Federal Republic of Germany

National Renewable Energy Action Plan in accordance with Directive 2009/28/EC on the promotion of the use of energy from renewable sources

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1. SUMMARY OF THE NATIONAL STRATEGY FOR RENEWABLE ENERGIES

Current national policy on renewable energy sources and role of the National Action Plan

The development of renewable energies is a key element of Germany's energy strategy. With the introduction and advancement of numerous effective measures and instruments, the share of renewable energies in total energy consumption could increase fivefold, from 2 % in 1990 to approximately 10 %[1] in 2009. The development of renewable energies in Germany is to be continued in the future. In the long term, the majority of energy supply is to be covered by renewable energies.

Germany's energy policy – and therefore its strategy for the expansion of renewable energies – is under constant development. Since spring 2010, the Federal Government has been working on a new energy concept for Germany, which is to be completed in autumn 2010 and will contain an overall national strategy for energy supply until 2050. The key points of future German energy policy will therefore be defined here.

Since the drafting of this energy plan overlaps in time with the present National Renewable Energy Action Plan, the latter could not take into account the key points which will be defined here. It is therefore possible that forward-looking data and statements contained in this National Action Plan will be modified by the energy plan. The Federal Government will inform the European Commission about any specific details and updates which result from the energy plan or follow in its aftermath in its mandatory reports as required under the Directive.

The National Action Plan presents the currently (July 2010) expected development of the expansion of renewable energies in Germany in order to achieve the national target under Directive 2009/28/EC, and thus Germany's contribution to the overall EU target of 20 % renewable energy in 2020. It contains existing and currently planned measures, with which the national target is to be achieved.

The National Action Plan was prepared in accordance with Article 4 of Directive 2009/28/EC on the promotion of the use of energy from renewable sources. It follows the template established by Commission Decision 2009/548/EC under document number K(2009) 5174.

Through its extensive and detailed character, the National Action Plan is a key document of the Federal Government's national promotion of renewable energies and supports its policy objectives of security of supply, climate protection, competitiveness, promotion of technology and innovation, as well as of securing and expanding employment in Germany.

Objective of the National Action Plan: to advance the development of renewable energies

[1] For 2009, there is no figure that takes into account in full the methodological and statistical requirements of EU Directive 2009/28/EC. The value mentioned here of 10 % renewable energies in 2009 in Germany was calculated according to national methodology. It is therefore not to be directly compared to estimates made in this Action Plan about the share of renewable energy in Germany from 2010 to 2020.

The National Action Plan under Directive 2009/28/EC presented here states that the development of renewable energies in Germany will continue to be forcefully promoted. In this National Action Plan, the Federal Government estimates the share of renewable energies in gross final energy consumption to be 19.6 % in 2020. The share of renewable energies in the electricity sector will thereby amount to 38.6 %, the share in the heating/cooling sector will be 15.5 %, while in the transport sector it will amount to 13.2 %.

In their expectations for the development of renewable energies by 2020, the Federal Government is therefore expecting to achieve a higher value than the Directive's binding national target of 18 %. It should be stressed that this value of 19.6 % renewable energies in 2020 is the currently expected development, and not a national target of the Federal Government.

The measures and instruments that are necessary to achieve the national target of 18 % renewable energies by 2020 have basically already been established. All instruments and measures, however, will continue to be constantly evaluated and developed if necessary.

In the electricity sector, the current Renewable Energy Act (*Erneuerbare-Energien-Gesetz* – EEG), is the crucial basis for further development in the production of renewable energies. This also applies to the production of combined power and heating/cooling based on renewable energies. The EEG is here supplemented by the Combined Heat and Power Act (*Kraft-Wärme-Kopplung-Gesetz* – KWKG) and by emissions trading. The EEG was developed further with its amendment in the field of photovoltaics of July 2010: Compensation rates were adjusted and the target for the annual market volume for solar radiation energy almost doubled, to 3 500 megawatts. In addition, incentives for private domestic use of solar power were increased. The next amendment of the EEG is planned for January 2012. This amendment will focus in particular on the greater system integration of renewable energies. It will review how demand-oriented power feed-in, load management and direct marketing of electricity from renewable energy sources can be improved and promoted. In this respect, grid connection requirements, grid reconstruction and development, as well as the promotion of storage technologies, will be of fundamental importance.

In the heating/cooling sector, the main package of measures includes a Market Incentive Program (*Marktanreizprogramm* – MAP), the Renewable Energies Heat Act (*Erneuerbare-Energien-Wärmegesetz* – EEWärmeG), support programs of the KfW and the Energy Saving Ordinance (*Energieeinsparverordnung* – EnEV). These instruments have allowed for a significant expansion in the use of renewable energies in recent years. Before 31 December 2011, the Federal Government will submit a progress report on the EEWärmeG, which will focus on the possibilities of an increased use of renewable energies within buildings. The Federal Government is also examining the conditions within tenancy legislation for energy-efficient refurbishment of rented housing stock and thus for fostering the use of renewable energy.

