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# Second National Energy Efficiency Action Plan (NEEAP) of the Federal Republic of Germany

Pursuant to the EU Directive on Energy End-use Efficiency and Energy Services  
(2006/32/EC)

Methodological Accompanying Document



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# List of abbreviations

AGEB	Working Group on Energy Balances	EnVKV	Ordinance on the labelling of household appliances with information on their consumption of energy and other important resources (Energy Consumption Labelling Ordinance)
BAFA	Federal Office of Economics and Export Control		
BAU	Business as usual		
BfEE	Federal Energy Efficiency Center		
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	EU	European Union
BMVBS	Federal Ministry of Transport, Building and Urban Development	EU-ETS	European Union Emissions Trading Scheme
BMWi	Federal Ministry of Economics and Technology	Goe	Grams of oil equivalent
CB	Condensing boiler	IEKP	Integrated Energy and Climate Programme
CEN	European Committee for Standardisation	ICT	Information and communication technologies
CHP	Combined heat and power generation	IND	Industry
CITL	Community Independent Transaction Log	IREES	Institute of Resource Efficiency and Energy Strategies
CS	Commercial sector	IT	Information technology
D	Directive	KfW	KfW banking group
DE	Germany	kWh	Kilowatt-hour
dena	German Energy Agency	LT boiler	Low-temperature boiler
DIHK	Association of German Chambers of Industry and Commerce	MAP	Market Incentive Programme for Promotion of the Use of Renewable Energies
eaD	German Federation of Energy Conservation and Climate Protection Agencies	MD	Multiple dwelling
EBPG	Energy-using Products Act (EBPG)	NEEAP	National Energy Efficiency Action Plan
EDL-G	Law on implementation of Directive 2006/32/EC of the European Parliament and the Council of 5 April 2006 on energy end-use efficiency and energy services	NEPE	National Electromobility Development-Plan
EEWärmeG	Law on promotion of renewable energies in the heating sector	NFM	Non-ferrous metals
ESD	Directive of the European Parliament and the Council of 5 April 2006 on energy end-use efficiency and energy services, Directive 2006/32/EC	PHH	Private households
DH	Detached house	PJ	Petajoule
EC	European Community	Pkm	Passenger-kilometres
EMEEES	Evaluation and monitoring for the EU Directive on energy end-use efficiency and energy services	PV	Passenger vehicle
EnEV	Ordinance on energy-saving thermal insulation and energy-saving systems engineering in buildings (Energy Saving Ordinance)	RegG	Regionalisation Act
		SMEs	Small and medium-sized companies
		Tkm	Tonne-kilometre
		TRANS	Transport and mobility
		TRS	Trade, retail and services
		SDH	Semi-detached house

# 1. Updating of the national indicative energy savings target

Directive 2006/32/EC on energy end-use efficiency and energy services (ESD) stipulates a national indicative energy savings target for the period between the beginning of 2008 and the end of 2016. This figure is 9% of the average annual consumption of all energy users within the scope of the ESD over the last five years prior to implementation of the ESD for which official data are available. For Germany this was the period from 2001 to 2005, for which data on domestic energy consumption were available from the national energy balance prepared by the Working Group on Energy Balances (AGEB). In respect of the indicative energy savings target established on this basis in the First NEEAP, in the framework of its assessment of the First NEEAP the European Commission ordered its updating in the Second NEEAP. In particular the European Commission called for updating of final official data<sup>1</sup> and non-inclusion of energy consumption of undertakings that come under emissions trading and of the armed forces.

For the present Second NEEAP the indicative energy savings target is therefore updated for the reference period 2001 to 2005 taking into account both of the points referred to above.

## 1.1 Non-inclusion of the emissions trading sector

The ESD is not in competition with the emissions trading system, but rather it includes the sectors not covered by the Emissions Trading Directive. Accordingly, as defined by Article 2, Letter b), the ESD does not apply to undertakings subject to trading of greenhouse gas emissions certificates in the Community.

Nevertheless, in drafting of the First NEEAP, due to the data situation at that time it was not possible at justifiable cost to determine the aggregate energy consump-

tion of all the undertakings in Germany included in emissions trading. Accordingly, the emissions trading clause of the ESD was not taken into account in calculation of the indicative energy savings target in the First NEEAP. In the course of its evaluation of the First NEEAP the European Commission therefore ordered that the indicative energy savings target must be updated by the federal government in the Second NEEAP in respect of the non-inclusion of the aggregate energy consumption of all undertakings in Germany included in emissions trading.

Already in the First NEEAP the Federal Government made an assurance that in the run-up to preparing the Second NEEAP it would check whether and, if necessary, how this gap in the data can be filled at justifiable cost both in calculating the indicative savings target and in estimating the energy saving volumes which have already been achieved. Following a successful review of the current situation<sup>2</sup> it is clear that it is possible to determine with sufficient accuracy the proportion of total industrial energy consumption in Germany accounted for by the energy consumption of the undertakings covered by the emissions trading system.

For this purpose in the Second NEEAP the fuel consumption of the undertakings subject to emissions trading is subtracted on an approximate basis from the total industrial energy consumption figure on the basis of data from the Community Independent Transaction Log (CITL).<sup>3</sup> The electricity consumption of the undertakings subject to emissions trading nevertheless remains part of industrial energy consumption, as the latter is not directly subject to emissions trading. Thus by reverse logic, the Second NEEAP also takes measures into account that contribute to exploitation of the electricity-related energy efficiency potential in industry. In respect of the scope of application of the emissions trading system only the industry sectors which formed

<sup>1</sup> At the time of creation of the First NEEAP, due to the peculiarities of German energy statistics the available data were still only provisional, so the calculations for the indicative energy savings target in the framework of the First NEEAP based on them were also only of a provisional nature.

<sup>2</sup> The review was carried out by the Fraunhofer ISI and Prognos AG (Prognos/ISI 2010, 2011). This also applies to the resulting concrete calculations in respect of non-inclusion of the energy consumption of undertakings included in emissions trading.

<sup>3</sup> While the fuels used are not themselves included in the CITL, the CITL contains both the emissions allocated to the recorded undertakings and the latter's real emissions, which can provide inferences on the energy usage. The emissions shown in the CITL also include a small proportion of non-energy-related CO<sub>2</sub> emissions, which must be deducted. This applies to the cement, glass and steel industries. In principle the CITL data are available for individual industry sectors and can therefore also be allocated for the correction on a sectoral basis. There are difficulties in sector allocation for dedicated steam generators with an output of more than 20 MW which are subject to emissions trading but operated in sectors which were not subjected to emissions trading in the first two phases (chemicals and non-ferrous metals) or are not subject to emissions trading at all. Estimates are required here.

**Table 1.1 Share of energy consumption of total industry and industrial sub-sectors falling within the scope of Directive 2006/32/EC**

Industry – sub-sector (Figures in %)	No. CS 2003	2005	2006	2007
		Share under Directive 2006/32/EC		
Quarrying, other mining	13, 14 (o. 10.30, 12)	95	94	94
Foods and tobacco	15, 16	79	79	77
Paper industry	21	63	20	26
Commodity chemicals	24.1	59	55	57
Other chemicals industry	24 o. 24.1	62	66	56
Rubber and plastic goods	25	85	86	82
Glass and ceramics	26.1, 26.2, 26.3	17	23	17
Processing of mineral products	26 o. 26.1 bis 26.3	0	0	6
Processing of mineral products	27.1	5	5	5
Non-ferrous metals and foundries	27.4, 27.5	85	86	82
Metalworking	27 o. 27.1, 27.4, 27.5 incl. 28	60	65	61
Mechanical engineering	29	85	86	82
Vehicle construction	34, 35	85	86	82
Other processing and finishing sector	17–20, 30–33, 36–37	85	86	82
Total industry	Share under Directive 2006/32/EC	47	43	42
	Share under Directive 2003/87/EC	53	57	58
DATA SOURCES AND METHODS: Share of industrial energy consumption falling within the scope of the EU-ETS (Directive 2003/87/EC): Estimate of the Fraunhofer ISI based on CITL data, AGE 2010, Federal Environment Agency (UBA) 2009, Federal Statistical Office (TS 4, S 6.4).				

part of the emissions trading system at the time of the formal implementation of the ESD in April 2006 are taken out of the area of application of the ESD. Thus the sectors which are not to be included in the emissions trading system until 2013 (chemicals and non-ferrous metals) fall within the scope of application the ESD (cf. Table 1.1).

The calculations of the emissions trading factor relevant for the ESD for the years 2005 to 2007 on the basis of the data on the emissions in the CITL from 2005 to 2007 show that the emissions trading factor remains almost constant. For reasons of simplicity, therefore, in the correction a constant factor is assumed and for the sake of currency the factor calculated for 2007 is used in the Second NEEAP.

## 1.2 Non-inclusion of the energy consumption of the armed forces

According to Article 2, Letter c) of the ESD, the armed forces are also included in the area of application of the Directive, provided their deployment does not conflict with the nature and primary objective of the activities of the armed forces and with the exception of material used exclusively for military purposes. On this basis the component of energy consumption of the armed forces which primarily serves the purpose of defence (for example fuel for tanks and military vehicles) is not included in the area of application of the ESD, whereas fuel oil consumption for the heating of buildings, for example, does fall within the area of application of the ESD. In the First NEEAP, energy consumption not covered by the ESD was stated at 23 petajoules (PJ) and added to fuels and other petroleum products.

In the evaluation tables relating to the energy balance, the energy consumption of the armed forces has for some years been stated together with the energy consumption of the TRS sector (trade, retail and services). Before that it was also published separately in the evaluation tables relating to the energy balance. Internal data on the energy consumption of the armed forces up to 2006 are available from the Working Group on Energy Balances.<sup>4</sup> These data include consumption of fuels and light fuel oil by the armed forces (cf. Table 1.2).

Against this backdrop, given non-inclusion of the energy consumption of the armed forces, for the base period 2001 to 2005 for calculation of the indicative energy savings target we obtain an average fuel consumption figure of 13 PJ, which is to be left out of the

area of application of the ESD, while the consumption of light fuel oil, which should be allocated to the heating of buildings, is left in.<sup>5</sup>

## 1.3 Conversion factors and selection of the conversion factor for electricity

For the purposes of comparing energy savings and for converting different final energy sources into comparable units, Annexe II of the ESD defines conversion factors. Electricity is a special case, and in accordance with Article 4, Para. 1 and Annexe II of the ESD the Member States can use for its conversion a factor of 1 or 2.5 or a figure somewhere between.

In the First NEEAP the indicative energy savings target and the quantitative savings figures were calculated based on both conversion factor for electricity 1 and conversion factor for electricity 2.5. In principle this procedure is retained in the Second NEEAP. Thus in chapters 3 and 4 the overall results together with the results for the individual areas for action of the quantitative savings figures are stated using both conversion factor for electricity 1 and conversion factor for electricity 2.5.

## 1.4 Updating of the indicative energy savings target and result

By means of this procedure the indicative energy savings target for Germany can be updated in accordance with the requirements of the European Commission and, based on this, finally established. Compared to the provisional calculation in the First NEEAP the following updates now apply:

**Table 1.2 Final energy consumption by the armed forces in Germany in the period 2000–2006**

Sector: Military (Figures in PJ)	2001	2002	2003	2004	2005	2006
Final energy consumption	20	20	18	17	17	17
of which fuel oil	7	6	5	5	5	5
Fuels	13	14	13	12	12	12
SOURCE: AGEB 2007						

<sup>4</sup> On this basis the average energy consumption of the armed forces of 23 PJ stated in the First NEEAP would correspond to the consumption stated for 2000, of which 19 PJ for fuels and 4 PJ for light fuel oil (AGEB 2007).

<sup>5</sup> The concrete calculations for updating the non-inclusion of the energy consumption of the armed forces in the First NEEAP were carried out by the Fraunhofer ISI and Prognos AG (Prognos/ISI 2010, 2011).

- As in the First NEEAP the base period for calculation of average annual energy consumption in the last five years before implementation of the ESD continues to be the period from 2001 to 2005. However, calculation is carried out on the basis of current – and thus final – consumption data from the national energy balance (AGEB 2010).
- The average energy consumption of the armed forces which is to be deducted from the area of application of the ESD was updated on the basis of internal data of the Working Group on Energy Balances (AGEB 2007) and only the fuel consumption was deducted.
- After an extensive review of possible different correction variations and using data from the CITL

the share of industrial energy consumption subject to emissions trading was determined on an approximate basis in the Second NEEAP and the corresponding energy consumption left out of the indicative energy savings target. Emissions trading in the delimitation up to 2012 is used as a basis for this. The fuel consumption of industry is only corrected to account for the emissions trading share, while electricity consumption is allocated in full to the area of application of the ESD.

Following these required updates the national indicative energy savings target for Germany at a conversion factor for electricity of 1 is now 748 PJ and at a conversion factor for electricity of 2.5 is now 995 PJ (cf. Table 1.4).

**Table 1.4 Updating of the national indicative energy savings target (base period: 2001–2005)**

Indicative energy savings target Base period: 2001–2005	Unit	Fuels (incl. district heat)	Elec- tricity	Total energy
Calculation with conversion factor for electricity 1				
Average annual energy consumption for the five-year period	PJ	7491	1828	9319
Energy consumption of the armed forces which does not fall within the scope of application of Directive 2006/32/EC	PJ	13	0	13
Energy consumption of facilities governed by the EU-ETS not included in the area of application of Directive 2006/32/EC	PJ	992	0	992
	%	58	0	58
Total of the energy consumption to be taken into account under Directive 2006/32/EC	PJ	6486	1828	8314
<b>Indicative energy savings target:</b> 9% of the energy consumption to be taken into account under Directive 2006/32/EC	PJ	584	165	<b>748</b>
Calculation with conversion factor for electricity 2.5				
Total of the energy consumption to be taken into account under Directive 2006/32/EC	PJ	6486	4570	11056

**Table 1.4 Updating of the national indicative energy savings target (base period: 2001–2005)**

Indicative energy savings target Base period: 2001–2005	Unit	Fuels (incl. district heat)	Elec- tricity	Total energy
<b>Indicative energy savings target:</b> 9% of the energy consumption to be taken into account under Directive 2006/32/EC	PJ	584	411	995
<small>DATA SOURCES:            Energy consumption 2001–2005:            AGEB 2010 (calculated on the basis of the evaluation tables relating to the energy balance; valid as at: July 2010)            Energy consumption of armed forces:            AGEB 2007 (only fuels)            Energy consumption of facilities governed by the EU-ETS:            Estimate of Fraunhofer ISI based on CITL data for 2007, AGEB 2010, UBA 2009, Federal Statistical Office (TS 4, S 6.4)</small>				

## 1.5 Intermediate target for 2010

On the basis of these required updates the intermediate target for 2010 must also be modified. In the First NEEAP differing methods were used for calculation of the indicative energy savings target and the intermediate target: Whilst the indicative energy savings target was derived from average annual energy consumption in the base period 2001–2005, the intermediate target for the year 2010 was estimated on the basis of a “bottom-up approach” based on the energy savings achievable from the options available in terms of measures set out in the First NEEAP. On this basis, in the First NEEAP it was set at 510 PJ with a conversion factor for electricity of 1 and at 659 PJ with a conversion factor for electricity of 2.5.

For the sake of consistency with the First NEEAP the intermediate target for 2010 is now adjusted in the Second NEEAP on the basis of the ratio between the indicative energy savings target and the intermediate target in the First NEEAP. Given that the intermediate target for 2010 in the First NEEAP, at 510 PJ with a conversion factor for electricity of 1, was 61% of the indicative energy savings target of 833 PJ, this ratio is also retained in the Second NEEAP. On this basis the intermediate target for 2010, with an indicative energy savings target now of 748 PJ taking into account a conversion factor for electricity of 1, is now 456 PJ. Using a conversion factor for electricity of 2.5 and a corresponding indicative energy savings target of 995 PJ, the intermediate target is consequently 607 PJ.

## 2. Methodological stipulations and procedure for verification of the national indicative energy savings target<sup>6</sup>

### 2.1 Methodological requirements of the ESD

The concrete methodological stipulations for proving achievement of the national indicative energy savings target in the framework of the NEEAPs are essentially contained in articles 4, 15 and 16 and annexes I and IV of the ESD. Pursuant to the general framework for the measurement and verification of energy savings prescribed in Annexe IV of the ESD the Member States are to use a harmonised calculation model with a combination of top-down and bottom-up calculation methods for the purpose of proving achievement of the national indicative energy savings target in the framework of the NEEAPs.

Pursuant to Art. 15, Para. 4 ESD the European Commission has until 30 June 2008 to propose the specifications of this general framework required for this purpose as well as harmonised efficiency indicators. Against this backdrop the European Commission submitted various discussion papers which, pursuant to Article 16, Para. 2 ESD, were discussed with the Member States in the framework of a comitology process. These proposals by the European Commission, in particular in the latest version of 2 July 2010 (European Commission 2010), constitute the fundamental approach to calculation of the energy savings in the Second NEEAP for proving achievement of the national indicative energy savings target.

In general top-down and bottom-up calculation methods, being two fundamental methodological approaches to the measurement of energy savings and energy efficiency, can be differentiated from each other as follows:<sup>7</sup>

- In a top-down evaluation one considers energy consumption at a highly aggregated level such as the energy consumption of a nation, of a federal state, or of a macroeconomic sector, for example

the entire industrial sector. As a rule one bases the consumption on a reference variable such as the number of households or on an activity factor such as the economic output of the territory under consideration. Ideally it is possible to determine the movement over the course of time of a top-down indicator of this type and to show that specific energy consumption per unit under consideration is falling. At the same time, however, one does not obtain any information as to the causes or factors triggering this development.

- By contrast, in a bottom-up evaluation one considers an individual measure, such as the introduction of a regulatory standard or the implementation of a funding programme. One calculates the energy savings of a representative individual case and extrapolates the energy savings on the basis of programme statistics that are as detailed as possible. Nevertheless, an individual appraisal of this type is very time-consuming and expensive. In addition to this, the required data are frequently not available.

### 2.2 Complementary use of top-down and bottom-up methods of calculation

Top-down and bottom-up methods represent two different but complementary approaches to calculation and estimation of energy savings. While the top-down methods make a view of the overall development in a sector under consideration or area for action possible, the bottom-up methods allow observation of the effectiveness and intensity of individual measures or programmes. The two approaches thus examine different aspects and both are necessary for monitoring and evaluation of energy efficiency policy.

Accordingly, therefore, in the present Second NEEAP the federal government pursues the approach of using both methodological procedures in a complementary manner in accordance with the recommendations of

<sup>6</sup> In the conception and execution of the methodological approach to verification of the national indicative energy savings target the federal government was supported by Prognos AG and the Fraunhofer Institute for Systems and Innovation Research (ISI) in the course of several projects (Prognos/ISI 2010, 2011).

<sup>7</sup> It should be noted that energy savings calculated by means of both top-down and bottom-up methods for verification of the indicative energy savings target are relative and not absolute energy savings. This is derived from the indicative energy savings target itself.

the European Commission of 2 July 2010 for proving achievement of the indicative energy savings target. In the Second NEEAP each area for action is viewed individually. The overall development of the respective area for action is recorded by means of top-down methods and the effect of individual measures or groups of measures is recorded using bottom-up methods and these results are quantified in respect of the energy savings achieved. The results of the two methodological approaches are consciously placed in parallel in order thus to ensure an overall picture of the energy savings in Germany which is as complete as possible. For methodic reasons the bottom-up savings are well short of the top-down figures as a rule. The top-down approach assesses the events in the entire sector or area for action under consideration, irrespective of which causes have led to a particular energy saving. Energy savings can be induced both politically or by the market (due to prices) or can be attributable to the behaviour of consumers. In addition, in more elaborate evaluation processes, besides the efficiency effect a distinction is also made between the influence of weather factors (climate) and structural effects.

