ 35MW	$A^{GHG}_{Install_i} = C_{Install_i} * LF_{Standard} * Benchmark_{Prod_j} * \frac{RD_{Install_i}}{TD_{Period}} * TY_{Period}$	$A^{GHG}_{Install_i}$: Allocated emission allowances for the trading period according to the formula applicable for the installation ($Install_i$) and product ($Prod_j$) in [t CO2eq] $C_{Install_i}$: Capacity of the installation ($Install_i$) in [MWh/yr or t/yr] $LF_{Standard}$: Standard load factor $Benchmark_{Prod_j}$: Emission benchmark per unit of product ($Prod_j$) in [t CO2eq/MWh or t CO2eq/t] $RD_{Install_i}$: Total number of days between the starting the operation of installation ($Install_i$) and the end of the trading period TD_{Period}: Total number of days in the trading period TY_{Period}: Total number of years in the trading period

Link to other regulations

The Emission Trading Act is linked to the National Allocation Plan for Greenhouse Gas Emissions Allowances, which lays down concrete emission targets for the sectors.

Appendix D: Renewable Energy Act

In German: “Erneuerbare-Energien-Gesetz“ (EEG - Gesetz für den Vorrang Erneuerbarer Energien)

Basic Idea

The Renewable Energy Act targets the market penetration of electricity produced from renewable energy. According to the EEG certain renewable energy sources are prioritised for the generation of grid-supplied electricity. Network operators are obliged to purchase electricity generated from renewables at a special price. Additional costs can be passed on to the end user.

Current regulation

§1 Purpose of law
The share of renewable energies in electricity generation shall be increased to 30% by 2020.

§8, 16, 23-33 Regulation of feed-in-tariff
Network operators are obliged to purchase electricity from renewable energy operators at regulated minimum prices (prerequisites and exemptions apply). The price to be paid depends on the type of renewable energy and the size of the operator’s installation.

§40 41 EEG levy reduction for manufacturing industries

Network operators are allowed to hand the policy-induced additional price to be paid for electricity from renewables on to the customer as a levy. For manufacturing industries that consume more than 10MWh of electricity per year and show a ratio of electricity cost to gross value added greater than 15%, this levy is capped at 0.5€/MWh. Furthermore, for companies that consume less than 100GWh of electricity per year and show a ratio of electricity cost to gross value added greater than 20%, the additional levy of 0.5€/MWh applies only to 90% of the electricity used.

The figure below shows the algorithm for the calculation of the EEG levy derived from the above legal provisions.

Figure 5.6: Renewable Energy Act - Calculation of levy

Conditions	Formula	Variable description
Renewable energy act		
Regular formula	$Cost_{Re} = MWh_{Elec} * Cost_{Re}^{All}$	$Cost_{Re}$: Renewable energy act pass-through cost MWh_{Elec}: Annual electricity use 10GWh, 100GWh: Threshold annual electricity use (§41) GVA: Gross value added (§41) $Cost_{Elec}$: Annual costs for electricity purchase (§41) $Cost_{Re}^{All}$: Cost passed through for renewable energy act to regular users, published yearly by transmission network provider (§64) $Cost_{Re}^{Ind.}$: Cost passed through for renewable energy act to privileged users (§41), published yearly by transmission network provider (§64)
$(15\% \text{ GVA} < Cost_{Elec} < 20\% \text{ GVA } \underline{\text{AND}}\ MWh_{Elec.} > 10GWh)$ <u>OR</u> $(Cost_{Elec} \geq 20\% \text{ GVA } \underline{\text{AND}}\ 10GWh < MWh_{Elec} < 100GWh)$	$Cost_{Re} = MWh_{Elec} * \{90\% * Cost_{Re}^{Ind§41} + 10\% * Cost_{Re}^{All}\}$	
$Cost_{Elec} \geq 20\% \text{ GVA } \underline{\text{AND}}\ MWh_{Elec} \geq 100GWh$	$Cost_{Re} = MWh_{Elec} * Cost_{Re}^{Ind§41}$	