In the electricity sector, the promotion of electric mobility is of crucial importance. The Federal Government wants to achieve its ambitious targets in this area through the implementation of the measures agreed upon in the National Development Plan for Electrical Mobility. In the transport sector, compliance with the sustainability criteria for biofuels contained in Articles 17 to 20 of Directive 2009/28/EC plays a major role.

In Germany, these requirements have been implemented through the Biofuels Sustainability Ordinance (*Biokraftstoff-Nachhaltigkeitsverordnung* – Biokraft-NachV) as well as in the field of power generation by the Biomass Power Sustainability Ordinance (*Biomassestrom-Nachhaltigkeitsverordnung* – Bioster-NachV).

The implementation of the Directive must be completed by 5 December 2010. Many of the Directive's requirements have been met in Germany for years now; some new measures, such as the implementation of sustainability criteria, were adopted in 2009. For further implementation of the Directive, the Federal Government is currently preparing the 'European Law Adaptation Act for Renewable Energy' (*Europarechtsanpassungsgesetz Erneuerbare Energie* – EAG EE). This act will provide some further adjustments and specifications to existing instruments and schemes for the promotion of renewable energies. Since this law is passed after submission of the National Action Plan (expected in December 2010), the specific contents are mentioned only in individual cases and in general terms, under planned additional measures in Chapter 4 of the National Action Plan. The EAG EE will include the implementation of the role model function of renewable energy use and increased energy efficiency in public buildings, a regulation on the use of certificates of origin, improvement of grid connection conditions and adjustment of energy statistics, as well as defining the basis for the issuance and recognition of certificates of origin.

The overarching goal of the Federal Government until 2020 is to advance the process of transformation towards an energy system based on renewable energy. In this National Action Plan, the measures of the Federal Government are listed in detail and described. In addition to the core instruments mentioned above to achieve the sectoral targets, the Federal Government can also refer to existing projects and schemes in other areas of the National Action Plan. The Federal Government disposes of a large range of information on renewable energy and has adopted comprehensive regulations for the operation and expansion of the electricity infrastructure. In addition, under the present National Action Plan's points 4.6.1 and 4.6.2 on biomass availability, the National Biomass Action Plan of April 2009 is specified and developed further.

In addition to the measures of the Federal Government, there are a number of other measures and efforts to promote the development of renewable energy at regional and local level in Germany. In the National Action Plan, the importance of regional and local activities to promote renewable energies are exemplified or summarised under the appropriate subject areas. Due to the numerous regional and local measures, ultimately only a limited and in no way comprehensive overview can be offered.

The success story of renewable energy in Germany

Between 1990 and 2009, the share of renewable energy in energy supply in Germany increased fivefold from 2 % to 10 %[2] in final consumption of energy. This is a unique success story. While originally it was hydropower in the electricity sector and the more traditional use of wood for heating purposes which prevailed, nowadays advanced technologies are to be found in all application areas of renewable energies. A mix of wind, biomass, geothermal energy and photovoltaic

[2] See footnote 1

systems is deployed in the electricity sector. In the heating sector, modern pellet heating, efficient biomass heating plants, biomass (block) heating power stations, geothermal heating plants and solar thermal systems are increasingly supplementing traditional usages. Biofuels provide an important and significant contribution to reducing greenhouse gas emissions in the transport sector.

Appropriate framework conditions, created or developed over several legislative periods, were a prerequisite for this development. The core of the package of measures includes, in the electricity sector, the feed-in tariffs (through the Electricity Feed Act [*Stromeinspeisungsgesetz*] 1991 to 2000 or the Renewable Energy Act [EEG] since 2000) in the heating and cooling sector, the Market Incentive Program (MAP), as well as the Renewable Energies Heat Act (EEWärmeG) and, in the transport sector, first the tax incentives and, from 2007 on, primarily the quotas. These and other measures at national and, increasingly also at European level, were flanked by states' and municipalities' funding programs, as well as numerous contributions from other stakeholders, especially in the field of business.

Of all developments, the most notable has been registered during the past two decades in the electricity sector. Electricity generation from all renewable energy sources has more than quintupled, from 17 terawatt hours (TWh) in 1990 to over 93 TWh in 2009. Whereas in 1990 91 % of renewable electricity was produced by hydropower, in 2009 it was only 20 % – while over 40 % derived from wind power and 33 % from biomass.

In the heating sector, the energy supply from renewable energy sources from 1990 to 2009 more than tripled from just over 32 TWh to about 115 TWh. The use of solid biomass (mainly wood) was predominant throughout this period, and in 2009 still amounted for approximately 68 %. If biogas, bioliquids and the biogenic share of waste are also included, use of biomass for heating purposes even accounted for 92 % of all renewable resources.

The years 2004-2007 in particular recorded a boom in the use of biofuels in the transport sector, as their share in total fuel consumption rose from 1.8 % in 2004 to 7.2 % in 2007. In 2009, sales had declined again slightly and amounted to 33.8 TWh (5.5 %). At the same time, the use of biodiesel and vegetable oil decreased, while consumption of bioethanol continued to grow. Because of the one percentage point increase in the quota in 2010, increased sales are expected again.