By contrast, the bottom-up calculations are respectively based on an individual politically induced instrument or programme. Especially in the simplified bottom-up methods applied here among others, effects such as (market-driven) technical progress or changes in consumer behaviour are not taken into account. In particular, for reasons of data availability it is only possible in exceptional cases to document all the activities in a given area for action such that all the energy savings are recorded causally. Moreover, the great effort involved in the evaluation of measures only allows the evaluation of larger measures. The inevitable consequence is that with the bottom-up figures for an entire sector or area of application many realised savings cannot be included, as the total of the selected and evaluated instruments only represents a (greater or lesser) part of the energy saving activities in a given sector or area of application. Nevertheless, in exceptional cases the technically inadequate implementation of a measure or so-called rebound or comfort effects can lead to the energy savings documentable by

means of bottom-up methods being higher than the savings in practice. Moreover, these or similar effects can also lead in individual cases to the savings calculated using bottom-up methods being higher than the savings calculated with top-down methods.

### 2.3 Scientific support

For verifying the indicative energy savings target the federal government availed itself of scientific support provided by several prominent and independent institutions. The Federal Ministry of Economics and Technology (BMWi), the body responsible for leading the project, and the Federal Energy Efficiency Center (BfEE) co-operated closely and at a very early stage awarded projects and study assignments designed both to clarify the methodological aspects and to procure the necessary data. Worthy of particular mention in this connection are a study in which a methodological base for the measurement of energy efficiency in the framework of the implementation of the ESD (Fraunhofer ISI 2006) is drawn up, a study to estimate the potential for energy savings and energy efficiency improvements in Germany (Prognos 2007), a study for the purpose of methodological substantiation and quantifying of the early measures reported in the NEEAPs (so-called early action) (Prognos 2008), a study designed to develop proposals for a reporting and calculation system for energy savings (Prognos/Fraunhofer ISI 2010), two studies on the qualification and quantifying of energy savings by federal government, states and municipalities (Prognos 2011, Prognos/DIFU 2011), and, finally, a study for calculation of the energy savings for verification of the indicative energy savings target in the framework of the Second NEEAP (Prognos/Fraunhofer ISI 2011).

The research activities executed in this framework constitute the essential foundation for verification of achievement of the national indicative energy savings target in Germany. This applies both to the consulting in respect of the selected methodological approach and, in particular, in respect of the top-down and bottom-up calculations carried out and clarification and creation of the foundation of data required for this.

## 2.4 Top-down evaluation of energy savings

### 2.4.1 Calculation method

For the top-down calculation of energy savings in the Second NEEAP full use is made of the recommendations of the European Commission of 2 July 2010 (European Commission 2010). The recommendations of the European Commission contain top-down indicators at the level of individual end-user sectors (private households, services, transport, and industry). A distinction is made between two categories of indicators:

- On the one hand these are highly aggregated minimum indicators, denoted “M” (M1–M8), with relatively limited requirements in terms of statistical data availability.
- The second category is the more detailed “preferred indicators”, denoted “P” (P1–14), with much more extensive data requirements. These so-called P-indicators are complemented in the transport sector by two alternative indicators, denoted “A” (A1–A2).

From a methodological point of view the indicators used are statistics-based top-down indicators with which the annual statistical data for the measurement of the energy savings – as required in Annexe IV, Point 1.1 of the ESD – are adjusted for external factors such as volume and temperature effects and structural changes:

- The impact of economic activity on energy consumption (quantity effect) is guaranteed for the proposed indicators by means of constant use of specific figures (i.e. the energy consumption is related to a suitable activity factor). The activity underlying the indicator varies depending on the sector and aggregation level and can be either a quantity (such as the number of inhabitants or households, a traffic volume, or a number of employees) or a value (such as the gross value-added of individual industry sectors).
- For heating of buildings and fuel-related indicators in the private households and services sectors a temperature adjustment is allowed for in addition.
- In methodological terms, adjustment for structural factors is carried out for the proposed indicators by means of calculation of the energy savings at disaggregated level (e.g. the passenger and freight transport sub-sectors in the transport sector, or

various different industrial sub-sectors in the industry sector) and by subsequent addition of the sub-sectoral or sector-specific energy savings within a sector. This adjustment is greater for the more disaggregated preferred indicators than for the more aggregated minimum indicators. Calculation of the energy saving by means of the preferred indicators consequently determines the overall improvement in energy efficiency more accurately than by using the minimum indicators. Accordingly, in principle the preferred indicators are used in the Second NEEAP.

The indicators proposed and recommended by the European Commission and used here for top-down calculation of the energy savings are not adjusted for the influence of energy prices or of autonomous technical progress. In methodological terms the adjustment for price- and technology-related factors could be carried out by means of an econometric approach, by carrying out a regression analysis in respect of an (adjusted) indicator, though this would involve a number of disadvantages. Examination of such an approach in the framework of the EMEEES project (EMEEES 2010) commissioned by the European Commission has shown for example that the regression analysis itself involves methodological problems and therefore does not necessarily deliver adequate results. The problems here arise in particular due to the frequently very short review periods and the small variation in energy prices in these periods. At the same time sophisticated econometric estimation methods also mean extensive use of resources, which conflicts with the principle of selecting methods that are as simple as possible for use by the Member States with comparatively limited resources for calculation of energy savings in the framework of the ESD.

The foregoing of such adjustment for price- and technology-related factors recommended by the European Commission nevertheless means that the top-down energy savings calculated in the Second NEEAP inevitably greatly exceed the bottom-up energy savings determined at the level of individual measures. The reason for this is the increasingly large influence of non-measures-induced technical progress on the top-down calculations. By contrast, in the bottom-up calculations of the energy savings achieved by means of individual measures these price- and technology-

related factors are a priori not included in the savings for methodological reasons. This needs to be taken into account in interpreting the calculations carried out here for verification of the energy savings in the framework of the ESD.

#### 2.4.2 Foundation of data

For Germany the calculation of most of the top-down indicators proposed by the European Commission in its recommendations of 2 July 2010 is achievable. The required data are available to a large extent on an annual basis from a wide range of statistical sources, from empirical surveys on energy consumption or, with certain individual indicators, at least from models. For this reason, here too verification of the top-down energy savings is carried out exclusively on the basis of the P-indicators, as these are methodologically more sophisticated and more precise in respect of determining the overall improvement in energy efficiency.<sup>8</sup>

For reasons of quality and consistency of the data only national data sources are used for calculation of the top-down indicators. The main gaps in the data in the national statistics are to be found in the figures for electricity consumption by private households. In particular there is a lack of reliable data on air conditioning, which means that the corresponding P2 indicator cannot be calculated for Germany at present.

In most cases the data required for calculation of the top-down indicators in the Second NEEAP are currently available from the statistics up to 2009,<sup>9</sup> though in some cases only up to 2008. Thus for all the future years under review up to 2016, the ESD target year, use is made of current forecasts available for Germany from appropriate scientific studies (Prognos et al. 2010; Prognos/Öko-Institut 2009) which are respectively related to the latest year for which statistics are available.

In respect of the statistical data for energy consumption in 2007, which is the base year for calculation of the energy savings achieved under the ESD, it should also be pointed out that this figure has been adjusted for calculation of the energy savings. This is because in the national energy balance (AGEB 2010) a sharp fall in consumption is reported for this year in the private households and TRS end-user sectors, in particular of petroleum and to a certain extent also of gas, which according to energy statistics experts at Prognos AG and Fraunhofer ISI cannot be attributed solely to inventory changes. Instead, a compilation error is likely to be the cause. The basis for the adjustment in the TRS sector is formed by the consumption figures for 2007, which have been determined in the course of the survey on energy consumption in this sector carried out on behalf of the BMWi over the past few years (Fraunhofer ISI et al. 2010; TUM-IfE 2010). For the private households sector model-based data of Prognos AG (Prognos et al. 2010a) is used. Table 2.4.2 shows the energy consumption figures after appropriate correction.

<sup>8</sup> Nevertheless, in the studies underlying the NEEAP calculations with the minimum indicators were made in addition. The results hardly differed from the calculations with the P-indicators and thus strengthened the validity of the savings figures identified in the Second NEEAP.

<sup>9</sup> Both the top-down and the bottom-up calculations were carried out by the contracted institutes in January 2011 on the basis of the latest data at that point in time. On the whole these were data for 2009. Nevertheless, a reservation should be made in this connection, namely that most of the statistical data stated for 2009 were still provisional at this point in time or were not available in full. In these cases, where data quality and completeness was inadequate, in some cases statistical data for 2009 were not used, and data for 2008 were used instead.

**Table 2.4.2 Updating of the national indicative energy savings target (base period: 2001–2005)**

Correction final energy consumption 2007 (figures in PJ)	2006	2007	2008	2007
<b>Private households sector</b>				
Sources		AGEB 2010		Prognos et al. 2010a
Final energy consumption	2622	2259	2558	2577
of which fuel oil	727	439	647	738
Gases	987	920	969	939
<b>Trade, retail and services sector (TRS)</b>				
Sources		AGEB 2010		Fraunhofer ISI et al. 2010; TUM-Ife 2010
Final energy consumption	1442	1303	1442	1392
of which fuel oil	277	167	248	226
Gases	387	396	421	425

### 2.4.3 Temporal delimitation

All top-down indicators are calculated for the following periods<sup>10</sup> and shown in table form in the Second NEEAP:

- The so-called early action period (period 1996–2007, with base year 1995).
- The first period under review in the framework of the ESD up to the 2010 intermediate target (period 2008–2010, with base year 2007).
- The total period under review in the framework of the ESD up to the target year (period 2008–2016, with base year 2007); a further intermediate year, 2013, is also shown.<sup>11</sup>
- The total of the savings from the early action period and the total period under review; this total is calculated by means of netting out energy savings (positive sign) and possible additional energy consumption (negative sign).

In the following section we list the formulae for calculation of the P-indicators used in the Second NEEAP in the various sectors and preferred by the European Commission in its methodological recommendations. For reasons of improved clarity the formulae not used in the Second NEEAP for calculation of the minimum (M) and alternative (A) indicators proposed by the European Commission are not listed in the Methodological Accompanying Document to the Second NEEAP (cf. European Commission 2010).

<sup>10</sup> Nevertheless, in the studies underlying the NEEAP calculations with the minimum indicators were made in addition. The results hardly differed from the calculations with the P-indicators and thus strengthened the validity of the savings figures identified in the Second NEEAP.

<sup>11</sup> Both the top-down and the bottom-up calculations were carried out by the contracted institutes in January 2011 on the basis of the latest data at that point in time. On the whole these were data for 2009. Nevertheless, a reservation should be made in this connection, namely that most of the statistical data stated for 2009 were still provisional at this point in time or were not available in full. In these cases, where data quality and completeness was inadequate, in some cases statistical data for 2009 were not used, and data for 2008 were used instead.

2.4.4 Top-down indicators (preferred P-indicators)

Type	Energy efficiency indicator	Formula for calculation of the energy saving compared to base year 2007 <sup>1</sup>
<b>Private households sector (PHH)</b>		
<b>P1</b>	Energy consumption of households for space heating in toe per floor area in m <sup>2</sup> adjusted for climatic conditions	$\left[ \left( \frac{E_{2007}^{HSH}}{F_{2007}} * \frac{MDD_{25}^{heating}}{ADD_{2007}^{heating}} \right) - \left( \frac{E_t^{HSH}}{F_t} * \frac{MDD_{25}^{heating}}{ADD_t^{heating}} \right) \right] * F_t$ <p>with:</p> <p><math>E_t^{HSH}</math> = Energy consumption of households for space heating in year t</p> <p><math>F_t</math> = Total floor area in m<sup>2</sup> of permanently occupied dwellings in year t</p> <p><math>MDD_{25}^{heating}</math> = Mean heating degree days over the last 25 years</p> <p><math>ADD_t^{heating}</math> = Actual heating degree days in year t</p>
<b>P2</b>	Energy consumption of households for space cooling in toe per floor area in m <sup>2</sup> adjusted for climatic conditions	$\left[ \left( \frac{E_{2007}^{HSC}}{F_{2007}} * \frac{MDD_{25}^{cooling}}{ADD_{2007}^{cooling}} \right) - \left( \frac{E_t^{HSC}}{F_t} * \frac{MDD_{25}^{cooling}}{ADD_t^{cooling}} \right) \right] * F_t$ <p>with:</p> <p><math>E_t^{HSC}</math> = Energy consumption of households for space cooling in year t</p> <p><math>F_t</math> = Total floor area in m<sup>2</sup> of permanently occupied dwellings in year t</p> <p><math>MDD_{25}^{cooling}</math> = Mean cooling degree days over the last 25 years</p> <p><math>ADD_t^{cooling}</math> = Actual cooling degree days in year t</p>
<b>P3</b>	Energy consumption of households in toe for water heating per inhabitant	$\left( \frac{E_{2007}^{HWH}}{P_{2007}} - \frac{E_t^{HWH}}{P_t} \right) * P_t$ <p>with:</p> <p><math>E_t^{HWH}</math> = Energy consumption of households for water heating in year t (excluding solar)</p> <p><math>P_{2007}, P_t</math> = Total population in year t</p>

Type	Energy efficiency indicator	Formula for calculation of the energy saving compared to base year 2007 <sup>1</sup>
P4	Electricity consumption per appliance type in kWh/year	$(UEC_{2007}^x - UEC_t^x) * Stock_t^x$ <p>with:</p> $UEC_t^x = \text{Unit electricity consumption of the stock in year } t$ $Stock_t^x = \text{Stock of the respective appliance in year } t$
P5	Electricity consumption of households for lighting	$\left( \frac{E_{2007}^{H_{L}}}{D_{2007}} - \frac{E_t^{H_{L}}}{D_t} \right) * D_t$ <p>with:</p> $E_{2007}^{H_{L}}, E_t^{H_{L}} = \text{Electricity consumption of households for lighting in 2007 and in year } t$ $E_t^{H_{L}}, D_t = \text{Number of permanently occupied dwellings in 2007 and in year } t$
<b>Trade, retail and services sector (TRS)</b>		
P6	Non-electricity consumption by sub-sector per indicator of activity	$\left[ \left( \frac{E_{2007}^{S_{NON-EL}}}{IA_{2007}^{S^X}} * \frac{MDD_{25}^{heating}}{ADD_{2007}^{heating}} \right) - \left( \frac{E_t^{S_{NON-EL}}}{IA_t^{S^X}} * \frac{MDD_{25}^{heating}}{ADD_t^{heating}} \right) \right] * IA_t^{S^X}$ <p>with:</p> $E_{2007}^{S_{NON-EL}}, E_{2007}^{S_{NON-EL}} = \text{Non-electricity consumption of sub-sector } X \text{ in the service sector in 2007 and in year } t$ $IA_{2007}^{S^X}, IA_t^{S^X} = \text{Indicator of activity in sub-sector } X \text{ in 2007 and in year } t$ $MDD_{25}^{heating} = \text{Mean heating degree days over the last 25 years}$ $ADD_{2007}^{heating}, ADD_t^{heating} = \text{Actual heating degree days in 2007 and in year } t$
P7	Electricity consumption by sub-sector per indicator of activity	$\left( \frac{E_{2007}^{S_{EL}}}{IA_{2007}^{S^X}} - \frac{E_t^{S_{EL}}}{IA_t^{S^X}} \right) * IA_t^{S^X}$ <p>with:</p> $E_{2007}^{S_{EL}}, E_t^{S_{EL}} = \text{Electricity consumption of sub-sector } X \text{ in the service sector in 2007 and in year } t$ $IA_{2007}^{S^X}, IA_t^{S^X} = \text{Indicator of activity in sub-sector } X \text{ in 2007 and in year } t$

Type	Energy efficiency indicator	Formula for calculation of the energy saving compared to base year 2007 <sup>1</sup>
<b>Transport and mobility sector (TRANS)</b>		
<b>P8</b>	Energy consumption of cars in goe per passenger-km	$\left( \frac{E_{2007}^{CA}}{T_{2007}^{CA}} - \frac{E_t^{CA}}{T_t^{CA}} \right) * T_t^{CA}$ <p>with:</p> $E^{CA} = \text{Energy consumption of cars (motor fuels)}$ $T^{CA} = \text{Total traffic of cars in passenger-km}$
<b>P9</b>	Energy consumption of trucks and light vehicles in goe per ton-km	$\left( \frac{E_{2007}^{TLV}}{T_{2007}^{TLV}} - \frac{E_t^{TLV}}{T_t^{TLV}} \right) * T_t^{TLV}$ <p>with:</p> $E_{2007}^{TLV}, E_t^{TLV} = \text{Energy consumption of trucks and light vehicles in 2007 and in year t}$ $T_{2007}^{TLV}, T_t^{TLV} = \text{Total traffic of trucks and light vehicles in ton-km in 2007 and in year t}$
<b>P10</b>	Energy consumption of passenger rail in goe per passenger-km	$\left( \frac{E_{2007}^{RPa}}{T_{2007}^{RPa}} - \frac{E_t^{RPa}}{T_t^{RPa}} \right) * T_t^{RPa}$ <p>with:</p> $E_{2007}^{RPa}, E_t^{RPa} = \text{Energy consumption of passenger rail transport in 2007 and in year t}$ $T_{2007}^{RPa}, T_t^{RPa} = \text{Total passenger rail traffic in passenger-km in 2007 and in year t}$
<b>P11</b>	Energy consumption of rail transport of goods in goe per ton-km	$\left( \frac{E_{2007}^{RFr}}{T_{2007}^{RFr}} - \frac{E_t^{RFr}}{T_t^{RFr}} \right) * T_t^{RFr}$ <p>with:</p> $E_{2007}^{RFr}, E_t^{RFr} = \text{Energy consumption of goods rail transport in 2007 and in year t}$ $T_{2007}^{RFr}, T_t^{RFr} = \text{Total freight rail traffic in tonne-km in 2007 and in year t}$

Type	Energy efficiency indicator	Formula for calculation of the energy saving compared to base year 2007 <sup>1</sup>
P12	Share of public transport in total land passenger transport	$(PT_t - PT_{2007}) * T_t^{Pa} * (UE_t^{CA} - UE_t^{PT})$ <p>with:</p> $PT_{2007}, PT_t = \text{Share of public transport 2007 and in year t} = \frac{T_{public}^{Pa}}{T_t^{Pa}}$ $T_t^{Pa} = \text{Total passenger traffic in year t in passenger-km}$ $T_{public}^{Pa} = \text{Passenger traffic by public transport in passenger-km}$ $UE_t^{CA} = \text{Unit energy consumption of cars in year t (goe/pkm)}$ $UE_t^{PT} = \text{Unit energy consumption of public transport in year t (in goe/pkm)}$
P13	Share of rail and inland waterways freight transport in total freight transport	$(RW_t - RW_{2007}) * T_t^{Fr} * (UE_{RV_t}^{Fr} - UE_{RW_t}^{Fr})$ <p>with:</p> $RW_t, RW_{2007} = \text{Share of rail and inland waterways freight transport in year t and in 2007 in total freight transport}$ $T_{RW}^{Fr} = \text{Freight traffic of rail and inland waterways}$ $T_t^{Fr} = \text{Total freight traffic (rail, road, waterways) in year t}$ $UE_{RV_t}^{Fr} = \text{Unit energy consumption of freight road vehicle transport (trucks and light vehicles) in year t}$ $UE_{RW_t}^{Fr} = \text{Unit energy consumption of rail and inland waterways freight transport in year t}$

Type	Energy efficiency indicator	Formula for calculation of the energy saving compared to base year 2007 <sup>1</sup>
<b>Industry sector (IND)</b>		
<b>P14</b>	Energy consumption of industrial subsectors per unit of production	$\left( \frac{E_{2007}^{I^X}}{IPI_{2007}^{I^X}} - \frac{E_t^{I^X}}{IPI_t^{I^X}} \right) * IPI_t^{I^X} * K_{2007}^{I^X}$ <p>with:</p> $E_{2007}^{I^X}, E_t^{I^X}, E_t^{I^X} = \text{Energy consumption of industrial sub-sector x in 2007 and in year t}$ $K_{2007}^{I^X} = \text{Share of energy consumption of industrial subsector x falling under the scope of Directive 2006/32/EC in 2007}$ $IPI_{2007}^{I^X}, IPI_t^{I^X}, IPI_{2007}^{I^X}, IPI_t^{I^X} = \text{Industrial production index of industry sub-sector x in 2007 and in year t}$
Source: European Commission 2010		

1 On the basis of the formulae proposed here the energy savings are given as positive variables, and additional energy consumption figures have a negative sign.

## 2.5 Bottom-up evaluation of energy savings

### 2.5.1 Calculation methods

For calculation of the bottom-up energy savings use is similarly made of the recommendations of the European Commission of 2 July 2010. The bottom-up calculation methods proposed therein primarily relate to measures in the buildings and installations as well as to appliances and lighting areas for action. They have been formulated by the European Commission as non-binding proposals and recommendations in order to give the Member States the freedom to be able to adjust the calculation methods in a suitable manner according to the large differences between the national information and data situations of the Member States.

The recommendations of the European Commission for calculation of energy savings by means of bottom-up methods do not include all areas for action in which measures for increasing energy efficiency have been carried out. In the recommendations of the European Commission it is therefore explicitly stated that for those instruments for which no recommendations of the European Commission for calculation of the resulting energy savings are available the Member States develop and use additional national bottom-up calculation methods. This relates in particular to instruments and measures in the “Transport and mobility” and “Horizontal measures” areas for action. Accordingly, the federal government has made use of this stated option.

In addition, in these cases use was made of existing evaluations of funding measures and programmes in which they were available in a suitable form. In programme evaluations such as these bottom-up-based methods of calculation are similarly carried out. Nevertheless, as a rule they involve additional empirical components such as standardised surveys or expert interviews and can in principle therefore provide – with a greater amount of work and consequently at higher evaluation cost – more precise estimates about the energy-saving effects achieved.

The calculation method respectively applied to a given measure (formula for calculation on the basis of the recommendations of the European Commission,

national formula for calculation, or recourse to already existing external evaluation) is listed in the measures sheets in Section 4 of the present Methodological Accompanying Document to the Second NEEAP.

### 2.5.2 Foundation of data

Procurement and processing of the relevant foundation of data is a considerable challenge in the application of bottom-up-calculation methods. Accordingly, in the framework of the research activities contracted out by the BMWi and BfEE, in each case contact with the corresponding sponsors of measures and programmes was sought and the appropriate foundation of data was collected working in close cooperation. Besides the sponsors of relevant national funding programmes such as the KfW banking group and the Federal Office of Economics and Export Control (BAFA), particular mention should be made here of the German Federal Ministry of the Environment, Nature Conservation and Nuclear Safety (BMU), the German Federal Ministry of Transport, Building and Urban Affairs (BMVBS), and various different departments at the BMWi.

Moreover, it should also be recognised that in Germany the departments and sponsors referred to only cover the national instruments and programmes. For a complete survey documentation of all the instruments and programmes of the 16 German federal states together with the more than 13,000 municipalities (cities and districts) would also be necessary. Due to Germany’s federal structure, information about energy efficiency measures at the level of the federal states and municipalities is not centralised and is therefore relatively fragmented. Complete coverage cannot be achieved at justifiable cost. Therefore, besides the federal government measures the Second NEEAP restricts itself to the designation and quantification of the respective most important measures in the area of the federal states.

The same applies to the multitude of measures for increasing energy efficiency executed independently by market participants. A large number of different market participants are very active in the well developed energy services market and make a substantial contribution to the exploitation of energy saving potential in Germany. To give a detailed survey or a

full overview of these activities, let alone quantify individual measures in respect of the energy-saving effects achieved, is similarly impossible due to cost-benefit reasons.

### 2.5.3 Instrument, implementation and other correction factors

A challenge arising from the use of bottom-up methods is the very simplifying, relatively static and mechanical portrayal of interdependencies. Essentially linear cause-and-effect relationships are assumed, with a linear relationship being created between an individual statistically recorded typological case (e.g. one consultation, or €1 of funding) and the energy saving. Nevertheless, practice shows that the implementation of an energy saving measure is embedded within a complex causative network of supporting or inhibiting individual factors (values, motives, interests, education, specialist know-how, financial situation, etc.). More complex interdependencies such as innovative behaviour, market transformation, rebound effects, freeriding behaviour and exemplary effects (multiplier effects) are not taken into account in this simplifying appraisal.

In a bottom-up calculation of energy savings in the framework of the Second NEEAP the aim is to minimise the effects of distorting errors in this simplified view by introducing various correcting variables. On the one hand so-called instrument factors should avoid double counts. Double counts can arise because a single energy saving measure is usually addressed by a large bundle of instruments and programmes. Frequently, for example, in redeveloping their buildings owners make simultaneous use of informational

measures, such as an energy counselling programme, and a funding programme. If the two instruments were assessed in isolation from each other, each could be assigned the full savings figure. In summation of the instrument-specific savings there would then be a double count, although ultimately the two instruments have interacted to achieve the energy saving. The instrument factors used in the Second NEEAP ensure that these double counts are corrected and that the identified energy saving is only added once to the total savings figure. On the basis of empirical experience and expert estimates the energy saving in a given sector is allocated on a pro rata basis to the measures addressing that sector.

Furthermore, in view of the complexity referred to above it is obvious that not every statistically recorded case (e.g. an energy consultation) will lead to the implementation of an energy saving measure. Thus in the Second NEEAP a so-called implementation factor is introduced into the bottom-up calculations of the energy savings. With the implementation factor, among other things the non-consideration or non-fulfilment of legal requirements (non-compliance) can also be portrayed. It is of no significance whether the deviation from the required or calculated situation is due to wilful disregard, non-execution, inadequate consideration of rules, ignorance, or technical failings in implementation.

The following summary table shows the instrument and implementation factors used in the Second NEEAP together with the corrections used in the calculations at conversion factor for electricity 2.5.

**Table 2.5.3-1 Instruments and implementation factors together with correction factors used in the calculations at conversion factor for electricity 2.5**

Instrument	No.	Instrument factor	Implementation factor	Correction on the basis of conversion factor for electricity 2.5	
				to 2007	from 2008
Activities of Deutsche Bahn	M 54	0.90	1.00	1.94	1.94
BAFA On-site Consultation	M 14	0.45	1.00 <sup>1</sup>	1.10	1.11
Contracting for federal government properties	M 85	0.90	1.00	1.14	1.18
Energy-using Products Act (EBPG): implementing measure for electric motors	M 27	0.90	0.80	2.50	2.50
Energy-using Products Act (EBPG): implementing measures for electrical appliances, TRS+PHH	M 28 M 29	0.90	0.80	2.50	2.50
Energy Savings Programme for Federal Government Properties (€120m Programme)	M 77	0.90	1.00	1.14	1.18
Energy Saving Ordinance (non-residential buildings)	M 02	0.90	0.95	1.14	1.18
Energy Saving Ordinance (residential buildings)	M 01	0.90	0.95	1.10	1.11
Energy Consumption Labelling Ordinance (EnVKV) (historical)	M 30	0.90	0.60	2.50	2.50
ERP – parts A and B of the Environmental Protection and Energy Efficiency Programme	M 37 M 38	0.90	1.00	1.41	1.49
Voluntary agreement of the German automotive industry	M 53	0.30	1.00	1.00	1.00
Voluntary agreements between German industry and the federal government designed to increase energy savings and reduce CO <sub>2</sub> emissions	M 40	0.10	1.00	1.41	1.49
Green IT Initiative of the federal government	M 83	0.75	1.00 <sup>4</sup>	2.50	2.50
Energy-efficient modernisation of the social infrastructure	M 79	0.95	1.00	1.14	1.18
KfW Housing Modernisation Programme II	M 07	0.90	1.00	1.10	1.11

**Table 2.5.3-1 Instruments and implementation factors together with correction factors used in the calculations at conversion factor for electricity 2.5**

Instrument	No.	Instrument factor	Implementation factor	Correction on the basis of conversion factor for electricity 2.5	
				to 2007	from 2008
KfW Housing Modernisation Programme 2003	M 08	0.90	1.00	1.10	1.11
KfW CO <sub>2</sub> Building Redevelopment	M 04	0.90	1.00	1.10	1.11
KfW CO <sub>2</sub> Reduction	M 05	0.90	1.00	1.10	1.11
KfW Energy-efficient Construction	M 09	0.70	1.00	1.10	1.11
KfW Energy-efficient Redevelopment	M 03	0.90	1.00	1.10	1.11
KfW Energy-efficient Redevelopment – municipalities	M 80	0.70	1.00	1.14	1.18
KfW Special Fund for Energy Efficiency in SMEs	M 41	0.45	1.00	1.41	1.49
KfW Market Incentive Programme – KfW component	M 12	0.90	1.00	1.10	1.11
KfW Municipal Loans – Energy-efficient Building Redevelopment	M 81	0.70	1.00	1.14	1.18
KfW Ecological Construction	M 10	0.70	1.00	1.10	1.11
KfW Social Investment	M 82	0.70	1.00	1.14	1.18
KfW Environmental Programme, ERP predecessor programmes	M 36	0.90	1.00	1.41	1.49
KfW Housing Modernisation Programme – Eco Plus	M 06	0.90	1.00	1.10	1.11
Motor vehicle tax	M 50	0.50	1.00	1.00	1.00
The federal government's fuel strategy	M 49	0.20	1.00	1.00	1.00
Federal states' activities in the buildings sector	M 13	0.90	1.00	1.10	1.11
Activities of the federal states in the public sector	M 78	0.90	1.00	1.14	1.18
Heavy goods vehicle toll	M 51	0.95	n.b. <sup>2</sup>	1.00	1.00
Market Incentive Programme for Promotion of the Use of Renewable Energies (MAP) – BAFA component	M 11	0.70	1.00	1.10	1.11
mission E	M 84	0.45	1.00	1.40	1.52

**Table 2.5.3-1 Instruments and implementation factors together with correction factors used in the calculations at conversion factor for electricity 2.5**

Instrument	No.	Instrument factor	Implementation factor	Correction on the basis of conversion factor for electricity 2.5	
				to 2007	from 2008
Stimulus programme for funding climate protection measures for commercial refrigeration facilities	M 39	0.90	1.00	2.50	2.50
Climate protection projects in social, cultural and public institutions	M 87	0.90	1.00	2.50	2.50
Ecological Tax Reform TRS, PHH, TRA	M 67	0.95	1.00	Various <sup>3</sup>	
Ecological Tax Reform IND	M 67	0.95	0.50		
Environmental bonus	M 52	0.90	1.00	1.00	1.00
Energy counselling in consumer advice centres	M 32	0.45	Various <sup>3</sup>	1.24	1.33
Future Investments Act (ZuInvG)	M 76	0.90	1.00	1.14	1.18

1 Implementation factor already taken into account in determination of the unit savings figure

2 Implementation factors not part of the method of calculation

3 Determined empirically

4 From 2014: 0.75

For establishment of the implementation factors use was made of the source references listed in the following summary table.

**Table 2.5.3-2 List of sources for the implementation factors**

Signature	Sources for implementation factors
BEI/Institute of Housing and the Environment (IWU) 2007	Bremen Energy Institute, Institute of Housing and the Environment (IWU) 2007: Determination of the effects of the KfW CO <sub>2</sub> Building Redevelopment Programme – development of the methodology and results from the 2005 and 2006 reporting periods.
Berliner Energieagentur 2008	Berlin Energy Agency 2008: GreenLabelsPurchase – Making greener procurement with energy labels.
co2 online 2006	co2 online 2006: Evaluation pumps check, self-assessment co2 online gGmbH.
co2 online 2006a	co2 online 2006: Impact analysis of interactive CoolCheck, self-assessment co2 online gGmbH.
dena 2005	German Energy Agency 2005: National information and motivation campaign for efficient use of electricity in private households in the framework of the Energy Efficiency Initiative, RESULTS of the first campaign period from 2002 to 2004.

**Table 2.5.3-2 List of sources for the implementation factors**

Signature	Sources for implementation factors
dena 2003	German Energy Agency 2003: Pilot project: Contracting for federal government properties – national sustainability strategy.
Deutscher Bundestag 2008	German Bundestag (the national parliament) 2008: Small enquiry by Bundestag members Ulla Lötzer, Hans-Kurt Hill, Dr. Barbara Höll and the DIE LINKE group: Funding of the Energy Efficiency Initiative by the Federal Ministry of Economics and Technology (BMWi), Bulletin 16/7713, 10.1.2008.
forsa 2004	forsa – Gesellschaft für Sozialforschung und statistische Analysen mbH: Evaluation of the efficiency campaign of the Energy Efficiency Initiative, 4th wave October-December 2004, Berlin 2004.
Fraunhofer ISI/GfK 2001	Fraunhofer ISI, GfK market research agency 2001: Evaluation of the implementation of the Energy Consumption Labelling Ordinance (EnVKV).
ifeu 2008	ifeu – Institute of Energy and Environmental Research Heidelberg 2008: Evaluation of the “On-site Energy Saving Advice” funding programme.
ifeu 2007	ifeu – Institute of Energy and Environmental Research Heidelberg 2007: Efficient counselling modules for the reduction of electricity consumption in private households.
ifeu 2005	ifeu – Institute of Energy and Environmental Research Heidelberg 2005: Evaluation of the centre-based energy counselling of the consumer advice centres, of the German Housewives’ Association in Lower Saxony, and of the consumer service department in Bavaria.
IFSM 2006a	Malte Friedrich: Evaluation of the online modernisation guide of co2online.
IFSM 2006b	Malte Friedrich: Evaluation of the interactive online guide “Heating costs in new buildings”.
IFSM 2006c	Malte Friedrich: Evaluation of the interactive online guide “Heating costs in new buildings”.
IWU 2003	Institute of Housing and the Environment (IWU) 2003: Energy saving through improvement of thermal insulation and modernisation of heating systems for 31 model buildings of the building typology.
LBME 2006	State metrology and verification agency of North-Rhine Westphalia 2006: Information on the Energy Consumption Labelling Ordinance (EnVKV).
LME 2006	State metrology and verification agency of Rhineland-Palatinate 2006: Information on the Passenger Vehicle Energy Consumption Labelling Ordinance (Pkw-EnVKV).
OPTIMUS, 2005	OPTIMUS, 2005: Optimisation of heating systems (summarised in a position paper of the Heat Supply Association 2007).
Prognos 2009	Prognos AG 2009: Evaluation of the Star campaign in the framework of the RWE €150m Efficiency Programme.

**Table 2.5.3-2 List of sources for the implementation factors**

Signature	Sources for implementation factors
Prognos/dena 2006	Prognos AG, German Energy Agency 2006: Evaluation of the Contracting in Federal Government Properties initiative (confidential).
RWI/forsa 2004	RWI research institute/forsa 2004: Survey of the energy consumption of private households for 2003.
RWI/RUB 2008	Rhineland-Westphalian Institute of Economic Research, Ruhr University in Bochum 2008: Why is energy saving counselling subsidised? Central Research & Development Agency (ZfE), 02/08, pp. 97 et seq.
Wuppertal Institut 2006	Wuppertal Institute 2006: Successful design and execution of programmes for on-site counselling and energy analysis in the residential buildings sector, success factors and obstacles – concrete proposals; Workshop on active implementation of the ESD, 11 December 2006, BMWi, Berlin.
Wuppertal Institut 2006a	Wuppertal Institute 2006: Evaluation of the online modernisation guide of co2online – 6.
ZSW et al. 2006	Centre for Solar Energy and Hydrogen Research Baden-Württemberg; Technology and Support Centre in the Competence Centre for Renewable Resources; Solites Steinbeis Research Institute for Solar and Sustainable Thermal Energy Systems: Evaluation of individual measures for the use of renewable energies (market incentive programme) in the period from January 2004 to December 2005.
ZVEI 2007	Central Association of the German Electrical and Electronics Industry (ZVEI) (trade association for electrical domestic appliances in the ZVEI) 2007: Energy efficiency for domestic appliances; Energy Efficiency Offensive Forum (EOR-Forum) 2007.

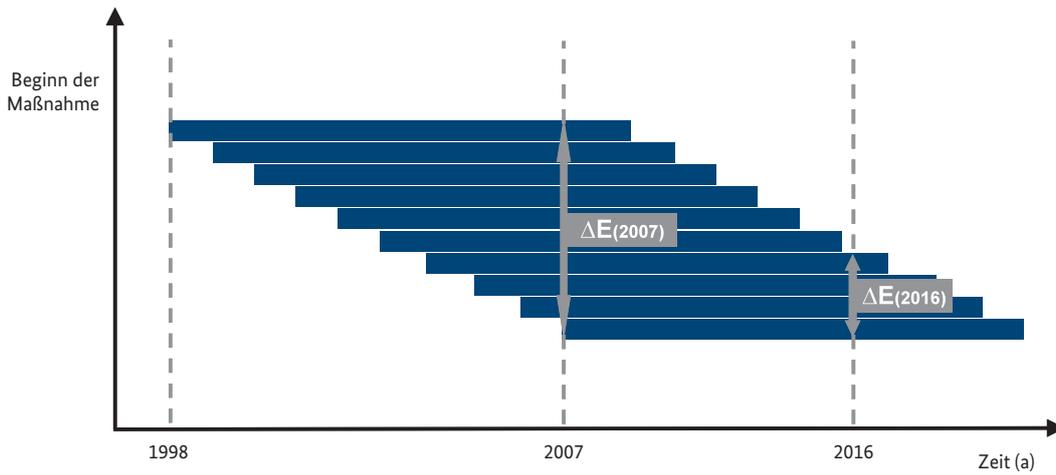
#### 2.5.4 Use of lifetimes

A further simplification in the bottom-up calculation of energy savings in the Second NEEAP is the use of (limited) lifetimes. As the technical lifetime of buildings, installations and appliances is limited, it appears to make sense also to assume limited lifetimes for the evaluation of instruments and measures. Due to the use of lifetimes, in the presentation of calculated ener-

gy savings it can in principle occur that, due to the expired lifetimes savings reported in 2007 or 2010 for example are no longer included in the verified energy savings at a later reporting date (e. g. in 2016) or are deducted. The total verified savings at the later reporting date are reduced in such cases. This applies in particular to measures with shorter life-times.<sup>12</sup>

<sup>12</sup> For Germany most of the quantitatively evaluated programmes address technical systems with lifespans of 15 years and more. Most of the programmes relating to technical systems with shorter lifespans were not started until after 2000, so the effect of the lifespan approach is small and is noticeable for the first time in the savings calculated for the appliances sector (cf. EnVKV in Section 4).