Estimates in the National Action Plan

All information in the National Action Plan reflects the current state of research and planning, and is accurate to the best knowledge and belief. The time frame of the Action Plan (horizon 2020), however, requires that future figures of the development of renewable energies be based on a scenario analysis, and these in turn are based on specific assumptions. These assumptions are subject to future market and policy developments and can therefore change in the future.

The numerical estimates mentioned in the National Action Plan are constantly reviewed and updated. The updates will be forwarded to the European Commission as part of the progress reports in accordance with the Directive. This ensures that the development of renewable energies in Germany is depicted realistically and in a relevant manner.

The presentation of the national total-energy data, including data of renewable energies, is carried out for the previous year on the basis of available data calculated in the national energy balance. These data are transmitted to the Eurostat annually – for the previous year, respectively – on the basis of the 'Regulation (EC) No 1099/2008 of the European Parliament and the Council of 22 October 2008 on energy statistics'. However, the data necessary for this report are available at different times, so that estimates must also be made at the time of transmitting the data to the Eurostat. This means that until definitive national data are available, at different points in time data updates (back data) are required, each of which can affect the overall energy balance.

In addition to the estimates, all data mentioned in the National Action Plan on existing or planned measures are based on the state of knowledge of July 2010. The data from regional and local level are based on data from February and July 2010. Against the backdrop of constant development in the promotion of renewable energies, it is inevitable that the measures listed in the National Action Plan could change at short notice.

2. EXPCETED FINAL CONSUMPTION OF ENERGY 2010-2020

The National Renewable Energy Action Plan requires the Member States to develop two scenarios for the expected gross final consumption of energy until 2020 in the sectors of electricity, heating and cooling as well as transport. While under 'reference scenario' a scenario should be drafted that only considers energy efficiency and energy saving measures that were taken prior to 2009, the second scenario should anticipate the gross final consumption of energy Germany would expect if additional energy efficiency and energy saving measures would be taken that go further than the status quo of 2009. Basically, the contribution of renewable energies to the gross final consumption of energy is to be assessed in this 'scenario with additional energy efficiency measures'. This applies in particular to meeting the indicative trajectory of a national overall target of 18 % renewable energies in gross final consumption of energy by 2020 and the separate sectoral target of at least 10 % renewable energies in the transport sector by 2020.

It should be noted that the scenarios of development of energy consumption and the contribution of renewable energies to energy supply described here, cannot be understood as a *prediction* of the development in Germany until 2020. Inevitable uncertainties in the economic, demographic, technological, political and social assumptions made by the scenarios make it seem unlikely that the energy system will follow the exact course described in the scenarios. Taking into account the uncertainties of the basic parameters, a scenario is to be seen as a plausible and consistent development path that is to be used as a guideline – in particular for the National Renewable Energy Action Plan – but which may possibly also require energy policy re-adjustments until 2020.

Data basis of the 'reference scenario' (REF) and the 'scenario with additional energy efficiency measures' (EFF) of the National Renewable Energy Action Plan

The estimate of the gross final consumption of energy of both scenarios for the National Renewable Energy Action Plan is essentially based on assumptions for the

development of gross domestic product (GDP) and energy productivity, i.e. the ratio of GDP to primary consumption of energy (PCE). Based on statistical data for the year 2008, the reference scenario expects an average annual increase in energy productivity of 1.7 % between 2008 and 2020, while the scenario 'additional energy efficiency measures' is based on the assumption of a higher average energy productivity growth of 2.3 % per year between 2008 and 2020. The ratio of primary consumption of energy (PCE) to final consumption of energy (FCE) in the scenarios' time span is derived from model results taken from external studies.

The national gross final consumption of energy (GFCE), as defined in Directive 2009/28/EC, can be calculated from the final consumption of energy (FCE) of both scenarios as follows: Based on Germany's statistical energy balances from the years 2001-2008[3] the GFCE can be calculated as the sum of the FCE, plus flaring and transmission losses in electricity and heating as well as own use of electricity and heat in power plants and heating plants. For the period 2001-2008, an empirically fixed ratio of GFCE to FCE of $f = 1.037 \pm 0.001$ results from the statistic data. Assuming that f remains constant until 2020, the gross national consumption of energy can be calculated based on the final consumption of energy of the underlying scenarios.

The respective share of the three sectors – electricity, heating/cooling and transport – in the total gross final consumption of energy has been updated from statistical data available in recent years, taking into account sector-specific energy savings and efficiency potentials. Details of the calculations are to be found in the Annex under Chapter 7.1.1.

The development of renewable energies in the EFF scenario is based on an adaptation and expansion of the reference scenario from the study *Langfristszenarien und Strategien für den Ausbau erneuerbarer Energien in Deutschland* (Long-term Scenarios and Strategies for Developing Renewable Energies in Germany)[4] (For details see Chapter 5).