Fig. 2.5.4 Use of lifetimes



In its recommendations of 2 July 2010 the European Commission recommended the use of lifetimes and proposed a harmonised list with the lifetimes of individual measures as the basis for the bottom-up calculations. It refers back to a list of lifetimes agreed upon in 2007 in the framework of the European Committee

for Standardisation (CEN). The lifetimes set out in this list are used as a basis for the calculations in the Second NEEAP (cf. Table 2.5.4).<sup>13</sup> In the cases in which no lifetimes are used due to the selected methodological approach, this is stated in the corresponding formulae for calculation (cf. Section 4).

13 The lifespans recommended by the European Commission for the instruments described in the Second NEEAP exceed the period of validity of the ESD

**Table 2.5.4 Overview of the lifetimes used**

Type of measure	Lifetime used	Comment
<b>Buildings and installations</b>		
Heat insulation external wall	30 years	
Heat insulation roof/cellar	25 years	
Window replacement	30 years	
Replacement of heating/water heating	20 years	<sup>1</sup>
Heat pumps	10 years	<sup>1</sup>
Ventilation units with heat recovery	17 years	
Solar energy installations	20 years	
<b>Buildings and installations</b>		
Refrigerators, freezers	15 years	
Washing machines, dishwashers	12 years	
Electric motors	12 years	
<b>Public sector</b>		
Street lighting	15 years	
<b>Transport and mobility</b>		
Vehicles (passenger vehicles, heavy goods vehicles)	100,000 km	
<sup>1</sup> In these types of measure the recommendations of the European Commission contain proposals with varying lifetimes. In the Second NEEAP the shortest proposed lifetimes were always assumed in these cases.		

In the following sub-section the methods of calculation and data requirements for the instruments and measures quantified in the Second NEEAP in the various different areas for action are described in respect of their energy-saving effects. As far as possible and available the methods of calculation focus on the formulae for calculation given by the European Commission in its methodological recommendations. For those instruments for which no recommendations for calculation of the resulting energy savings were available, additional national bottom-up calculation methods were used.

In addition, in these cases use was made of existing evaluations of funding measures and programmes in which they were available in a suitable form. As a rule this recourse to existing external evaluations for certain instruments (e.g. the environmental bonus or the Energy Savings Programme for Federal Government Properties) makes possible even more precise estimates of the energy-saving effects achieved. For the affected measures the respective measures sheets contained an appropriate reference to the external evaluation used (cf. Section 4).

2.5.5 Methods of calculation in the instruments and measures

2.5.5.1 Replacement of heating systems in residential and non-residential buildings (F 2.5.5.1)

$$\left( \frac{1}{\approx_{old}} - \frac{1}{\approx_{new}} \right) \times SHD \times A = UFES \text{ [kWh / m}^2\text{]}$$

Data requirement

Abbreviation	Description	Data
h <sub>old</sub>	Efficiency of the old heating system	Average efficiency of the stock in 1995 (early action), 2007 and 2011
h <sub>new</sub>	Efficiency of the new heating system	
SHD	Specific heating energy requirement [kWh/m <sup>2</sup> a]	
A	Average area heated by the heating system [m <sup>2</sup> ]	

Allocation of instruments

Programme		η <sub>init</sub>	η <sub>new</sub>	SHD	UFES (kWh/m <sup>2</sup> )	f <sub>i</sub>	f <sub>u</sub>	Datasource
KfW Municipal Loans – Energy-efficient Building Redevelopment(prog. part B); KfW Energy-efficient Redevelopment – Municipalities (prog. part B); KfW Social Investment (prog. part B); Future Investments Act (ZuInvG)	Heating systems in general	0.74	0.95	133.2	39	0.7 bis 0.9	1	BBSR2007
	Condensing boilers	0.74	0.95	133.2	39	0.9	1	BBSR2007
	Low-temperature boilers	0.74	0.92	133.2	35	0.9	1	
	Condensing boilers with solar energy	0.74	1.33	133.2	80	0.9	1	
KfW Housing Modernisation Programme – Eco Plus/Mix	Heat pumps	0.74	2.5	133.2	127	0.9	1	
	Heat pumps	0.74	3.0	133.2	136	0.7	1	BAFA2010a
Market Incentive Programme for Promotion of the Use of Renewable Energies (prog. part Heat Pumps)	Heat pumps	0.74	3.0	133.2	136	0.7	1	BAFA2010a

2.5.5.2 Replacement of household appliances in residential buildings (F 2.5.5.2)

$$AEC_{average} - AEC_{promoted} = UFES \text{ [kWh/unit a]}$$

Data requirement

Abbreviation	Description	Data
AEC <sub>average</sub>	Annual energy consumption of the reference group	<p><i>For substitution:</i> average annual consumption of the stock 1995 (early action), 2007 and 2011</p> <p><i>For new installation:</i> average annual consumption of the market intake in 1995 (early action), 2007 and 2011</p>
AEC <sub>promoted</sub>	Annual energy consumption of an appliance in the energy class supported by the measure	
Energy-efficient appliances sold	Number of appliances sold under the measure/ programme	

Allocation of instruments

Programme	Time	Form	AEC <sub>stock_average</sub> [kWh/a]	AEC <sub>promoted</sub> [kWh/a]	f <sub>i</sub>	f <sub>u</sub>	Data source
EnVKV	Up to 2007	Refrigerators	388	388-262	0.9	0.6	GfK2010; own calculation
		Freezers	291	291-181	0.9	0.6	
		Washing machines	153	153-115	0.9	0.6	
		Dishwashers	198	198-162	0.9	0.6	
	After 2007	Refrigerators	252	252-239	0.9	0.6	
		Freezers	174	174-167	0.9	0.6	
		Washing machines	115	115	0.9	0.6	
		Dishwashers	160	160-159	0.9	0.6	

**2.5.5.3 Replacement or new installation of lamps in residential buildings and non-residential buildings (F 2.5.5.3)**

The formula for calculation recommended by the European Commission was not used here. Instead the lit surface area was multiplied by a standard energy saving value.

**Allocation of instruments**

Programme	UFES [kWh/m <sup>2</sup> ]	f <sub>i</sub>	f <sub>u</sub>	Data source
KfW Municipal Loans – Energy-efficient Building Redevelopment (prog. part B), KfW Energy-efficient Redevelopment – Municipalities (prog. part B) KfW Social Investment (prog. part A), Future Investments Act (ZuInvG) Federal states’ activities in the buildings sector, activities of the federal states in the public sector	1.75	0.7	1	BBSR2007

**2.5.5.4 Energy-efficient redevelopment of residential and non-residential buildings (F 2.5.5.4)**

$$\frac{SHD_{init}}{\approx_{init}} - \frac{SHD_{new}}{\approx_{new}} = UFES \text{ [kWh/m}^2 \text{ residential surface]}$$

**Data requirement**

Abbreviation	Description	Data
SHD <sub>init</sub>	Specific heating energy requirement previously [kWh/m <sup>2</sup> a]	Either „individual“ previous consumption or stock average in the year of the measure corrected on the basis of the heating degree days
h <sub>init</sub>	Efficiency of the heating system previously	
SHD <sub>new</sub>	Specific heating energy requirement afterwards [kWh/m <sup>2</sup> a]	Pursuant to the new building standard, corrected on the basis of the heating degree days
h <sub>new</sub>	Efficiency of the heating system afterwards	

## Allocation of instruments

Programme	Time	Building type	Form	SHD <sub>init</sub>	$\eta_{init}$	SHD <sub>new</sub>	$\eta_{new}$	UFES	f <sub>i</sub>	f <sub>u</sub>	Data source	
KfW Municipal Loans – Energy-efficient Building Redevelopment (prog. part A), KfW Energy-efficient Redevelopment – Municipalities (prog. part A), KfW Social Investment (prog. part A)		Building youth		323	1	140	1	183	0.9	1	BMVBS 2010	
		Pre-school facility		263	1	150	1	113	0.9	1		
		School		368	1	149	1	219	0.9	1		
		Indoor swimming pool		514	1	187	1	327	0.9	1		
		Sport hall		501	1	202	1	299	0.9	1		
EnEV stock PHH	To 2001	DH/SDH	To 1918	190	0.74	173	0.9	64	0.9	0.95	Prognos model, techem 2009, ZUB2006, Prognos/ IER 2004, IWU/ ifeu 2005	
			1919–1948	178	0.74	162	0.9	60	0.9	0.95		
			1949–1978	141	0.74	129	0.9	48	0.9	0.95		
			1979–1990	141	0.74	129	0.9	48	0.9	0.95		
			1991–1995	117	0.74	107	0.9	40	0.9	0.95		
		1996–2000	117	0.74	107	0.9	40	0.9	0.95			
		MD	To 1918	95	0.74	87	0.9	32	0.9	0.95		
			1919–1948	105	0.74	95	0.9	35	0.9	0.95		
			1949–1978	109	0.74	99	0.9	37	0.9	0.95		
			1979–1990	109	0.74	99	0.9	37	0.9	0.95		
	1991–1995		83	0.74	75	0.9	28	0.9	0.95			
				1996–2000	83	0.74	76	0.9	28	0.9		0.95
	2002 to 2007	DH/SDH	To 1918	190	0.74	154	0.9	86	0.9	0.95		
			1919–1948	178	0.74	154	0.9	70	0.9	0.95		
			1949–1978	141	0.74	129	0.9	48	0.9	0.95		
			1979–1990	141	0.74	129	0.9	48	0.9	0.95		
			1991–1995	117	0.74	107	0.9	40	0.9	0.95		
1996–2000			117	0.74	107	0.9	40	0.9	0.95			
2001–2004			101	0.74	92	0.9	34	0.9	0.95			
From 2005			101	0.74	93	0.9	32	0.9	0.95			

## Allocation of instruments (Continued)

Programme	Time	Building type	Form	SHD <sub>init</sub>	$\eta_{init}$	SHD <sub>new</sub>	$\eta_{new}$	UFES	$f_i$	$f_u$	Data source		
EnEV stock PHH	2002 to 2007	MD	To 1918	95	0.74	87	0.9	32	0.9	0.95			
			1919–1948	105	0.74	95	0.9	35	0.9	0.95			
			1949–1978	109	0.74	99	0.9	37	0.9	0.95			
			1979–1990	109	0.74	99	0.9	37	0.9	0.95			
			1991–1995	83	0.74	75	0.9	28	0.9	0.95			
			1996–2000	83	0.74	76	0.9	28	0.9	0.95			
			2001–2004	78	0.74	71	0.9	26	0.9	0.95			
			From 2005	78	0.74	71	0.9	26	0.9	0.95			
	2008 to 2009	DH/SDH		To 1918	186	0.74	154	0.9	81	0.9	0.95		
				1919–1948	177	0.74	154	0.9	68	0.9	0.95		
				1949–1978	141	0.74	129	0.9	48	0.9	0.95		
				1979–1990	141	0.74	129	0.9	48	0.9	0.95		
				1991–1995	117	0.74	107	0.9	40	0.9	0.95		
				1996–2000	117	0.74	107	0.9	40	0.9	0.95		
				2001–2004	101	0.74	92	0.9	34	0.9	0.95		
				From 2005	96	0.74	87	0.9	32	0.9	0.95		
		MD			To 1918	95	0.74	87	0.9	32	0.9	0.95	
					1919–1948	105	0.74	95	0.9	35	0.9	0.95	
					1949–1978	109	0.74	99	0.9	37	0.9	0.95	
					1979–1990	109	0.74	99	0.9	37	0.9	0.95	
					1991–1995	83	0.74	75	0.9	28	0.9	0.95	
					1996–2000	83	0.74	75	0.9	28	0.9	0.95	
	2010 to 2011	DH/SDH		To 1918	186	0.74	112	0.9	127	0.9	0.95		
				1919–1948	177	0.74	112	0.9	114	0.9	0.95		
				1949–1978	141	0.74	112	0.9	66	0.9	0.95		
				1979–1990	141	0.74	112	0.9	66	0.9	0.95		
				1991–1995	117	0.74	107	0.9	40	0.9	0.95		
				1996–2000	117	0.74	107	0.9	40	0.9	0.95		
2001–2004				101	0.74	92	0.9	34	0.9	0.95			
From 2005				96	0.74	87	0.9	32	0.9	0.95			
MD				To 1918	95	0.74	82	0.9	37	0.9	0.95		
				1919–1948	105	0.74	82	0.9	50	0.9	0.95		
			1949–1978	109	0.74	82	0.9	56	0.9	0.95			
			1979–1990	109	0.74	82	0.9	56	0.9	0.95			
			1991–1995	83	0.74	75	0.9	28	0.9	0.95			
			1996–2000	83	0.74	75	0.9	28	0.9	0.95			
			2001–2004	77	0.74	71	0.9	26	0.9	0.95			
			From 2005	77	0.74	71	0.9	26	0.9	0.95			

## Allocation of instruments (Continued)

Programme	Time	Building type	Form	SHD <sub>init</sub>	$\eta_{init}$	SHD <sub>new</sub>	$\eta_{new}$	UFES	f <sub>i</sub>	f <sub>u</sub>	Data source		
EnEV stock PHH	From 2012	DH/SDH	To 1918	186	0.74	96	0.9	145	0.9	0.95			
			1919–1948	177	0.74	96	0.9	132	0.9	0.95			
			1949–1978	141	0.74	96	0.9	84	0.9	0.95			
			1979–1990	141	0.74	96	0.9	84	0.9	0.95			
			1991–1995	117	0.74	96	0.9	52	0.9	0.95			
			1996–2000	117	0.74	96	0.9	52	0.9	0.95			
			2001–2004	101	0.74	92	0.9	34	0.9	0.95			
	From 2005	96	0.74	87	0.9	32	0.9	0.95					
	MD			To 1918	95	0.74	70	0.9	50	0.9		0.95	
				1919–1948	105	0.74	70	0.9	63	0.9		0.95	
				1949–1978	109	0.74	70	0.9	69	0.9		0.95	
				1979–1990	109	0.74	70	0.9	69	0.9		0.95	
				1991–1995	83	0.74	70	0.9	34	0.9		0.95	
				1996–2000	83	0.74	70	0.9	34	0.9		0.95	
				2001–2004	77	0.74	70	0.9	27	0.9		0.95	
				From 2005	77	0.74	70	0.9	27	0.9		0.95	
				KfW CO <sub>2</sub> Reduction								75.5	0.9
KfW Energy-efficient Redevelopment					EFH/MFH	Subsidy cases					49	0.9	1
	EFH	Loan cases						85	0.9	1	BEI et.al.2010		
	MFH	Loan cases						88	0.9	1	BEI et.al.2010		
Investment Pact on energy-efficient renewal of the social infrastructure	2008							193	0.95	1	BMVBS 2010; own calculation		
	2009							250	0.95	1			
KfW CO <sub>2</sub> Building Redevelopment		EFH/ZFH	Subsidy					14.7	0.9	1	BEI et.al. (2007-2009); averages		
			Loan					17.0	0.9	1			
		MFH	Subsidy					6.8	0.9	1			
			Loan < €1m					8.4	0.9	1			
			Loan > €1m					5.5	0.9	1			

2.5.5.5 Heat insulation measures on residential and non-residential buildings (F 2.5.5.5)

$$\left( \begin{matrix} U\text{-value}_{init} & U\text{-value}_{init} \end{matrix} \right) \times \text{HDD} \times \frac{24 \text{ h}}{1000} = \text{UFES [kWh/m}^2 \text{ façade area]}$$

$a \times b \times c \times \frac{24 \text{ h}}{1000} = \text{UFES [kWh/m}^2 \text{ façade area]}$

Data requirement

Abbreviation	Description	Data
U-Value <sub>init</sub>	Heat transfer coefficient before execution of the redevelopment [H/m <sup>2</sup> K]	U-value of the building before the redevelopment or average U-value of the building stock in the building age group of this building
U-Value <sub>init</sub>	Specific heating energy requirement after implementation of the measure	Heat transfer coefficient of the insulating material used
HDD	Heating degree days [K d/a]	Eurostat2010
a	Correction factor for the climate zone	1, where no national figure available
b	Correction factor for heating system and energy source	Average efficiency of the stock of the heating system (or 0.95 for electrical heating and 0.6 for fossil fuel-operated heating)
c	Periodicity coefficient for modelling of the non-continuous operation of the heating system	0.5, where no national figure is available

Allocation of instruments

Programme	Form	Uvalue <sub>init</sub>	Uvalue <sub>new</sub>	HDD	a	b	c	UFES	f <sub>i</sub>	f <sub>u</sub>	Data source
KfW Municipal Loans – Energy-efficient Building Redevelopment (prog. part A); KfW Energy-efficient Redevelopment – Municipalities (prog. part A); KfW Social Investment (prog. part A); Federal states’ activities in the buildings sector (various programmes)	Windows	4.03	1.30	3239	1	0.6	0.5	177	0.7	1	Eurostat 2010; BBSR2007; EnEV2009
	Roof, upper storey ceiling	1.00	0.24	3239	1	0.6	0.5	49	0.7	1	
	External walls	1.69	0.24	3239	1	0.6	0.5	94	0.7	1	
	Cellar ceiling	0.90	0.24	3239	1	0.6	0.5	43	0.7	1	
Future Investments Act (ZuInvG)	Insulation	1.28	0.24	3239	1	0.6	0.5	68	0.9	1	Eurostat 2010; BBSR2007; EnEV2009
	Windows	4.03	1.30	3239	1	0.6	0.5	177	0.9	1	

**2.5.5.6 Counselling for energy-efficient redevelopment of residential buildings (F 2.5.5.6)**

There is no recommendation from the European Commission. A standard energy saving value is used for each consultation. For the BAFA on-site consulta-

tion the implementation factor is already accounted for in this figure (ifeu 2008).

**Allocation of instruments**

Programme		Share of consultations on the subject	UFES [kWh/consultation]	f <sub>i</sub>	f <sub>u</sub>	Data source
BAFA On-site Consultation			6225	0.45	1.00	ifeu2008
vzbv Energy Consultations	Solar energy	15 %	2932	0.45	0.28	ifeu2005
	Heating replacement	20 %	2444	0.55	0.28	ifeu2005
	Roof insulation	16 %	2321	0.52	0.56	ifeu2005
	External wall insulation	16 %	3441	0.52	0.53	ifeu2005

**2.5.5.7 Construction of new residential and non-residential buildings with compliance with or outperformance of a building standard (F 2.5.5.7)**

$$\begin{array}{c} \text{SHD}_{\text{init}} \\ \text{---} \\ \approx_{\text{init}} \end{array} - \begin{array}{c} \text{SHD}_{\text{new}} \\ \text{---} \\ \approx_{\text{new}} \end{array} = \begin{array}{c} \text{UFES} \\ \text{[kWh/m}^2 \\ \text{residential surface]} \end{array}$$

**Data requirement**

Abbreviation	Description	Data
SHD <sub>init</sub>	Specific heating energy requirement previously [kWh/m <sup>2</sup> a]	Pursuant to the previous building standard, corrected on the basis of the heating degree days
h <sub>init</sub>	Efficiency of the heating system previously	
SHD <sub>new</sub>	Specific heating energy requirement afterwards [kWh/m <sup>2</sup> a]	Pursuant to the new building standard, corrected on the basis of the heating degree days
h <sub>new</sub>	Efficiency of the heating system afterwards	

**Allocation of instruments**

Programme	Time		SHD <sub>inicode</sub>	$\eta_{inicode}$	SHD <sub>newcode</sub>	$\eta_{new}$	UFES	$f_i$	$f_u$	Data source
Heat Conservation Ordinance (WschV) 1995 New construction of residential buildings	To 2002	EFH/ ZFH	200	0.74	124	0.74	103.0	0.9	0.95	Prognos-Modell, techem 2009, ZUB2006, Prognos <sup>4</sup> / IER 2004, IWU / ifeu 2005
		MFH	138	0.74	98	0.74	54.0	0.9	0.95	
EnEV 2002 New construction of residential buildings	2002 to 2007	EFH/ ZFH	200	0.74	110	0.90	148.0	0.9	0.95	
		MFH	138	0.74	79	0.90	98.0	0.9	0.95	
	2007 to 2009	EFH/ ZFH	134	0.80	110	0.90	45.0	0.9	0.95	
		MFH	106	0.80	79	0.90	44.0	0.9	0.95	
EnEV 2009 New construction of residential buildings	From 2010	EFH/ ZFH	134	0.80	80	0.90	78.0	0.9	0.95	
		MFH	106	0.80	59	0.90	67.0	0.9	0.95	
EnEV New construction of non-residential buildings	2002 to 2007		86	0.74	90	0.90	16.0	0.9	0.95	
	From 2008		93	0.80	78	0.9	29.3	0.9	0.95	
KfW Energy-efficient Construction		EH 70	65	0.80	45	0.90	31.8	0.7	1	KfW2010
		EH 55	65	0.80	36	0.90	41.8	0.7	1	
KfW Ecological Construction		ESH 60	75	0.80	49	0.90	38.6	0.7	1	KfW2005
		ESH 40	75	0.80	36	0.90	53.1	0.7	1	

**2.5.5.8 Solar energy in residential and non-residential buildings (F 2.5.5.8)**

$$\begin{array}{c} \text{USAVE} \\ \text{-----} \\ \approx \text{Stock} \end{array} = \begin{array}{c} \text{UFES} \\ [\text{kWh/m}^2 \\ \text{collector surface a}] \end{array}$$

**Data requirement**

Abbreviation	Description	Data
USAVE	Average annual saving per m <sup>2</sup> of collector surface area, i.e. the average heat production per m <sup>2</sup> of collector surface area [kWh/m <sup>2</sup> a]	
$h_{\text{Stock}}$	Efficiency of an average water heating system	Average efficiency of the stock of water heating systems 1995 (early action), 2007 and 2011

**Allocation of instruments**

Programme	USAVE	$n_{\text{stock\_average\_heating\_system}}$	UFES	$f_i$	$f_u$	Data source	
Market Incentive Programme for Promotion of the Use of Renewable Energies (solar energy prog. part); Housing Modernisation Programme – Eco Plus / Mix (solar energy prog. part)	Up to and including 2006	525	0.77	682	0.7 bis 0.9	1	BAFA2010
	From 2007	525	0.84	625	0.7 bis 0.9	1	BAFA2010

**2.5.5.9 Construction of ventilation systems with heat recovery (F 2.5.5.9)**

There is no recommendation from the European Commission. A standard energy saving value per unit of total flow volume (m<sup>3</sup>/h) is used.

**Allocation of instruments**

Programme	UFES [kWh h/m <sup>3</sup> ]	$f_i$	$f_u$	Data source
KfW Municipal Loans – Energy-efficient Building Redevelopment (prog. part A); KfW Energy-efficient Redevelopment – Municipalities (prog. part A); KfW Social Investment (prog. part A); KfW Housing Modernisation Programme – Eco Plus / Mix (ventilation systems prog. part)	7	0.7 to 0.9	1	BBSR2007

**2.5.5.10 Heavy goods vehicle toll, Ecological Tax Reform, motor vehicle tax (F 2.5.5.10)**

There is no recommendation from the European Commission. An econometric approach with price elasticity is assumed.

$$f_i \times \frac{\partial e_{ij}}{\partial p_{ij}} \times \Delta p_{ijm} \times E'_m = \text{Saving of the measure [kWh/a]}$$

**Data requirement**

Abbreviation	Description
Methodological parameters	
$f_i$	Instrument factor
$\frac{\partial e_{ij}}{\partial p_{ij}}$	Price elasticity for energy source i and area of application j
Statistical parameters	
$\Delta p_{ijm}$	Percentage price increase for energy source i in area of application j due to measure m
$E'_m$	Consumption before introduction of the measure

## Allocation of instruments

Programme	Application	Form	Price elasticity	$f_i$	Data source
Ecological Tax Reform, private households	Heating of buildings	Light fuel oil	-0.200	0.95	Prognos;GWS2009
		Natural gas	-0.200	0.95	Prognos;GWS2009
		Heating current	-0.200	0.95	Prognos;GWS2009
		Auxiliary current	-0.025	0.95	Prognos;GWS2009
	Water heating	-0.050	0.95	Prognos;GWS2009	
	Electrical appliances		-0.025	0.95	Prognos;GWS2009
Ecological Tax Reform, trade, retail and services	Heating of buildings		-0.200	0.95	Prognos;GWS2009
	Process heat		-0.100	0.95	Prognos;GWS2009
	Other applications		-0.025	0.95	Prognos;GWS2009
Ecological Tax Reform, industry		Light fuel oil	-0.100	0.95	Prognos;GWS2009
		Heavy fuel oil	-0.100	0.95	Prognos;GWS2009
		Natural gas	-0.100	0.95	Prognos;GWS2009
		Electricity	-0.025	0.95	Prognos;GWS2009
Ecological Tax Reform, transport	Motorised private transport		-0.250	0.95	Prognos;GWS2009
	Road freight transport		-0.050	0.95	Prognos;GWS2009
Heavy goods vehicle toll	Road freight transport		-0.050	0.95	Prognos;GWS2009

## 2.5.5.11 Street lighting, energy efficiency measures in companies (F 2.5.5.11)

There is no recommendation from the European Commission. A standard energy saving value per euro invested or granted as a loan is applied.

## Allocation of instruments

Programme	UFES	$f_i$	$f_u$	Data source
Future Investments Act (ZuInvG)	0.983	0.9	1	UVM2010
Activities of the federal states in the public sector (BW energy-efficient street lighting, NI energy-efficient street lighting)	0.983	0.9	1	
ERP – Part A of the Environmental Protection and Energy Efficiency Programme	0.572	0.9	1	KfW2010
ERP – Part B of the Environmental Protection and Energy Efficiency Programme	0.572	0.9	1	
KfW Environmental Programme, ERP predecessor programmes	0.572	0.9	1	

### 3. Top-down: Calculation of the trend (with conversion factor for electricity 1 and 2.5) and detailed overview of the data sources and methods used

#### 3.1 General overview

Energy saving		2007	2010	2013	2016	Total
Unit		PJ/a				
Top-down		vs. 1995	vs. 2007			
Total	Conversion factor for electricity 1	1061	751	1113	1418	2479
	Conversion factor for electricity 2.5	1304	936	1413	1819	3123
Private households	Conversion factor for electricity 1	238	404	539	671	909
	Conversion factor for electricity 2.5	332	482	652	820	1152
TRS <sup>14</sup>	Conversion factor for electricity 1	73	153	210	228	301
	Conversion factor for electricity 2.5	70	196	270	298	368
Industry	Conversion factor for electricity 1	334	100	159	205	539
	Conversion factor for electricity 2.5	436	155	268	363	799
Transport	Conversion factor for electricity 1	416	94	205	314	730
	Conversion factor for electricity 2.5	466	103	223	338	804

#### 3.2 Detailed calculation of the preferred indicators

##### Private households sector – Heating of buildings area of application

Energy saving [PJ]	Type	2007	2010	2013	2016	Total
		vs. 1995		vs. 2007		
Heating of buildings (relating to residential surface area; temperature-adjusted)	<b>P1</b>					
	Conversion factor for electricity 1	230.6	329.7	443.8	554.3	784.9
	Conversion factor for electricity 2.5	244.4	349.5	470.5	587.5	831.9

##### DATA SOURCES AND METHODS:

##### Energy and fuel consumption PHH:

1995 – 2009: AGEB 2010 (corrected fuel consumption for 2007)

2007: AGEB figure corrected (only fuel oil and gases), based on Prognos, Fraunhofer ISI et al. 2010

2010 – 2016: Recalculation based on Prognos et al. 2010 (scenario reference)

##### Energy consumption accounted for by heating of buildings:

1995 – 2008: AGEB/Energy Industry Federation (BDEW)

2009 – 2016: Recalculation (share calculated from updated consumption for heating of buildings)

##### Share of electricity for heating of buildings (for calculation with conversion factor for electricity 2.5):

2007: AGEB/BDEW (const. share 2007 used for all years)

##### Residential surface area PHH:

1995 – 2009: Federal Statistical Office (TS 4, S 5.3)

2009 – 2016: Recalculation based on Prognos et al. 2010

##### Degree days (for temperature adjustment):

1995 – 2009: Ziesing 2009 (based on German Weather Service (DWD)/IWU)

2010 – 2016: Forecast with long-term funds

14 The savings described for the TRS sector also include savings of 47 PJ from the public sector.

### Private households sector – Water heating area of application

Energy saving [PJ]	Type	2007	2010	2013	2016	Total
		vs. 1995	vs. 2007			
Water heating (in respect of inhabitants)	<b>P3</b>					
	Conversion factor for electricity 1	-66.3	50.8	52.7	56.1	-10.2
	Conversion factor for electricity 2.5	-96.7	74.0	76.8	81.7	-14.9

#### DATA SOURCES AND METHODS:

##### Energy and fuel consumption PHH:

1995 – 2009: AGEB 2010 (2007 fuel consumption corrected and not corrected)  
 2007: Correction AGEB figure (only fuel oil and gases) based on Prognos et al. 2010a  
 2010 – 2016: Recalculation based on Prognos et al. 2010 (scenario reference)

##### Share of energy and electricity consumption accounted for by water heating:

1995 – 2008: AGEB/BDEW  
 2009 – 2016: Recalculation (share calculated from updated consumption for water heating)

##### Inhabitants:

1995 – 2010: Federal Statistical Office: Annual Statistical Report and www.destatis.de  
 2011 – 2016: Recalculation based on Prognos et al. 2010

### Private households sector – Electricity area of application

Energy saving [PJ]	Type	2007	2010	2013	2016	Total
		vs. 1995	vs. 2007			
Air conditioning (in respect of residential surface area)	<b>P2</b>	Not to be calculated for Germany based on the current data situation.				
Electrical domestic appliances	<b>P4</b>					
	Conversion factor for electricity 1	75.7	14.0	26.5	39.9	115.6
	Conversion factor for electricity 2.5	189.2	35.0	66.2	99.7	288.9
Lighting (in respect of residential units)	<b>P5</b>					
	Conversion factor for electricity 1	-2.0	9.5	15.6	20.6	18.6
	Conversion factor for electricity 2.5	-5.0	23.8	38.9	51.4	46.5

#### DATA SOURCES AND METHODS:

##### Electricity consumption PHH:

1995 – 2009: AGEB 2010  
 2010 – 2016: Recalculation based on Prognos et al. 2010 (scenario reference)

##### Share of energy consumption accounted for by lighting:

1995 – 2008: AGEB/BDEW  
 2009 – 2016: Recalculation (share calculated from updated electricity consumption for lighting)

##### Electricity consumption by domestic appliances:

1995 – 2010: Model calculations by Prognos, as at mid-2009 (scenario reference)  
 2011 – 2016: Recalculation based on Prognos/Öko-Institut 2009

##### Number of residential units PHH:

1995 – 2009: Federal Statistical Office (TS 4, S 5.3); Federal Statistical Office (2008 Data Report; micro-census: percentage of permanently occupied residential units)  
 2009 – 2016: Recalculation based on Prognos et al. 2010

Trade, retail and services sector (TRS) <sup>15</sup>

Energy saving [PJ]	Type	2007	2010	2013	2016	Total
		vs. 1995		vs. 2007		
Fuel consumption (Total savings in the sub-sectors; in respect of activity indicator)	<b>P6</b>	75.3	147.1	202.4	219.6	294.9
Electricity consumption (Total savings in the sub-sectors; in respect of activity indicator)	<b>P7</b>					
	Conversion factor for electricity 1	-2.2	5.4	7.5	8.7	6.5
	Conversion factor for electricity 2.5	-5.6	48.4	67.3	78.5	72.9

## DATA SOURCES AND METHODS:

*Electricity and fuel consumption in the sub-sectors:*

Currently available for 2001-2008 from Fraunhofer ISI et al. 2009, 2010. Method: Face-to-face interviews on energy consumption in 2,000 places of work and projection of the survey results. Division of the TRS sector into 17 sub-sectors. No consistent data available before 2001.

Recalculation for 2009-2016: Forecast by Fraunhofer ISI, based on Prognos et al. 2010; forecast of development of specific fuel and electricity consumption multiplied by activity indicator (no forecast of the specific electricity and fuel consumption by sub-sector available, therefore assumption for all sub-sectors that development as for total TRS and linked with sector-specific growth in activity).

*Activity indicators:*

For most sub-sectors: persons in employment. Sector-specific activity quantification for hospitals (permanent beds), schools/universities (number of pupils/students), swimming pools (m<sup>2</sup> of water surface area), airports (traffic units).

Currently available for 2001-2008 from Fraunhofer ISI et al. 2009, 2010, based on Federal Statistical Office (TS 11, S1 and S4; TS 12, S6.1.1; TS 18, S1.4), Business Register, and Annual Statistical Report.

Recalculation for 2009-2016. Forecast Fraunhofer ISI, based on Prognos et al. 2010.

<sup>15</sup> The P6 and P7 indicators include the energy savings of the public sector, which are shown again separately in the following table in view of the role model function of the public sector. There is therefore no double count.

Public sector (as part of the TRS sector) <sup>16</sup>

Energy saving [PJ]	Type	2007	2010	2013	2016	Total
		vs. 1995		vs. 2007		
Fuel consumption (Total savings at regional authority level; in respect of activity indicator)	<b>P6</b> (only public sector)	34.2	6.7	13.9	19.1	53.3
Electricity consumption (Total savings of the sub-sectors; in respect of activity indicator)	<b>P7</b> (only public sector)					
	Conversion factor for electricity 1	-2.5	-1.3	-2.1	-3.2	-5.7
	Conversion factor for electricity 2.5	-6.2	-3.1	-5.3	-8.0	-14.2

## DATA SOURCES AND METHODS:

Electricity and fuel consumption of federal government, states and municipalities

Currently available for 2000-2008 from Prognos/DIFU 2011. Recalculation for 2009-2016 and reverse calculation 1995 to 1999: forecast by Prognos.

## Activity indicators:

The activity factor used is the gross built surface area (GBSA) of the properties. Currently available for 2000-2008 from Prognos/DIFU 2011, based on a survey by municipalities as well as data requests to federal government and states.

## Industry sector

Energy saving [PJ]	Type	2007	2010	2013	2016	Total
		vs. 1995		vs. 2007		
Energy consumption (Total of sectors savings; in respect of production index; without EU-ETS)	<b>P14</b>					
	Conversion factor for electricity 1	333.5	100.3	158.8	205.4	538.9
	Conversion factor for electricity 2.5	436.4	155.1	268.1	362.7	799.1

## DATA SOURCES AND METHODS:

Energy consumption (also broken down into electricity and fuels) of industry by 14 sectors:

1995 - 2008: AGEB 2010

2009 - 2016: Recalculation based on Prognos et al. 2010 (scenario reference); forecast of growth in specific energy consumption multiplied by production index.

## Fuel consumption of the ETS undertakings:

Total fuel consumption of individual sectors accounted for by the ETS undertakings: Fraunhofer ISI estimate based on CITL data, AGEB 2010; UBA 2009; Federal Statistical Office (TS 4, S6.4); proportion of consumption (=reciprocal) falling within the scope of application of Directive 2006/32/EC; proportion calculated for 2007 and same proportion used for all years of calculation.

## Production index (PI) by sector:

1995 - 2009: Federal Statistical Office (TS 4, S2.1)

2010 - 2016: Recalculation based on Prognos et al. 2010; individual missing sector figures supplemented by Prognos/Öko-Institut 2009.

<sup>16</sup> While the energy savings in the public sector determined in the Second NEEAP by means of top-down calculations are broken down between federal government, states and municipalities, the savings here are broken down between electricity and fuels in order to maintain consistency with the designation of the indicators. The total of indicators P6 and P7 corresponds to the total stated in the Second NEEAP.

## Transport sector

Energy saving [PJ]	Type	2007	2010	2013	2016	Total
		vs. 1995		vs. 2007		
Energy consumption of passenger vehicles (in respect of passenger-kilometres)	<b>P8</b>	183.4	52.0	113.1	171.9	355.3
Energy consumption of heavy goods vehicles and light commercial vehicles (in respect of tonne-kilometres)	<b>P9</b>	217.1	33.1	78.5	127.0	344.1
Energy consumption of passenger rail transport (in respect of passenger-kilometres)	<b>P10</b>					
	Conversion factor for electricity 1	15.3	1.4	7.0	9.6	24.9
	Conversion factor for electricity 2.5	33.0	3.1	15.3	21.2	54.2
Energy consumption of rail freight transport (in respect of tonne-kilometres)	<b>P11</b>					
	Conversion factor for electricity 1	27.6	6.9	8.5	10.5	38.1
	Conversion factor for electricity 2.5	59.7	14.8	18.6	23.3	83.0
Proportion of total passenger transport on land accounted for by public transport	<b>P12</b>					
	Conversion factor for electricity 1	2.5	3.0	2.2	1.4	3.9
	Conversion factor for electricity 2.5	59.7	14.8	18.6	23.3	83.0
Proportion of total freight transport accounted for by rail-way and inland water-way freight transport	<b>P13</b>	-30.1	-3.0	-4.8	-6.3	-36.4

## DATA SOURCES AND METHODS:

## Energy consumption by mode of transport:

1995 – 2008: AGEB 2010

2009: BMVBS/German Institute of Economic Research (DIW) 2010

2010 – 2016: Recalculation based on Prognos et al. 2010 (scenario reference)

## Shares of modes of transport accounted for by passenger and freight transport: for all years and model values (Prognos et al. 2010)

## Proportion of road traffic accounted for by public transport:

1995 – 2009: BMVBS/DIW

2010 – 2010: Recalculation (forecast Fraunhofer ISI)

## Energy consumption passenger vehicles and heavy goods vehicles:

1995 – 2008: DIW calculation of consumption for motorised road vehicles

2009 – 2016: Recalculation of specific consumption based on Prognos/Öko-Institut 2009; absolute consumption calculated

## Traffic volume passenger and freight transport:

1995 – 2008: BMVBS/DIW (freight transport volume up to 2009 available; sharp fall-off in 2009 because of economic crisis; due to non-availability of energy consumption figures for 2009 and absence of figures for 2010 results implausible in some cases; therefore forecast values from 2009 used throughout here).