Development of the gross final consumption of energy in the sectors electricity, heating and cooling and transport for the scenarios REF and EFF

Table 1 illustrates the expected gross final consumption of energy in the areas of heating and cooling, electricity and transport in both scenarios REF and EFF until 2020. In the scenario REF, the gross final consumption of energy decreases from 229 092 ktoe[5] in the base year 2005 to 223 767 ktoe in 2010 and finally to 211 599 ktoe (8 859 PJ) in 2020. The sector heating/cooling is responsible for the largest share in this decrease, with 116 842 ktoe in 2005 and 98 766 ktoe (4 135 PJ) in 2020. The gross final consumption of energy in the electricity sector in the base year 2005 was 51 813 ktoe. By 2020, it rises to 52 627 ktoe (2 203 PJ). The gross final consumption of energy in the transport sector will decrease from 53 602 ktoe in the base year to 51996 ktoe (2177 PJ) in the year 2020.

The significantly increased energy efficiency in the EFF scenario against the reference scenario results in a lower gross final consumption of energy in all sectors of the scenario EFF. The gross final consumption of energy decreases from 229 092

[3] AGEB 2009a, b

[4] BMU 2009a

[5] 1 ktoe = 1000 tonnes of oil-equivalent (toe) = 41.868 TJ = 0.041868 PJ or 1PJ = 23.8846 ktoe.

ktoe in the base year 2005 by 13.9 % to 197 178 ktoe (8 255 PJ) in 2020. The sector heating and cooling has the highest share in this, since its gross final consumption of energy sinks from 116 842 in 2005 by 20.3 % to 93 139 ktoe (3 900 PJ) by 2020. The gross final consumption of energy in the electricity sector decreases from 51 813 ktoe in 2005-2020 by 6.7 % to 48 317 ktoe (2 023 PJ), while energy consumption in the transport sector drops from 53 602 ktoe in 2005-2020 to 48 302 ktoe (2 022 PJ). An implicit crucial factor in the development of the gross final consumption of energy in both scenarios is the economic crisis of the years 2008 and 2009, which is responsible for the approximately 7 % decline in gross final consumption of energy in both scenarios.

The GFCE values specified here for the base year 2005 differ from those of the report 'Forecast'[6] from 21 December 2009, since the calculations in the present document could recourse to the more recent statistics of the Working Group on Energy Balances[7] (*Arbeitsgemeinschaft Energiebilanzen*).

Table 1 provides that in the efficiency scenario estimates for energy efficiency savings match forecasts submitted by the Member States (such as under the Directive on Energy Efficiency and Energy Services). However, to reflect current developments and assessments, updated estimates have been made for the present efficiency scenario. In addition, the Energy Efficiency Directive and the Renewable Energies Directive differ in terms of classifications and reference points, as well as on definitional and methodological guidelines. Against this backdrop, a perfect match of the present estimates with recent figures on energy efficiency is not possible. Moreover, the Federal Government is preparing a new energy plan that will define the key points of German energy policy, including energy efficiency. The Federal Government will provide specific and updated information on energy efficiency as part of future reports on energy efficiency, such as under the Energy Efficiency Action Plan for the Directive on Energy Efficiency and Energy Services, scheduled for the year 2011. In the Annex (Chapter 7.1.2), a comparison is made between efficiency assumptions of the National Renewable Energy Action Plan and those listed by the National Energy Efficiency Action Plan.

In the scenario with additional energy efficiency measures, it is expected at present that the share of air traffic in gross final consumption of energy 2020 will not exceed the value of 6.18 %, and that therefore the capping mechanisms in air transport shall not apply. However, should the increase of energy consumption in air transport be significantly higher than expected in scenario EFF, it is assumed that the resulting limitation of gross final consumption of energy will effect an increase in the share of renewable energies in total gross final consumption of energy of less than 0.1 % points. In any case, the present scenario assumes that Germany will reach and even surpass the binding target of 18 % renewable energies in gross final consumption of energy even without applying the capping mechanism in air transport. In the progress reports to the National Renewable Energy Action Plan, the development of air transport will be examined in relation to the capping mechanisms and the assessments in the present scenario will be updated as necessary.

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[6] Estimate of the Federal Republic of Germany on the use of flexible mechanisms for cooperation to achieve the objectives under Article 4 paragraph 3 of Directive 2009/28/EC, available at http://ec.europa.eu/energy/renewables/transparency_platform/forecast_documents_en.htm

[7] AGEB 2009a, b

Table 1: Expected gross final consumption of energy in Germany in the areas of heating and cooling, electricity and transport until 2020, taking into account the impact of energy efficiency and energy saving measures (6) 2010-2020 (ktoe)

	2005	*2010*		*2011*		*2012*		*2013*		*2014*	
	Base year[8]	Reference scenario	Scenario with additional energy efficiency measures	Reference scenario	Scenario with additional energy efficiency measures	Reference scenario	Scenario with additional energy efficiency measures	Reference scenario	Scenario with additional energy efficiency measures	Reference scenario	Scenario with additional energy efficiency measures
1. Heating and cooling (1)	116 842	111 661	111 597	111 063	110 681	110 132	109 081	108 794	107 361	107 528	105 498
2. Electricity [2]	51 813	51 973	51 925	52 063	51 830	52 232	51 615	52 331	51 352	52 454	51 089
3. Transport within the meaning of Article 3 (4) (a) (3)	53 602	52 427	52 355	52 331	52 188	52 268	52 021	52 232	51 806	52 221	51 575
4. Gross final consumption of energy (4)	229 092	223 767	223 584	223 249	222 461	222 485	220 479	221 243	218 234	220 120	215 869
The following calculation is needed only if final consumption of energy for aviation is expected to be higher than 6.18% (4.12 % for Malta and Cyprus):											
Final consumption in aviation											
Reduction due to aviation capping (5) Article 5(6)											
Total consumption after reduction due to capping											

(1) It is the final consumption of energy of all energy commodities except electricity for purposes other than transport, plus the consumption of heat for own use at electricity and heat plants and heat losses in grids (points '2. Self-use by plant' and '11. Transmission and distribution losses' pp. 23 and 24 of the Regulation on energy statistics, OJ. L 304, 14.11.2008).