2009 – 2016: recalculation based on Prognos/Öko-Institut 2009.

## 4. Bottom-up: quantified measures

### 4.1 General overview

Energy saving (conversion factor for electricity = 1 and 2.5)		2007	2010	2013	2016	Total
Unit		PJ/a				
Bottom-up		1995 – 2007	2008 – 2010	2008 – 2013	2008 – 2016	1995 – 2016
<b>Total</b>	<b>Conversion factor for electricity 1</b>	460.0	198.6	331.6	462.6	818.7
	<b>Conversion factor for electricity 2.5</b>	544.8	235.8	417.4	597.4	1011.2
Buildings and installations	Conversion factor for electricity 1	247.7	75.5	162.5	251.0	498.7
	Conversion factor for electricity 2.5	278.2	84.6	182.3	281.7	559.7
Appliances and lighting	Conversion factor for electricity 1	8.2	5.2	24.6	44.0	49.8
	Conversion factor for electricity 2.5	19.4	12.5	60.3	108.3	121.9
Public sector	Conversion factor for electricity 1	1.1	9.1	14.3	16.4	17.2
	Conversion factor for electricity 2.5	1.4	11.2	17.3	20.2	21.5
Trade and industry	Conversion factor for electricity 1	40.4	2.9	15.0	27.1	67.5
	Conversion factor for electricity 2.5	53.6	-0.8	19.1	39.2	92.9
Transport and mobility	Conversion factor for electricity 1	59.4	16.8	25.8	34.6	89.2
	Conversion factor for electricity 2.5	62.6	17.7	27.5	37.0	94.9
Cross-section	Conversion factor for electricity 1	103.2	89.1	89.4	89.5	96.3
	Conversion factor for electricity 2.5	129.6	110.6	110.9	111.0	120.3

### 4.2. Buildings (residential and non-residential buildings) and installations

<b>M 01: Energy Saving Ordinance (residential buildings)</b>				
Regulatory law	Start: 2002	End: not planned	Amendment: Tightening-up 2004, 2007, 2009 and 2012 (planned)	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	<b>236.1 PJ</b>	127.9 PJ	27.2 PJ	108.1 PJ
Conversion factor for electricity=2.5	<b>261.3 PJ</b>	140.9 PJ	30.3 PJ	120.4 PJ
Focus of the measure:				
Activities associated with the measure:	With redevelopment within the building stock – depending on the scope of the measures – either the required heat transfer coefficients must be observed (component method) or the peak values for the annual primary energy requirement of the whole building must be verified (balance method). For new buildings minimum technical requirements for the efficient operation of newly constructed buildings apply, including maximum values for annual primary energy requirement and heat transfer losses.			
Sector:	Private households (PHH)	Region:	Germany (total)	
Target group:	Homeowners and construction project sponsors	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	Activity:			

<b>M 01: Energy Saving Ordinance (residential buildings)</b>				
Methodological information:				
Method:	Formulae F2.5.5.7 and F2.5.5.4		Evaluation:	
Sources/references:	Federal Statistical Office (TS 5, S1 [2002-2009]; TS 5, S1-Z2006); Prognos model, techem 2009; Centre for Sustainable Building (ZUB) 2006; Prognos/Institute of Energy Economics and Rational Use of Energy (IER) 2004; IWU/ifeu 2005			
<b>M 02: Energy Saving Ordinance (non-residential buildings)</b>				
Regulatory law	Start: 2002	End: not planned	Amendment: Tightening-up 2004, 2007, 2009 and 2012 (planned)	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	98.3 PJ	63.2 PJ	8.8 PJ	35.1 PJ
Conversion factor for electricity=2.5	115.9 PJ	74.6 PJ	10.3 PJ	41.3 PJ
Focus of the measure:				
Activities associated with the measure:	With redevelopment within the building stock – depending on the scope of the measures – either the required heat transfer coefficients must be observed (component method) or the peak values for the annual primary energy requirement of the whole building must be verified (balance method). For new buildings minimum technical requirements for the efficient operation of newly constructed buildings apply, including maximum values for annual primary energy requirement and heat transfer losses.			
Sector:	Industry (IND); trade, retail, services (TRS)	Region:	Germany (total)	
Target group:	Building owners and property developers	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	Activity:			
Methodological information:				
Method:	Formulae F2.5.5.7 and F2.5.5.4		Evaluation:	
Sources/references:	Prognos et al. 2010a; Fraunhofer ISI et al 2009; Federal Statistical Office (TS5, S1 [2002-2009]); BMVBS 2010; Prognos model			

<b>M 03: KfW Energy-efficient Redevelopment</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 2009	End: not planned	Amendment: From 1.3.2011, optionally, funding as investment subsidy	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	<b>52.0 PJ</b>	–	13.0 PJ	52.0 PJ
Conversion factor for electricity=2.5	<b>57.9 PJ</b>	–	14.5 PJ	57.9 PJ
Focus of the measure:				
Activities associated with the measure:	Low-interest long-term financing and subsidy.			
Sector:	Private households (PHH)	Region:	Germany (total)	
Target group:	Homeowners	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	KfW	Activity:	Cladding (C), technical building equipment (TBE)	
Methodological information:				
Method:	Formula F2.5.5.4	Evaluation:		
Sources/references:	KfW 2010; BMVBS/Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) 2009			

<b>M 04: KfW CO<sub>2</sub> Building Redevelopment Programme</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 2001	End: 2009	Amendment:	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	<b>23.4 PJ</b>	16.6 PJ	6.9 PJ	6.9 PJ
Conversion factor for electricity=2.5	<b>25.9 PJ</b>	18.3 PJ	7.7 PJ	7.7 PJ
Focus of the measure:				
Activities associated with the measure:	Low-interest long-term financing or subsidies towards CO <sub>2</sub> reduction measures in residential buildings.			
Sector:	Private households (PHH)	Region:	Germany (total)	
Target group:	Homeowners	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	KfW	Activity:	67,000 residential units funded per annum on average (1996–2006)	
Methodological information:				
Method:	Formula F2.5.5.4	Evaluation:		
Sources/references:	KfW 2010; BEI et al. 2007–2009; BMVBS/BBSR 2009			

<b>M 05: KfW CO<sub>2</sub> reduction</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 1999	End: 2004	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	13.9 PJ	13.9 PJ	–	–
Conversion factor for electricity=2.5	15.3 PJ	15.3 PJ	–	–
Focus of the measure:				
Activities associated with the measure:	Low-interest long-term financing of CO <sub>2</sub> reduction measures in residential buildings.			
Sector:	Private households (PHH)	Region:	Germany (total)	
Target group:	Homeowners	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	KfW	Activity:	6.3m m <sup>2</sup> of redeveloped residential surface area per annum on average (1996 – 2004)	
Methodological information:				
Method:	Formula F2.5.5.4	Evaluation:		
Sources/references:	Prognos/Institute of Economic Structures Research (GWS) 2009			

<b>M 06: KfW Housing Modernisation Programme – Eco Plus (CO<sub>2</sub> Building Redevelopment Programme)</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 2005	End: 2009	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	12.7 PJ	8.3 PJ	4.4 PJ	4.4 PJ
Conversion factor for electricity=2.5	14.2 PJ	9.3 PJ	4.9 PJ	4.9 PJ
Focus of the measure:				
Activities associated with the measure:	Low-interest long-term financing of CO <sub>2</sub> reduction measures.			
Sector:	Private households (PHH)	Region:	Germany (total)	
Target group:	Homeowners	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	KfW	Activity:	€627m of loan commitments per annum on average (2005 – 2009)	
Methodological information:				
Method:	Formulae F2.5.5.1, F2.5.5.5, F2.5.5.8 and F2.5.5.9	Evaluation:		
Sources/references:	KfW 2010; BBSR 2007			

<b>M 07: KfW's Housing Modernisation Programme II</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 2000	End: 2002	Amendment:	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	4.2 PJ	4.2 PJ	–	–
Conversion factor for electricity=2.5	4.7 PJ	4.7 PJ	–	–
Focus of the measure:				
Activities associated with the measure:	Low-interest long-term financing of CO <sub>2</sub> reduction measures in residential buildings.			
Sector:	Private households (PHH)	Region:	Mecklenburg–Western Pomerania, Brandenburg, Saxony-Anhalt, Berlin, Saxony, Thuringia	
Target group:	Homeowners	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	KfW	Activity:	Funding volume of €4bn (2000–2002)	
Methodological information:				
Method:	External evaluation	Evaluation:		
Sources/references:	Prognos/GWS 2009			

<b>M 08: KfW's Housing Modernisation Programme 2003</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 2003	End: 2004	Amendment:	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	1.2 PJ	1.2 PJ	–	–
Conversion factor for electricity=2.5	1.3 PJ	1.3 PJ	–	–
Focus of the measure:				
Activities associated with the measure:	Low-interest long-term financing of CO <sub>2</sub> reduction measures in residential buildings.			
Sector:	Private households (PHH)	Region:	Germany (total)	
Target group:	Homeowners	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	KfW	Activity:	Funding volume €4bn (2003-2004)	
Methodological information:				
Method:	External evaluation	Evaluation:		
Sources/references:	Prognos/GWS 2009			

<b>M 09: KfW Energy-efficient Construction</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 2009	End: not planned	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	6.9 PJ	–	1.7 PJ	6.9 PJ
Conversion factor for electricity=2.5	7.6 PJ	–	1.9 PJ	7.6 PJ
Focus of the measure:				
Activities associated with the measure:	Low-interest long-term financing of construction and acquisition of residential buildings which exceed the requirements of the Energy Saving Ordinance (EnEV).			
Sector:	Private households (PHH)	Region:	Germany (total)	
Target group:	Construction project sponsors/ property developers of new buildings	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	KfW	Activity:	55,000 (2009) and 84,000 (2010) residential units funded	
Methodological information:				
Method:	Formula F2.5.5.7	Evaluation:		
Sources/references:	KfW 2010; Federal Statistical Office (TS5, S1-Z2006); Prognos model; techem 2009			

<b>M 10: KfW Ecological Construction</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 2005	End: 2009	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	1.5 PJ	0.8 PJ	0.7 PJ	0.7 PJ
Conversion factor for electricity=2.5	1.6 PJ	0.9 PJ	0.8 PJ	0.8 PJ
Focus of the measure:				
Activities associated with the measure:	Low-interest long-term financing of construction and acquisition of residential buildings which exceed the requirements of the Energy Saving Ordinance (EnEV).			
Sector:	Private households (PHH)	Region:	Germany (total)	
Target group:	Construction project sponsors/ property developers of new buildings	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	KfW	Activity:	36,000 residential units funded per annum on average (2005 – 2009)	
Methodological information:				
Method:	Formula F2.5.5.7	Evaluation:		
Sources/references:	KfW 2010; Federal Statistical Office (TS5, S1-Z2006); Prognos model; techem 2009			

<b>M 11: Market Incentive Programme for Promotion of the Use of Renewable Energies (MAP) – BAFA component</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 1999	End: not planned	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	39.9 PJ	9.9 PJ	10.4 PJ	30.0 PJ
Conversion factor for electricity=2.5	44.4 PJ	10.9 PJ	11.6 PJ	33.4 PJ
Focus of the measure:				
Activities associated with the measure:	Funding of (1) efficient heat pumps, (2) combination bonus with solar collector system installed simultaneously and (3) especially innovative heat pumps (up to 2009), and (4) solar energy installations up to 40m <sup>2</sup> gross collector surface.			
Sector:	Cross-section (CS)	Region:	Germany (total)	
Target group:	Building owners and property developers	Application:	Technical building equipment (TBE)	
Sponsor of measure:	Federal Office of Economics and Export Control (BAFA)	Activity:	Funding volume 2009: €102.1m; on average (1999–2009) 787,000 m <sup>2</sup> of funded collector surface and (2008–2009) 4 million m <sup>2</sup> residential-/usable surface area supplied with geothermal energy	
Methodological information:				
Method:	Formulae F2.5.5.1 and F2.5.5.8	Evaluation:		
Sources/references:	BAFA 2010; German Aerospace Center (DLR) et al. 2009			

<b>M 12: KfW Market Incentive Programme for Promotion of the Use of Renewable Energies (MIP) – KfW component</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 2007	End: 2009	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	0.1 PJ	0.01 PJ	0.04 PJ	0.11 PJ
Conversion factor for electricity=2.5	0.1 PJ	0.01 PJ	0.04 PJ	0.12 PJ
Focus of the measure:				
Activities associated with the measure:	Low-interest long-term financing.			
Sector:	Cross-section (CS)	Region:	Germany (total)	
Target group:	Building owners and property developers	Application:	Technical building equipment (TBE)	
Sponsor of measure:	KfW	Activity:		
Methodological information:				
Method:	External evaluation	Evaluation:	ZSW	
Sources/references:	KfW 2010; ZSW 2008-2010			

<b>M 13: Federal states' activities in the buildings sector</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 1995	End:	Amendment:	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	6.2 PJ	1.2 PJ	1.8 PJ	5.0 PJ
Conversion factor for electricity=2.5	6.9 PJ	1.4 PJ	1.9 PJ	5.6 PJ
Focus of the measure:				
Activities associated with the measure:				
Sector:	Industry (IND); trade, retail and services (TRS); private households (PHH)	Region:	Germany (total)	
Target group:	Various, including social residential property construction	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	Various	Activity:		
Methodological information:				
Method:	External evaluation	Evaluation:		
Sources/references:	Prognos/DIFU 2011			

<b>M 14: BAFA On-site Consultation</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Information, motivation, communication	Start: 1998	End: not planned	Amendment:	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	2.3 PJ	0.5 PJ	0.6 PJ	1.8 PJ
Conversion factor for electricity=2.5	2.6 PJ	0.6 PJ	0.7 PJ	2.0 PJ
Focus of the measure:				
Activities associated with the measure:	Survey of the residential building, in particular of structural thermal insulation and heat generation, optionally by means of thermography or blower-door tests, together with submission of useful redevelopment proposals.			
Sector:	Private households (PHH)	Region:	Germany (total)	
Target group:	Homeowners	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	Federal Office of Economics and Export Control (BAFA)	Activity:	On average (2000–2009) 12,000 consultations per annum	
Methodological information:				
Method:	Formula F2.5.5.6	Evaluation:	ifeu/emnid 2008	
Sources/ references:	ifeu/emnid 2008			

### 4.3. Appliances and lighting

<b>M 27: Energy-using Products Act (EBPG): Implementing measure on electric motors</b>				
Regulatory law	In force since: 2009 Standards from: 2011	End: not planned		
Final energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	<b>10.5 PJ</b>	–	0.1 PJ	10.5 PJ
Conversion factor for electricity=2.5	<b>26.2 PJ</b>	–	0.2 PJ	26.2 PJ
Focus of the measure:				
Activities associated with the measure:				
Sector:	Cross-section (CS), focal point trade and industry	Region:	Germany (total)	
Target group:		Application:	Electric motors	
Sponsor of measure:	Federal Institute for Materials Research and Testing (BAM)	Activity:		
Methodological information:				
Method:	Inventory model	Evaluation:		
Sources/references:	<p>Calculations: Fraunhofer ISI 2011</p> <p>Methodological approach:</p> <ul style="list-style-type: none"> <li>→ Inventory model of shift in market shares of the efficiency categories (IE1-IE4) in two scenarios (BAU-baseline and eco-design minimum standards). Breakdown into three size categories. Shares of the size categories from Almeida et al. (2001).</li> <li>→ Savings calculated at average efficiency of the respective size category at full capacity.</li> <li>→ The annual savings are the difference between the scenarios.</li> <li>→ Only motors in trade and industry are taken into account (motors in households are excluded from the implementing measure).</li> <li>→ Assumption: in BAU the market share of the IE2 motors increases from 18 % (2009) to 24 % (2020).</li> <li>→ Assumption: share of motor current consumption for industry 69% and TRS 22 %, of which 90% alternating current motors.</li> <li>→ Variable-speed drive units (VSD) from 2015/2017 calculated on the basis of the EU Impact Assessment on typical savings with important motor systems (pumps, fans, refrigeration, compressed air, etc.).</li> <li>→ Assumption: IE3 motors only in 40% of all motors on the market from 2017, remainder IE2+VSD.</li> <li>→ The first minimum standard is planned for 2011, with shifts in the market compared to the baseline only occurring as of 2010. Prior to that the implementing measure has no impact.</li> <li>→ For model-related reasons the lifetimes for electric motors implemented in the model were used for calculation of the savings, though these could differ from the figures recommended by the European Commission.</li> </ul>			

<b>M 28: Energy-using Products Act (EBPG): Implementing measures in respect of electrical appliances in private households</b>				
Regulatory law	In force since: 2009	End: not planned		
<b>Final energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	16.4 PJ	-	3.5 PJ	16.4 PJ
Conversion factor for electricity=2.5	41.0 PJ	-	8.8 PJ	41.0 PJ
Focus of the measure:				
Activities associated with the measure:				
Sector:	Private households	Region:	Germany (total)	
Target group:	Manufacturers	Application:	Electrical appliances	
Sponsor of measure:	Federal Institute for Materials Research and Testing (BAM)	Activity:		
Methodological information:				
Method:	Inventory model	Evaluation:		
Sources/references:	<p>Calculations: Fraunhofer ISI 2011, based on Schmidt-Sercander 2010.</p> <p>Methodological approach:</p> <ul style="list-style-type: none"> <li>→ Inventory model which portrays electricity consumption at the level of individual product groups.</li> <li>→ Model parameters: Number of households, penetration rates of the appliances, shares of the label categories, average product life cycle, specific power consumption per appliance, frequency of use.</li> <li>→ Impact assessment based on the following scenarios:                             <ul style="list-style-type: none"> <li>- Business as usual (BAU) scenario: No change to the political measures after 2007, but continuation of the existing effect of these measures and autonomous technical progress.</li> <li>- LABEL scenario: Consideration of the effects of the revised EU Energy Labelling Directive (Directive 2010/30/EC).</li> <li>- ECO-DESIGN scenario: LABEL scenario initially included in calculation. In addition minimum standards pursuant to Eco-design Directive from existing implementing measures taken into account (LLCC version).</li> </ul> </li> <li>→ The annual savings in the LABEL und ECO-DESIGN scenarios are calculated as the difference compared to the BAU scenario. The isolated impact of the Eco-design Directive is derived from the difference between the LABEL and ECO-DESIGN scenarios.</li> </ul>			

<b>M 29: Energy-using Products Act (EBPG): implementing measures for electrical appliances in the TRS sector</b>				
Regulatory law	In force since: 2009		End: not planned	
Final energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	10.5 PJ	–	0.0	10.5 PJ
Conversion factor for electricity=2.5	26.3 PJ	–	0.0	26.3 PJ
Focus of the measure:				
Activities associated with the measure:				
Sector:	TRS	Region:	Germany (total)	
Target group:	Manufacturers	Application:	Electrical appliances	
Sponsor of measure:	Federal Institute for Materials Research and Testing (BAM)		Activity:	
Methodological information:				
Method:	Inventory model	Evaluation:		
Sources/references:	<p>Calculations: Fraunhofer ISI 2011, based on Schmidt-Sercander 2010.</p> <p>Methodological approach:</p> <ul style="list-style-type: none"> <li>→ Inventory model which portrays electricity consumption at the level of individual product groups.</li> <li>→ Model parameters: product-specific activity (e.g. employees), penetration rates of the appliances, average product life cycle, specific power consumption per appliance, frequency of use.</li> <li>→ Impact assessment based on the following scenarios: <ul style="list-style-type: none"> <li>– Business as usual (BAU) scenario: no change to the political measures after 2007, but continuation of the existing effect of these measures and autonomous technical progress.</li> <li>– ECO-DESIGN scenario: minimum standards pursuant to Eco-design Directive from existing implementing measures taken into account (LLCC version).</li> </ul> </li> <li>→ The annual saving in the ECO-DESIGN scenario is calculated as the difference compared to the BAU scenario.</li> <li>→ For model-related reasons the lifetimes for the appliances under review implemented in the model were used for calculation of the savings, though these could differ from the figures recommended by the European Commission.</li> <li>→ Energy savings with additional domestic appliances used in the TRS sector for which an implementing measure already exists could not be used due to a lack of data availability.</li> </ul>			

<b>M 30: Energy Consumption Labelling Ordinance (EnVKV) (historical)</b>				
Information, motivation, communication	Start: 1998	End: not planned	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	8.3 PJ	7.3 PJ	1.0 PJ	3.4 PJ
Conversion factor for electricity=2.5	20.9 PJ	18.3 PJ	2.6 PJ	8.4 PJ
Focus of the measure:				
Activities associated with the measure:				
Sector:	Cross-section (CS)	Region:	Germany (total)	
Target group:	End-users	Application:	Appliances (white goods: large domestic appliances) (LDA), lighting (L)	
Sponsor of measure:		Activity:		
Methodological information:				
Method:	Formula F2.5.5.2	Evaluation:		
Sources/references: GfK market research agency 2010				

<b>M 31: Energy Consumption Labelling Ordinance (EnVKV): delegated ordinances on electrical appliances in private households</b>				
Information, motivation, communication	In force since: 2010	End: not planned		
Final energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	1.8 PJ	–	0.1 PJ	1.8 PJ
Conversion factor for electricity=2.5	4.6 PJ	–	0.3 PJ	4.6 PJ
Focus of the measure:				
Activities associated with the measure:				
Sector:	Private households	Region:	Germany (total)	
Target group:	Buyers, sellers	Application:	Electrical appliances	
Sponsor of measure:		Activity:		
Methodological information:				
Method:	Inventory model	Evaluation:		

Sources/references:	Calculations: Fraunhofer ISI 2011, based on Schmidt-Sercander 2010.
	Methodological approach:
	→ Inventory model which portrays electricity consumption at the level of individual product groups.
	→ Model parameters: Number of households, penetration rates of the appliances, shares of the label categories, average product life cycle, specific power consumption per appliance, frequency of use.
	→ Impact assessment based on the following scenarios:
	– Business as usual (BAU) scenario: no change to the political measures after 2007, but continuation of the existing effect of these measures and autonomous technical progress.
	– LABEL scenario: Consideration of the effects of the revised EU Energy Labelling Directive (Directive 2010/30/EC).
	– ECO-DESIGN scenario: LABEL scenario initially included in calculation. In addition minimum standards pursuant to Eco-design Directive from existing implementing measures taken into account (LLCC version).
	→ The annual saving in the LABEL scenario is calculated as the difference compared to the BAU scenario.
	→ For model-related reasons the lifetimes for the appliances under review implemented in the model were used for calculation of the savings, though these could differ from the figures recommended by the European Commission.

<b>M 32: Energy counselling in consumer advice centres</b>					
Information, motivation, communication		Start: 1978	End: not planned	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)	
Conversion factor for electricity=1	2.3 PJ	0.9 PJ	0.5 PJ	1.4 PJ	
Conversion factor for electricity=2.5	2.9 PJ	1.1 PJ	0.6 PJ	1.8 PJ	
Focus of the measure:					
Activities associated with the measure:					
Sector:	Private households (PHH)	Region:	Germany (total)		
Target group:	End-users	Application:	Cladding (C), technical building equipment (TBE), lighting (L), large domestic appliances (LDA), home electronics (HE), information and communication devices (ICD)		
Sponsor of measure:		Activity:	Average (1999-2010) 56,000 consultations per annum		
Methodological information:					
Method:	Formula F2.5.5.6	Evaluation:			
Sources/references:	Federation of German Consumer Organisations (vzbv) 2010; ifeu 2005				

#### 4.4. Trade and industry

<b>M 36: KfW Environmental Programme, ERP predecessor programmes</b>				
Funding	Start: 2003	End: 2009	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	5.1 PJ	3.8 PJ	1.3 PJ	1.3 PJ
Conversion factor for electricity=2.5	7.7 PJ	5.7 PJ	1.9 PJ	1.9 PJ
Focus of the measure:				
Activities associated with the measure:	Low-interest long-term financing including energy efficiency measures in the commercial sector.			
Sector:	Industry (IND); trade, retail, services (TRS)	Region:	Germany (total)	
Target group:		Application:	Cladding (C), technical building equipment (TBE), centre-based drive units (CDU), thermal cross-sectional technologies (TCT), processes (PRO)	
Sponsor of measure:	KfW	Activity:	On average (2003-2009) €395m of loan commitments related to energy efficiency	
Methodological information:				
Method:	External evaluation	Evaluation:		
Sources/references:	KfW 2010			

<b>M 37: ERP Environmental Protection and Energy Efficiency Programme B</b>				
Funding	Start: 2009	End: not planned	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	9.5 PJ	–	2.9 PJ	9.5 PJ
Conversion factor for electricity=2.5	14.2 PJ	–	4.4 PJ	14.2 PJ
Focus of the measure:				
Activities associated with the measure:	Low-interest long-term financing including energy efficiency measures in the commercial sector.			
Sector:	Industry (IND); trade, retail, services (TRS)	Region:	Germany (total)	
Target group:	Small and medium-sized companies (SMEs)	Application:	Cladding (C), technical building equipment (TBE), centre-based drive units (CDU), thermal cross-sectional technologies (TCT), processes (PRO)	

Sponsor of measure:	KfW	Activity:	€354m of loan commitments related to energy efficiency (2009)
Methodological information:			
Method:	External evaluation	Evaluation:	
Sources/references:	KfW 2010		

<b>M 38: ERP Environmental Protection and Energy Efficiency Programme A</b>				
Funding	Start: 2009	End: not planned	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	5.7 PJ	–	1.4 PJ	5.7 PJ
Conversion factor for electricity=2.5	8.5 PJ	–	2.1 PJ	8.5 PJ
Focus of the measure:				
Activities associated with the measure:	Low-interest long-term financing including energy efficiency measures in the commercial sector.			
Sector:	Industry (IND); trade, retail, services (TRS)	Region:	Germany (total)	
Target group:	Cross-section; until the end of 2011. Focal point retail	Application:	Cladding (C), technical building equipment (TBE), centre-based drive units (CDU), thermal cross-sectional technologies (TCT), processes (PRO)	
Sponsor of measure:	KfW	Activity:	€249m of loan commitments related to energy efficiency (2009)	
Methodological information:				
Method:	External evaluation	Evaluation:		
Sources/references:	KfW 2010			

<b>M 39: Stimulus programme for funding climate protection measures for commercial refrigeration facilities</b>				
Funding	Start: 2008	End:	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	0.1 PJ	–	0.1	0.1 PJ
Conversion factor for electricity=2.5	0.3 PJ	–	0.3	0.3 PJ
Focus of the measure:				
Activities associated with the measure:	Subsidisation of the investments 15 – 25 %, subsidisation of the counselling up to 75 % (max. €1,300).			
Sector:	Industry (IND); trade, retail, services (TRS)	Region:	Germany (total)	

<b>M 39: Stimulus programme for funding climate protection measures for commercial refrigeration facilities</b>			
Target group:	Companies with refrigeration and air conditioning systems used in commercial and industrial applications with annual consumption in excess of 150 GWh/a	Application:	Thermal cross-sectional technologies (TCT)
Sponsor of measure:	BAFA	Activity:	On average (Sep 2008 – Apr 2010) €6.1m investment subsidy
Methodological information:			
Method:	External evaluation	Evaluation:	Öko-Institut et al.
Sources/references:	Öko-Institut et al. 2010		

<b>M 40: Voluntary agreements between German industry and the federal government designed to increase energy savings and reduce CO<sub>2</sub> emissions</b>				
Self-imposed commitment	Start: 1995	End: 2012	Amendment: New self-imposed commitment for the period after 2012	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	37.8 PJ	36.6 PJ	-5.8 PJ	1.2 PJ
Conversion factor for electricity=2.5	48.3 PJ	47.9 PJ	-14.2 PJ	0.3 PJ
Focus of the measure:				
Activities associated with the measure:				
Sector:	Industry (IND)	Region:	Germany (total)	
Target group:	15 industrial sectors	Application:	Cladding (C), technical building equipment (TBE), centre-based drive units (CDU), thermal cross-sectional technologies (TCT), processes (PRO)	
Sponsor of measure:	Activity:			
Methodological information:				
Method:	External evaluation	Evaluation:		
Sources/references:	RWI 2008-2010a; Prognos 2008			

<b>M 41: KfW Special Fund for Energy Efficiency in SMEs</b>				
Information, motivation, communication	Start: 2008	End: not planned	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	9.3 PJ	–	3.1 PJ	9.3 PJ
Conversion factor for electricity=2.5	13.9 PJ	–	4.7 PJ	13.9 PJ
Focus of the measure:				
Activities associated with the measure:	One- to two-day initial consultation, detailed consultation of up to ten days.			
Sector:	Industry (IND); trade, retail, services (TRS)	Region:	Germany (total)	
Target group:	Small and medium-sized companies (SMEs)	Application:	Cladding (C), technical building equipment (TBE), centre-based drive units (CDU), thermal cross-sectional technologies (TCT), processes (PRO)	
Sponsor of measure:	KfW	Activity:	On average (2008–2010) 672 detailed consultations and 2,800 initial consultations per annum	
Methodological information:				
Method:	External evaluation	Evaluation:	IREES; FhISI	
Sources/references:	IREES/Fraunhofer ISI 2010			

#### 4.5. Transport and mobility

<b>M 49: The German federal government's fuel strategy</b>				
Regulatory law	Start: 2004	End: 2020	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	21.8 PJ	14.7 PJ	2.4 PJ	7.1 PJ
Conversion factor for electricity=2.5	21.8 PJ	14.7 PJ	2.4 PJ	7.1 PJ
Focus of the measure:				
Activities associated with the measure:				
Sector:	Transport and mobility (TRANS)	Region:	Germany (total)	
Target group:		Application:	Mobile drive units (MDU)	
Sponsor of measure:	BMVBS	Activity:		

<b>M 49: The German federal government's fuel strategy</b>			
Methodological information:			
Method:	External evaluation	Evaluation:	IREES; FhISI
Sources/references:	BPA 2004; BMVBS 2004; Prognos 2008		

<b>M 50: Motor vehicle tax</b>				
Fiscal	Start: 1985	End: not planned	Amendment: since 1985 three pollutant classes, from 1997 six pollutant classes. Since 2009 CO <sub>2</sub> emissions-dependent component	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	30.4 PJ	14.7 PJ	4.0 PJ	15.7 PJ
Conversion factor for electricity=2.5	30.4 PJ	14.7 PJ	4.0 PJ	15.7 PJ
Focus of the measure:				
Activities associated with the measure:	Taxation according to pollutant class.			
Sector:	Transport and mobility (TRANS)	Region:	Germany (total)	
Target group:	Passenger vehicles, mobile homes, cars of more than 3.5 tonnes admissible total weight	Application:	Mobile drive units (MDU)	
Sponsor of measure:	Federal Ministry of Finance (BMF)	Activity:		
Methodological information:				
Method:	External evaluation	Evaluation:	IREES; FhISI	
Sources/references:	Prognos 2008; Motor Vehicle Tax Act (KraftStG) 2009			

<b>M 51: Heavy goods vehicle toll</b>				
Fiscal	Start: 2005	End: not planned	Amendment:	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	5.0 PJ	4.5 PJ	5.2 PJ	5.2 PJ
Conversion factor for electricity=2.5	5.0 PJ	4.5 PJ	5.2 PJ	5.2 PJ
Focus of the measure:				
Activities associated with the measure:	Consumption- and pollutant-linked tax.			

<b>M 51: Heavy goods vehicle toll</b>			
Sector:	Transport and mobility (TRANS)	Region:	Germany (total)
Target group:	Heavy commercial vehicles	Application:	Mobile drive units (MDU)
Sponsor of measure:	TollCollect	Activity:	
Methodological information:			
Method:	Formula F2.5.5.10	Evaluation:	
Sources/references:	Federal Freight Transport, Logistics and Waste Management Association (BGL) 2009; Federal Office of Goods Transport (BAG) 2010		

<b>M 52: Environmental bonus</b>				
Funding	Start: 2009	End: 2009	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	4.0 PJ	–	4.3 PJ	4.0 PJ
Conversion factor for electricity=2.5	4.0 PJ	–	4.3 PJ	4.0 PJ
Focus of the measure:				
Activities associated with the measure:				
Sector:	Transport and mobility (TRANS)	Region:	Germany (total)	
Target group:	Motorised private transport	Application:	Mobile drive units (MDU)	
Sponsor of measure:	BAFA	Activity:	780,000 newly registered energy- efficient vehicles under the Programme	
Methodological information:				
Method:	External evaluation	Evaluation:		
Sources/references:	ifeu 2009			

<b>M 53: Voluntary agreement of the German automotive industry</b>				
Self-imposed commitment	Start: 1995	End: 2008	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	22.0 PJ	22.0 PJ		
Conversion factor for electricity=2.5	22.0 PJ	22.0 PJ		
Focus of the measure:				
Activities associated with the measure:				
Sector:	Transport and mobility (TRANS)	Region:	Germany (total)	
Target group:	Motorised private transport	Application:	Mobile drive units (MDU)	
Sponsor of measure:		Activity:		

<b>M 53: Voluntary agreement of the German automotive industry</b>		
Methodological information:		
Method:	External evaluation	Evaluation:
Sources/references: Prognos 2008; Prognos/GWS 2009		

<b>M 54: Activities of Deutsche Bahn</b>				
Self-imposed commitment	Start: 2006	End:	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	<b>6.0 PJ</b>	3.5 PJ	0.9 PJ	2.6 PJ
Conversion factor for electricity=2.5	<b>11.7 PJ</b>	6.7 PJ	1.7 PJ	5.0 PJ
Focus of the measure:				
Activities associated with the measure:				
Sector:	Transport and mobility (TRANS)	Region:	Germany (total)	
Target group:	Deutsche Bahn AG, passenger transport, transport and logistics, infrastructure and technology business areas	Application:	Mobile drive units (MDU)	
Sponsor of measure:	Deutsche Bahn AG	Activity:		
Methodological information:				
Method:	Approach based on energy intensity	Evaluation:		
Sources/references: DB 2011				

#### 4.6. Horizontal measures

<b>M 67: Ecological Tax Reform</b>				
Fiscal	Start: 1999	End: 2003	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	<b>96.3 PJ</b>	103.2 PJ	89.1 PJ	89.5 PJ
Conversion factor for electricity=2.5	<b>120.3 PJ</b>	129.6 PJ	110.6 PJ	111.0 PJ
Focus of the measure:				
Activities associated with the measure:	Volume-related tax on fuels and electricity.			
Sector:	Cross-section (CS)	Region:	Germany (total)	

<b>M 67: Ecological Tax Reform</b>			
Target group:	End-users	Application:	Cladding (C), technical building equipment (heating, ventilation, air-conditioning) (TBE), lighting (L), appliances (white goods: large domestic appliances) (LDA), appliances (brown goods: home electronics) (HE), devices (grey goods: information and communication)
Sponsor of measure:		Activity:	
Methodological information:			
Method:	Formula F2.5.5.10	Evaluation:	
Sources/references:	Prognos/GWS 2009		

#### 4.7. Public sector

<b>M 76: Future Investments Act (ZuInvG)</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 2009	End: 2011	Amendment:	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	<b>7.7 PJ</b>	–	4.5 PJ	7.7 PJ
Conversion factor for electricity=2.5	<b>9.0 PJ</b>	–	5.3 PJ	9.0 PJ
Focus of the measure:				
Activities associated with the measure:	Measures for the improvement of the social infrastructure, including energy-efficient upgrading of buildings.			
Sector:	Public sector	Region:	Germany (total)	
Target group:	Municipalities (ÖHKO), federal states (ÖHST)	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	As a rule the finance ministries of the German federal states	Activity:	€13.3bn total investment for period from 2009 to 2011	
Methodological information:				
Method:	Formulae F2.5.5.1, F2.5.5.3, F2.5.5.5 and F2.5.5.11 (external evaluation)	Evaluation:	Federal Ministry of Finance	
Sources/references:	Prognos/DIFU 2011			

<b>M 77: Energy Savings Programme for Federal Government Properties (€120m Programme)</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 2006	End: 2010	Amendment Extension from 2011 budgetary year intended	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	1.7 PJ	0.2 PJ	0.8 PJ	1.5 PJ
Conversion factor for electricity=2.5	2.0 PJ	0.2 PJ	0.9 PJ	1.8 PJ
Focus of the measure:				
Activities associated with the measure:	Funding of construction measures on buildings directly and indirectly belonging to the federal administration, (1) individual measures and packages of measures for which the requirements of the EnEV are exceeded by a wide margin (thermal insulation, solar protection, heating/air conditioning systems, central district heating plants, and renewable energies), (2) measures for the achievement of target values which exceed the primary energy requirement of new buildings by not more than 10%.			
Sector:	Public sector	Region:	Germany (total)	
Target group:	Federal government (ÖHMS)	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	German Federal Ministry of Transport, Building and Urban Development (BMVBS)	Activity:	Funding of €120m per annum	
Methodological information:				
Method:	External evaluation	Evaluation:	German Federal Office for Building and Regional Planning (BBR), Institute for the Preservation and Modernisation of Buildings (IEMB)	
Sources/references:	BBSR 2010; Prognos/DIFU 2011			

<b>M 78: Activities of the federal states in the public sector</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 1995	End:	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	2.2 PJ	0.3 PJ	0.8 PJ	1.9 PJ
Conversion factor for electricity=2.5	2.5 PJ	0.3 PJ	0.9 PJ	2.2 PJ
Focus of the measure:				
Activities associated with the measure:				
Sector:	Public sector (ÖH)	Region:	Germany (total)	

<b>M 78: Activities of the federal states in the public sector</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>	
Target group:		Application:	Cladding (C), technical building equipment (TBE)
Sponsor of measure:	Various	Activity:	
Methodological information:			
Method:	Various (external evaluation)	Evaluation:	
Sources/references:	Prognos/DIFU 2011		

<b>M 79: Energy-efficient modernisation of the social infrastructure</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 2008	End: 2009	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	1.3 PJ	–	1.3 PJ	1.3 PJ
Conversion factor for electricity=2.5	1.7 PJ	–	1.7 PJ	1.7 PJ
Focus of the measure:				
Activities associated with the measure:	Redevelopment of buildings in the social infrastructure needing energy-related improvement in areas of urban development funding or in municipalities/districts with budget protection concept.			
Sector:	Public sector	Region:	Germany (total)	
Target group:	Municipalities (ÖHKO), with special consideration of municipalities in a budget crisis	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:		Activity:	On average (2008–2009) 1 million m <sup>2</sup> redeveloped usable surface area per annum	
Methodological information:				
Method:	Formula F2.5.5.4 (external evaluation)	Evaluation:	German Federal Ministry of Transport, Building and Urban Development	
Sources/references:	BMVBS 2010; Prognos/DIFU 2011			