(2) The gross consumption of electricity is national gross electricity production, including own production, plus imports, minus exports.

(3) Consumption in transport sector within the meaning of Article 3(4)(a) of Directive 2009/28/EC. The figure for renewable electricity in road transport should be multiplied by a factor of 2.5, as indicated by Article 3(4)(c) of Directive 2009/28/EC.

(4) Within the meaning of Article (2)(f) of Directive 2009/28/EC. Includes the final consumption of energy plus grid losses and production-related (own) consumption of electricity and heat in electricity and thermal power stations (NB: not included here is the electricity consumption for pumped storage or conversion in electric boilers or heat pumps in district heating plants).

(5) According to Article 5(6), consumption for aviation has to be considered only up to a maximum 6.18 % (EU average), or 4.12 % (for Cyprus and Malta), of gross final consumption of energy.

(6) These estimates on energy efficiency and energy savings shall be consistent with other such estimates that Member States notify to the Commission, notably in Action Plans under the Energy Services Directive and the Energy Performance of Buildings Directive. If different units are used in those Action Plans, the conversion factors applied should be indicated[9]. For details see Chapter 7.1.2.

[8] The GFCE specified here for the base year 2005 is based on the Energy Balances (2009a, b) as of October 2009. The estimate of 21.12.2009, however, is based on an older version of the energy balance and therefore uses other figures for 2005 (according to the forecast: gross final consumption of energy 2005: 224 638 ktoe).

[9] Due to different classifications, points of reference as well as definitional and methodological guidelines, estimates for energy efficiency and energy savings of the National Renewable Energy Action Plan differ from the corresponding estimates and forecasts provided by the Federal Government to the European Commission in action plans under the Energy Services Directive and the Directive on the Energy Performance of Buildings. The implicit values presented here in Table 1 apply thus exclusively for the National Renewable Energy Action Plan. To the extent possible and appropriate, consistency of information and estimates among the various action plans is striven (see also Chapter 7.1.2) within reporting obligations.

Table 1 (continued)

	2015		*2016*		*2017*		*2018*		*2019*		*2020*	
	Reference scenario	Scenario with additional energy efficiency measures	Reference scenario	Scenario with additional energy efficiency measures	Reference scenario	Scenario with additional energy efficiency measures	Reference scenario	Scenario with additional energy efficiency measures	Reference scenario	Scenario with additional energy efficiency measures	Reference scenario	Scenario with additional energy efficiency measures
1. Heating and cooling - (1)	106 215	103 588	105 164	101 581	103 420	99 551	101 748	97 449	100 172	95 276	98 766	93 139
2. Electricity - (2)	52 554	50 588	52 689	50 229	52 728	49 799	52 767	49 346	52 733	48 844	52 627	48 317
3. Transport within the meaning of Article 3(4)a - (3)	52 187	51 279	52 150	50 655	52 112	50 034	52 073	49 414	52 035	48 857	51 996	48 302
4. Gross final consumption of energy- (4)	218 926	213 122	218 019	210 089	216 347	206 984	214 723	203 760	213 122	200 463	211 599	197 178
The following calculation is needed only if final consumption of energy for aviation is expected to be higher than 6.18 % (4.12 % for Malta and Cyprus):												
Final consumption in aviation												
Reduction due to aviation capping Article 5(6) - (5)												
Total consumption after reduction for aviation limit												

(1) It is the final consumption of energy of all energy commodities except electricity for purposes other than transport, plus the consumption of heat for own use at electricity and heat plants and heat losses in grids (points '2. Own use by plant' and '11. Transmission and distribution losses, 'p. 23 and 24 of the Regulation on energy statistics, OJ. L 304, 14.11.2008).

(2) The gross consumption of electricity is national gross electricity production, including own production, plus imports, minus exports.

(3) Consumption in transport sector within the meaning of Article 3(4)(a) of Directive 2009/28/EC. The figure for renewable electricity in road transport should be multiplied by a factor of 2.5, as laid down in Article 3(4)(c) of Directive 2009/28/EC.

(4) Within the meaning of Article (2)(f) of Directive 2009/28/EC. Includes the final consumption of energy plus grid losses and production-related (own) consumption of electricity and heat in electricity and thermal power stations (NB: not included here is the electricity consumption for pumped storage or conversion in electric boilers or heat pumps in district heating plants).

(5) According to Article 5(6), consumption for aviation has to be considered only up to a maximum 6.18 % (EU average), or 4.12 % (for Cyprus and Malta), of gross final consumption of energy.

3. RENEWABLE ENERGY TARGETS AND TRAJECTORIES

3.1. National overall target

According to Annex I of Directive 2009/28/EC, the share of energy from renewable sources in gross final consumption of energy was 5.8 % in 2005. Based on this initial value, Germany is obliged to increase its share of energy from renewable sources by 2020 to at least 18.0 %. Based on an expected gross final consumption of energy of 197 178 ktoe (8 255 PJ) in 2020 in the 'scenario with further energy efficiency measures' (see Tables 1 and 2), this corresponds to an amount of energy from renewable sources of at least 35 492 ktoe (1 486 PJ) in 2020.

Germany assumes that the 2020 target of 18 % energy from renewable sources can be achieved with national measures only – i.e. without the benefit of surpluses from other Member States under the flexible cooperation mechanisms laid down in Directive 2009/28/EC. Instead, Germany expects to surpass the national target, so that according to the EFF scenario, an amount of excess renewable energy will be produced as specified in Chapter 4.7.4., which could potentially be made available for flexible cooperation mechanisms.

Table 2: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020 (figures to be transcribed from Annex I, Part A to Directive 2009/28/EC)

A) Share of energy from renewable sources in gross final consumption of energy in 2005 (S2005) (%)	5.8 %
B) Target for the share of energy from renewable sources in gross final consumption of energy in 2005 (S2020) (%)	18.0 %
C) Expected total energy consumption in 2020 after adjustment (from Table 1, last line) (ktoe)	197178
D) Expected amount of energy from renewable sources in accordance with the target 2020 (calculated as B x C) (ktoe)[10]	35492

Regional Targets

In Germany, many federal states and municipalities have set their own targets for the development of renewable energies, which contribute to achieving the national target. Federal state targets within the framework of energy and climate policy programs are listed in the Annex, under 7.2. Within the realm of municipalities, the 100 %-renewable-energy regions are particularly worthy of mention (see answer to question 5.4 b). A current survey on this can be found in the notes under 7.3.9.

[10] Point D does not display the expected amount of renewable energy in Germany in 2020, but rather the minimum volume of renewable energies required to achieve the national target, based on the expected final energy consumption in the year 2020.

3.2. Sectoral targets and trajectories

Table 3 gives an overview of the expected trajectory of the share of energy from renewable sources in the sectors heating and cooling, electricity and transport, in both gross final consumption of energy and in total gross final consumption of energy. The numerical values for the base year 2005 are based on statistical data of the AGEE-Stat[11] and differ slightly from the base value of 5.8 % laid down by the Directive. The difference is due to subsequent revisions of the figures of total final consumption of energy and the values for the development of renewable energies in 2005. The estimation of the development of renewable energies 2010-2020 builds on the data from the reference scenario 2009[12], but also takes into account current developments and trends in the expansion of renewable energies in Germany until March 2010[13].

A differentiated approach is necessary for the presentation of targets and expected trajectories. The key objectives of the Federal Government are the mandatory targets of the Directive, namely the overall national target of 18 % and the minimum target of 10 % in the transport sector. For this purpose, the Federal Government has – already before preparation of the National Action Plan – set national targets for 2020 and given these legal footing in relevant support instruments (§ 1 of the EEG, § 1 EEWärmeG): In 2020, at least 30 % renewable energy for electricity and 14 % for heating/cooling can be achieved. In the transport sector, the share of biofuels in fuel consumption should increase from 2020 to 7 % in net reduction of greenhouse gases; this is equivalent to approx. 12 % share of energy. Furthermore, 1 million renewable energy-powered electric vehicles are to be produced until 2020. These targets of the Federal Government remain and will be reviewed under the national energy plan and adjusted if necessary. In case of changes, the statutory sectoral targets for the electricity sector and for heating/cooling will be adapted to these changes without delay.

The sectoral targets and trajectories in Table 3 are expected developments in renewable energy by 2020 and surpass the overall national target and the existing sectoral targets of the Federal Government. Since these are not trajectories for mandatory targets, but rather development trajectories to significantly surpass the national target, the Federal Government regards these as non-binding estimates and therefore not as new sectoral targets of the Federal Government.

Target and/or development trajectories for heating and cooling from renewable sources

According to the ‘scenario with additional energy efficiency measures’ (EEF), in 2020 almost twice as much energy from renewable sources (14 431 ktoe or 604 PJ) will be used in heating and cooling as in the base year 2005 (7 706 ktoe). As a result of the ensuing decrease in gross final consumption of energy in heating and cooling, the share of heating and cooling from renewable sources in gross final consumption of energy in this sector more than doubles: from 6.6 % in the base year 2005 to 15.5 % in 2020.

Target and/or development trajectory for electricity from renewable sources

[11] BMU 2009b, see also updates from December 2009 and March 2010
[12] BMU 2009a
[13] BMU 2010a

According to this scenario, the share of electricity from renewable sources in gross final consumption of energy will, according to the scenario with additional efficiency measures, increase in the period 2005-2020 from 10.2 % to 38.6 %. This corresponds to an increase of electricity production from renewable sources by 5 301 ktoe in the base year 2005 to 18 653 ktoe (781 PJ) in 2020.