<b>M 80: KfW Energy-efficient Redevelopment – Municipalities</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 2009	End: not planned	Amendment:	
Energy saving	Total (1995–2016)	Early action (1995–2007)	Current period (2008–2010)	Forecast (2008–2016)
Conversion factor for electricity=1	1.8 PJ	–	0.5 PJ	1.8 PJ
Conversion factor for electricity=2.5	2.1 PJ	–	0.5 PJ	2.1 PJ

<b>M 80: KfW Energy-efficient Redevelopment – Municipalities</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>	
Focus of the measure:			
Activities associated with the measure:	Low-interest long-term financing of CO <sub>2</sub> reduction measures. Programme component A: Redevelopment at new construction level. Programme component B: Packages of measures (heat insulation external walls/roofs/cellars, heating, lighting, windows).		
Sector:	Public sector	Region:	Germany (total)
Target group:	Municipalities (ÖHKO), with special consideration of regional funding areas	Application:	Cladding (C), technical building equipment (TBE)
Sponsor of measure:	KfW	Activity:	119 redevelopments at new construction level (2009) in Part A of the Programme and a €20.9m loan commitment for energy-efficient redevelopment in Part B
Methodological information:			
Method:	Formulae F2.5.5.1, F2.5.5.3, F2.5.5.4, F2.5.5.5 and F2.5.5.9 (external evaluation)	Evaluation:	
Sources/references:	KfW 2010; Prognos/DIFU 2011		

<b>M 81: KfW Municipal Loans – Energy-efficient Building Redevelopment</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 2007	End: 2009	Amendment:	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	0.4 PJ	0.1 PJ	0.3 PJ	0.3 PJ
Conversion factor for electricity=2.5	0.4 PJ	0.1 PJ	0.3 PJ	0.3 PJ
Focus of the measure:				
Activities associated with the measure:	Low-interest long-term financing of CO <sub>2</sub> reduction measures. Programme component A: Redevelopment at new construction level. Programme component B: Packages of measures (heat insulation external walls/roofs/cellars, heating, lighting, windows).			
Sector:	Public sector	Region:	Germany (total)	
Target group:	Municipalities (ÖHKO)	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	KfW	Activity:	On average (2007–2009) 41 redevelopments at new construction level (2009) in Part A of the Programme and a €15.6m loan commitment for energy-efficient redevelopment in Part B	

Methodological information:		
Method:	Formulae F2.5.5.1, F2.5.5.3, F2.5.5.4, F2.5.5.5 and F2.5.5.9 (external evaluation)	Evaluation:
Sources/references:	KfW 2010; Prognos/DIFU 2011	

<b>M 82: KfW Social Investment – Energy-efficient Building Redevelopment (CO<sub>2</sub> Building Redevelopment Programme)</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Funding	Start: 2007	End: not planned	Amendment:	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	<b>0.5 PJ</b>	0.0 PJ	0.2 PJ	0.5 PJ
Conversion factor for electricity=2.5	<b>0.6 PJ</b>	0.0 PJ	0.2 PJ	0.6 PJ
Focus of the measure:				
Activities associated with the measure:	Low-interest long-term financing of CO <sub>2</sub> reduction measures. Programme component A: Redevelopment at new construction level. Programme component B: Packages of measures (heat insulation external walls/roofs/cellars, heating, lighting, windows).			
Sector:	Trade, retail and services (TRS)	Region:	Germany (total)	
Target group:	Non-profit-making private sponsors of social institutions, including churches	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	KfW	Activity:	On average (2007-2009) 19 redevelopments at new construction level in Part A of the Programme and a €4.3m loan commitment for energy-efficient redevelopment in Part B	
Methodological information:				
Method:	Formulae F2.5.5.1, F2.5.5.3, F2.5.5.4, F2.5.5.5 and F2.5.5.9 (external evaluation)	Evaluation:		
Sources/references:	KfW 2010; Prognos/DIFU 2011			

<b>M 83: Green IT Initiative of the federal government</b>				
Information, motivation, communication	Start: 2008	End: not planned	Amendment:	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	<b>1.0 PJ</b>	0.1 PJ	0.3 PJ	0.9 PJ
Conversion factor for electricity=2.5	<b>2.4 PJ</b>	0.3 PJ	0.8 PJ	1.8 PJ

<b>M 83: Green IT Initiative of the federal government</b>			
Focus of the measure:			
Activities associated with the measure:			
Sector:	Public sector (ÖH)	Region:	Germany (total)
Target group:	Federal administration	Application:	Information and communication devices (ICD)
Sponsor of measure:	Federal Ministry of the Interior	Activity:	
Methodological information:			
Method:	External evaluation	Evaluation:	
Sources/references:	BMI 2010; Prognos 2011		

<b>M 84: mission E</b>				
Information, motivation, communication	Start: 2008	End: not planned	Amendment:	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	0.3 PJ	0.3 PJ	0.3 PJ	0.3 PJ
Conversion factor for electricity=2.5	0.5 PJ	0.4 PJ	0.5 PJ	0.5 PJ
Focus of the measure:				
Activities associated with the measure:				
Sector:	Public sector	Region:	Germany (total)	
Target group:	Federal government (ÖHMS)	Application:	Lighting (L), appliances (grey goods: information and communication) (ICT)	
Sponsor of measure:	North Rhine-Westphalia Energy Agency	Activity:		
Methodological information:				
Method:	External evaluation	Evaluation:	Federal Defence Administration (BAWV)	
Sources/references:	EA.NRW 2010; Prognos 2011			

<b>M 85: Contracting for federal government properties</b>		<b>Measure within the meaning of Art. 10, Para. 2 of the Buildings Directive</b>		
Information, motivation, communication	Start: 2002	End: not planned	Amendment:	
<b>Energy saving</b>	<b>Total (1995–2016)</b>	<b>Early action (1995–2007)</b>	<b>Current period (2008–2010)</b>	<b>Forecast (2008–2016)</b>
Conversion factor for electricity=1	<b>0.3 PJ</b>	0.1 PJ	0.1 PJ	0.2 PJ
Conversion factor for electricity=2.5	<b>0.3 PJ</b>	0.1 PJ	0.1 PJ	0.2 PJ
<b>Focus of the measure:</b>				
Activities associated with the measure:	Investment measures in buildings with contractual commitment to energy saving: (1) identification of suitable properties, (2) process support, (3) awarding of contracting agreements.			
Sector:	Public sector	Region:	Germany (total)	
Target group:	Federal government (ÖHMS)	Application:	Cladding (C), technical building equipment (TBE)	
Sponsor of measure:	German Energy Agency	Activity:	On average (2005 – 2009) €5m of investments initiated per annum	
<b>Methodological information:</b>				
Method:	On the basis of contractually guaranteed savings (external evaluation)	Evaluation:		
Sources/ references:	dena 2010; Prognos/DIFU 2011			

## 5. Bibliography

Abbreviation	Source reference
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AGEB 2007	Working Group on Energy Balances 2007: Final energy consumption of the military sector in Germany by energy source. 1990-2006.
AGEB/BDEW	WG Energy Balances, German Energy and Water Industry Association (BDEW): Final energy consumption in Germany by sector, energy source and area of application. 2008 and previous years. Estimates based on the evaluation results for the energy balances (in some cases internal information of WG Energy Balances).
Almeida et al. 2001	Almeida, A.T. et al. 2001: Improving the penetration of energy-efficient motors and drives (in cooperation with University of Coimbra/Department of Electrical Engineering; Electricité de France; ENEL [Italy]; ETSU [UK]; NESA [Denmark]; Fraunhofer ISI [Germany]).
BAFA 2010	Federal Office of Economics and Export Control (BAFA) 2010: Statistics on the Market Incentive Programme 2009 (unpublished data supply, as at: 8.10.2010).
BAFA 2010a	Federal Office of Economics and Export Control (BAFA) 2010: Directives on the funding of measures for the use of renewable energies in the heating market (as at: 9.7.2010).
BAG 2010	Federal Office of Goods Transport (BAG) 2010: Toll statistics. Annual tables 2007–2009.
BBSR 2010	Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) 2010: Evaluation of the energy savings programme for federal government properties. Eighth Sub-report (8.6.2006 to 1.4.2010) (unpublished).
BBSR 2007	Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) 2007: Energy Savings Programme for Federal Government Properties – Implementing Directives.
BEI et al. 2010	Bremen Energy Institute, Institute of Housing and the Environment (IWU), University of Bremen (Institute of Statistics) 2010: Effects of the funding measures in 2009 of the CO <sub>2</sub> Building Redevelopment Programme and of the “Energy-efficient Redevelopment” Programme.
BEI et al. 2009	Bremen Energy Institute, Institute of Housing and the Environment (IWU), University of Bremen (Institute of Statistics) 2009: Effects of the CO <sub>2</sub> Building Redevelopment Programme 2008.
BEI et al. 2008	Bremen Energy Institute, Institute of Housing and the Environment (IWU), University of Bremen (Institute of Statistics) 2008: Effects of the CO <sub>2</sub> Building Redevelopment Programme 2007.
BEI et al. 2007	Bremen Energy Institute, Institute of Housing and the Environment (IWU), University of Bremen (Institute of Statistics) 2007: Determination of the effects of the KfW CO <sub>2</sub> Building Redevelopment Programme. Development of the methodology and results from the 2005 and 2006 reporting periods.
BGL 2009	Federal Freight Haulage, Logistics and Waste Management Association (BGL) Development of heavy goods vehicle toll rates in Germany from 2005 to 2011.
BMI 2010	Federal Ministry of the Interior (BMI): Personal communication (by telephone) in the period May to October 2010 with Department IT2 in the BMI on key issues and results in the federal government’s Green IT section.
BMVBS 2010	Federal Ministry of Transport, Building and Urban Development 2010: Provisional assessment of the Investment Pact (unpublished data supply, as at: 11.11.2010).

Abbreviation	Source reference
BMVBS 2004	Federal Ministry of Transport, Building and Urban Development (BMVBS) 2004: Prospects for Germany. Our strategy for sustainable development. Progress report 2004.
BMVBS/BBSR 2009	Bremen Energy Institute, Prognos AG, energetic solutions, Arzt, C. 2009: Contracting in rental housing construction – 3rd progress report and final report.
BMVBS/DIW 2010	Federal Ministry of Transport, Building and Urban Development, German Institute of Economic Research: Transport in figures 2010/2011 (provisional data, as at: January 2011).
BMVBS/DIW 2009	Federal Ministry of Transport, Building and Urban Development, German Institute of Economic Research: Transport in figures 2009/2010.
BMVBS/DIW 2008	Federal Ministry of Transport, Building and Urban Development, German Institute of Economic Research: Transport in figures 2008/2009.
BPA 2004	Federal Press Office 2004: The fuel strategy – alternative fuels and innovative drive units.
CITL 2009	Community Independent Transaction Log: <a href="http://ec.europa.eu/environment/ets/">http://ec.europa.eu/environment/ets/</a>
DB 2011	Deutsche Bahn AG (DB Environmental Centre): Data on the DB project entitled “Save Energy Costs” (personal data supply in February 2011).
dena 2010	German Energy Agency: Overview of energy-saving contracting agreements in federal government properties (unpublished data supply of 21.7.2010).
DIW 2008	German Institute of Economic Research (DIW): Motor vehicle transport 2007: Alternative drive units for passenger vehicles on the rise. DIW Weekly Reports 50/2008, pp. 796 – 804.
DIW 2009	German Institute of Economic Research (DIW): Motor vehicle traffic for 2008 still high. DIW Weekly Reports 50/2009.
DLR et al. 2009	German Aerospace Center, Centre for Solar Energy and Hydrogen Research Baden-Württemberg, Technology and Support Centre in the Competence Centre for Renewable Resources, University of Stuttgart (Institute of Thermodynamics and Thermal Engineering), Solites - Steinbeis Research Institute for Solar and Sustainable Thermal Energy Systems, C.A.R.M.E.N. e.V., Potsdam 2009: Evaluation of individual measures for the use of renewable energies (market incentive programme) in the period from January 2007 to December 2008.
EA.NRW 2010	North Rhine-Westphalia Energy Agency 2010: Wake-up call for a sleeping giant. The long-term user motivation for reducing energy consumption. A practical guide to the interdisciplinary background to “mission E”, which is being implemented throughout the armed forces.
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Fraunhofer ISI 2011	Fraunhofer ISI 2011: Estimation of the effect of individual implementing measures under the EU Eco-design Directive (2009/125/EG) as well as delegated regulations under the revised EU Labelling Directive (2010/30/EG) in Germany by means of an inventory model.
Fraunhofer ISI 2006	Fraunhofer ISI 2006: Statistical-methodological questions in connection with the Directive on energy end-use efficiency and energy services.

Abbreviation	Source reference
Fraunhofer ISI et al. 2010	Fraunhofer ISI/TU Munich (Chair of Energy Economics and Applications Technology)/GfK market research agency 2010: Energy consumption of the trade, retail and services sector (TRS) for the period 2007 to 2010 (second unpublished intermediate report of 31.10.2010).
Fraunhofer ISI et al. 2009	Fraunhofer ISI/TU Munich (Chair of Energy Economics and Applications Technology)/GfK market research agency 2009: Energy consumption of the trade, retail and services sector (TRS).
FZJ 2005	Jülich Research Centre 2005: Evaluation of the CO <sub>2</sub> reduction measures in the buildings sector.
GfK 2010	GfK market research agency 2010: Assessment of sales of appliance categories according to energy label 2002-2008 (unpublished data supply, as at: 21.4.2010).
ifeu 2009	ifeu Institute of Energy and Environmental Research Heidelberg 2009: Motor vehicle scrappage bonus and the environment – an initial assessment.
ifeu 2005	ifeu Institute of Energy and Environmental Research Heidelberg 2005: Evaluation of the centre-based energy counselling of the consumer advice centres, of the German Housewives' Association in Lower Saxony, and of the consumer service department in Bavaria.
ifeu/emnid 2008	ifeu Institute of Energy and Environmental Research Heidelberg/tns emnid 2008: Evaluation of the “On-site Energy Saving Consultation” funding programme.
IREES/Fraunhofer ISI 2010	Institute of Resource Efficiency and Energy Strategies; Fraunhofer ISI 2010: Evaluation of the “Energy Efficiency Counselling” funding programme as a component of the Special Fund for Energy Efficiency in Small and Medium-sized Companies (SMEs).
IWU/ifeu 2005	Institute of Housing and the Environment (IWU), ifeu Institute of Energy and Environmental Research 2005: Contributions of the EnEV and of the KfW CO <sub>2</sub> Building Redevelopment Programme to the National Climate Protection Programme.
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Prognos 2007	Prognos AG 2007: Potential for energy saving and energy efficiency in the light of current price changes.
Prognos/DIFU 2011	Prognos AG, German Institute of Urban Development 2011: Final energy savings in states and municipalities through public-sector measures for increasing energy efficiency in the context of the EU Energy Services Directive.
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Abbreviation	Source reference
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Prognos/GWS 2009	Prognos AG, Institute of Economic Structures Research 2009: Analysis and modelling of the development of energy consumption.
Prognos/IER 2004	Prognos AG, Institute of Energy Economics and Rational Use of Energy 2004: Analysis of the effectiveness of CO <sub>2</sub> reduction measures in the energy sector and their further development.
Prognos/Öko-Institut 2009	Prognos AG, Öko-Institut 2009: The German Model. Climate protection up to 2050: Thinking from the goal backwards.
Prognos et al. 2010	Prognos AG, Institute of Energy Economics at the University of Cologne, Institute of Economic Structures Research 2010: Energy scenarios for a federal government energy concept.
Prognos et al. 2010a	Prognos AG, Fraunhofer ISI, TU Munich (Chair of Energy Economics and Applications Technology) 2010: Database for the evaluation of energy efficiency measures 2008.
RWI 2010	Rhineland-Westphalian Institute of Economic Research 2010: The climate protection commitment of the German economy – Monitoring Report 2009.
RWI 2010a	Rhineland-Westphalian Institute of Economic Research 2010a: 2009 status report on implementation of the agreement on climate protection between the Federal Republic of Germany and German industry of 9 November 2000.
RWI 2009	Rhineland-Westphalian Institute of Economic Research 2009: The climate protection commitment of the German economy – Monitoring Report 2008.
RWI 2008	Rhineland-Westphalian Institute of Economic Research 2008: The climate protection commitment of the German economy – Monitoring Report 2005-2007.
Schmidt-Sercander 2010	Schmidt-Sercander B., 2010: Potential electricity savings by means of environmentally-friendly design.
Federal Statistical Office (various years and source references)	Federal Statistical Office: → Data report 2008 – Facts and figures about the Federal Republic of Germany → Technical Series 4, Sequence 2.1 (production index) (TS 4, S 2.1) → Technical Series 4, Sequence 5.3 (Cost structure of the companies in the construction trade) (TS 4, S 5.3) → Technical Series 4, Sequence 6.4 (Statistics on power generation plants of companies in mining and the processing and finishing sector) (TS 4, S 6.4) → Technical Series 5 (Construction activity and housing), Sequence 1 (TS 5, S 1) → Technical Series 5 (Construction activity and housing), Sequence 1, Supplementary survey 2006 for the micro-census (TS 5, S 1-Z2006) → Technical Series 11, Sequence 1 (Schools) (TS 11, S 1) → Technical Series 11, Sequence 4 (Institutes of higher education) (TS 11, S 4) → Technical Series 12, Sequence 6.1.1 (Master data for hospitals) (TS 12, S 6.1.1) → Technical Series 18, Sequence 1.4: Overall macroeconomic calculations, calculation of domestic product (TS 18, S 1.4) → Overall macroeconomic calculations. Quality report
techem 2009	Techem GmbH 2009: Energy indicators. Aids for the residential property manager.
TUM-Ife 2010	TU Munich 2010: Preparation of application balances 2008: Sub-report TRS (unpublished draft of 18.11.2010).

Abbreviation	Source reference
UBA 2009	Federal Environment Agency 2009: German national inventory report.
UVM 2010	Baden-Württemberg Environment Ministry 2010: "Efficient Street Lighting" funding programme (unpublished data supply of 29.4.2010).
vzbv 2010	Federation of Consumer Organisations 2010: Data on centre-based energy counselling by the consumer advice centres (unpublished communication of 2.3.2010, as at: 2009).
Ziesing 2009	Ziesing, H.-J. 2009: Breakdown of average degree days for Germany (based on information from the German Weather Service and the Institute of Housing and the Environment; unpublished).
ZSW 2010	Centre for Solar Energy and Hydrogen Research Baden-Württemberg 2010: Evaluation of the KfW funding of renewable energies in the domestic market in 2009.
ZSW 2009	Centre for Solar Energy and Hydrogen Research Baden-Württemberg 2009: Evaluation of the KfW funding of renewable energies in the domestic market in 2008.
ZSW 2008	Centre for Solar Energy and Hydrogen Research Baden-Württemberg 2008: Evaluation of the KfW funding of renewable energies in the domestic market in 2007.
ZUB 2006	Centre for Sustainable Building 2006: Experiences with the EnEV.