Target and/or development trajectories for the use of energy from renewable sources in transport

In the base year 2005, 2 087 ktoe energy from renewable sources were used in the transport sector. The consumption of electricity from renewable sources and the use of biofuels within the meaning of Article 21(2) of Directive 2009/28/EC were low in the base year 2005. The share of renewable energies in energy consumption in the transport sector in 2005 was around 3.9 %. In the EFF scenario, the consumption of renewable energies in the transport sector increases by 2020 to 6 138 ktoe (257 PJ) (without double counting biofuels which meet the criteria of Article 21(2) of Directive 2009/28/EC and without the 2.5-fold counting of electricity from renewable sources on roads) or to 6 388 ktoe (267 PJ), including the above-mentioned multiple counting. It is therefore assumed that the share of renewable energies in the transport sector, in accordance with the calculation method of Directive 2009/28/EC, will rise to 13.2 % in 2020. The driving forces behind this increase are:

- up to and including 2014, the energy quotas fixed in the Federal Immission Control Act (*Bundes-Immissionsschutzgesetz* – BImSchG)
- or, from 2015, the minimum reductions of greenhouse gas emissions to be achieved in transport fuels placed on the market, in relation to a reference fuel.

Moreover, by the double consideration given to biofuels as referred to in Article 21(2), of Directive 2009/28/EC, the minimum share of energy from renewable sources in transport of 10 % by 2020, as stipulated in the Directive, will be exceeded in Germany.

Trajectory for the share of renewable energy sources in total gross final consumption of energy

According to the 'scenario with additional efficiency measures', the consumption of energy from renewable sources will increase in the period 2005-2020 – without considering possible transfers in the context of flexible mechanisms for cooperation – from 14 926 to 38 557 ktoe (1 614 PJ): an increase of 158 %. The percentage of energy from renewable sources in total gross final consumption of energy will accordingly rise from 6.5 % in the base year 2005 to 19.6 % in 2020. With this, the 18 % target of renewable energy sources in gross final consumption of energy laid down in Annex I of Directive 2009/28/EC is met and surpassed in Germany.

Surplus for cooperation mechanisms

With the expected surpassing of the 18 % target, a potential surplus ensues of 1.6 % points for the use of flexible mechanisms for cooperation. In Chapter 4.7 and Table 9 of the National Action Plan, the planned use of cooperation mechanisms and the potential surplus will be discussed in detail.

Table 3: National target for 2020 and expected path for energy from renewable sources in the sectors of heating and cooling, electricity and transport *(the calculation tables 4a and 4b are to be used for the preparation of Table 3)*[14]

	2005[15]	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Renewable sources of energy – heating + cooling (1) (%)	6.6	9.0	9.4	10.0	10.5	11.1	11.7	12.4	13.1	13.9	14.7	15.5
Renewable energy sources – electricity (2) (%)	10.2	17.4	19.3	20.9	22.7	24.7	26.8	28.8	31.0	33.3	35.9	38.6
Renewable energy sources – transport (3) (%)	3.9	7.3	7.5	7.6	7.0	7.0	7.0	7.1	9.3	9.4	9.7	13.2
Renewable energy sources, total (4) (%)	6.5	10.1	10.8	11.4	12.0	12.8	13.5	14.4	15.7	16.7	17.7	19.6
Of which through cooperation mechanism (5) (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surplus for cooperation mechanism (5) (%),	0.0	0.0	2.6	3.2	2.5	3.3	2.2	3.1	2.0	2.9	0.0	1.6

In accordance with Part B of Annex I to the Directive		2011-2012	2013-2014	2015-2016	2017-2018		2020
		S_{2005} + 20 % (S_{2020}-S_{2005})	S_{2005} + 30 % (S_{2020}-S_{2005})	S_{2005} + 45 % (S_{2020}-S_{2005})	S_{2005} + 65 % (S_{2020}-S_{2005})		S_{2020}
Minimum value for target path for renewable energy (6)		8.24	9.46	11.29	13.73		18.00
Minimum value for target path for renewable energy sources (ktoe)[16]		18 249	20 533	23 890	28 198		35 492

(1) Share of renewable energy in heating and cooling: Gross final consumption of energy from renewable sources for heating and cooling (according to Article 5 (1) (b) and Article 5 (4) of Directive 2009/28/EC), divided by the gross final consumption of energy for heating and cooling. Row A of Table 4a, divided by row 1 of Table 1

(2) Share of renewable energy in the electricity sector: Gross final consumption of energy from renewable sources for electricity (as referred to in Article 5(1)(a) and Article 5(3) of Directive 2009/28/EC), divided by the total gross final consumption of electricity. Row B of table 4a, divided by row 2 of table 1

(3) Share of renewable energies in the transport sector: End use of energy from renewable sources for the transport sector (see Article 5, paragraph 1, point c, and Article 5, paragraph 5 of Directive 2009/28/EC), divided by consumption in the transport sector is 1. petrol, 2. diesel fuel, 3. biofuels used in road and rail and 4. electricity used in land transport (see row 3 of Table 1. Row J of table 4b divided by row 3 of Table 1

(4) Share of renewable energy in gross final consumption of energy. Row G of Table 4a, divided by row 4 of Table 1

(5) As percentage points of the overall share of renewable energy sources.

(6) As referred to in Annex I.B of Directive 2009/28/EC

[14] Table 3 shows the expected development of renewable energies in the respective sectors. These are non-binding estimates, not new sectoral targets of the Federal Government. The Federal Government has already set sectoral targets to achieve these objectives before the creation of the Action Plan (see also Chapter 3.2)

[15] The calculation of the shares of renewable energy for the base year 2005 is based on the updated statistics on consumption of renewable energies of the AGEE-Stat from December 2009 (BMU 2009b) and on the energy balance of Germany for 2005 as of October 2009 (2009a, b). The fixed start value for Germany of 5.8 % energy from renewable sources in 2005 as specified in Annex IA to Directive 2009/28/EC is based, in contrast, on statistics available at that time, from both the (gross) final energy consumption and the use of energy from renewable sources.

[16] Calculated as the difference between row 4 in Table 3 and the indicative trajectory. This is a potential surplus. The absolute figures of the potential surplus are shown in Table 9. At present it is not yet possible to assess to what extent the potential surplus can actually be made available for flexible cooperation mechanisms.

Table 4a: Calculation table for each sector's contribution to the share of renewable energy in final consumption of energy (ktoe)

		2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
A	Expected gross final consumption of energy from renewable sources for heating and cooling	7706	10031	10457	10884	11309	11736	12163	12617	13071	13524	13978	14431
B	Expected gross final consumption of electricity from renewable energy sources	5301	9026	9985	10770	11637	12596	13553	14487	15445	16431	17542	18653
C	Expected final consumption of energy from renewable sources in transport (1)	2087	3749	3837	3850	3513	3532	3479	3484	4495	4510	4546	6140
D	Expected total consumption of energy from renewable sources	14926	22588	24033	25233	26152	27526	28822	30172	32549	33952	35490	38557
E	expected transfer of energy from renewable sources to other Member States[17]	0	0	0	0	0	0	0	0	0	0	0	0
F	Expected transfer of energy from renewable sources from other Member States and third countries	0	0	0	0	0	0	0	0	0	0	0	0
G	Expected consumption of energy from renewable sources after adjusting the target (D) - (E) + (F)	14926	22588	24033	25233	26152	27526	28822	30172	32549	33952	35490	38557

(1) In accordance with Article 5(1) to Directive 2009/28/EC, gas, electricity and hydrogen from renewable energy sources will be considered only once. They shall not be counted twice.

[17] Calculated from the average of gross final consumption of energy for the relevant two-year period and the average of the indicative trajectory for the same period.

Table 4b: Calculation table for the share of renewable energy in the transport sector (ktoe)

		2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
C	Expected consumption of energy from renewable sources in transport (1)	2087	3749	3837	3850	3513	3532	3479	3484	4495	4510	4546	6140
H	Expected consumption of electricity from renewable energy sources in transport (2)	0	0	0	0	0	0	0	1	3	9	23	63
I	Expected consumption of biofuels from wastes, residues, non-food cellulosic material, and lignocellulosic material in the transport sector (2)	0	98	98	98	99	100	133	135	137	141	147	155
J	Expected contribution of energy from renewable sources in transport in view of the target for the transport sector (C) + (2.5 - 1) × (H) + (2 -1) × (I)	2087	3847	3935	3949	3613	3632	3613	3620	4638	4664	4728	6390

(1) Here all renewable energy sources used in the transport sector are considered, including electricity, hydrogen, renewable gas and biofuels only that do not meet sustainability criteria (see Article 5(1), last subparagraph). Here actual values are specified, without applying multiplication factors.

(2) Here actual figures are specified, without applying multiplication factors.

4. MEASURES TO IMPLEMENT THE TARGETS

4.1. Overview of all policies and measures to promote the use of energy from renewable sources

Table 5 provides an overview of the core measures. Details to other and subordinate measures are mentioned in the following sections.

Table* 5: *Overview of all policies and measures

Name and reference of the measure	***Type of measure****	***Expected Result *****	***Target group and/or activity******	***exists/is planned***	***Date of beginning and end of the measure***
1.Renewable Energy Act (EEG)	Legislative	Increased share of renewable energies in electricity	Investors, private households	Exists	Start: April 2000 (as a follow-up regulation to the Electricity Feed Act of 1991); amendments 2004 and 2009; next revision in 2011; the law is not limited in time.
2. Renewable Energies Heat Act (EEWärmeG)	Legislative	Increased share of renewable energies in the heating of buildings (focus on new buildings)	Building owners (private and public)	Exists	Start: Jan 2009; first revision 2011
3. Market Incentive Programme (MAP)	Financial	Investments in renewable energy in heating	Private households, investors	Exists	Start: 1999 financed from funds established in EEWärmeG; until 2012
4. KfW-funding-programs (e.g. CO_2renovation-program)	Financial	Energy efficiency measures and investments in renewable energy in buildings	Private households, investors, building owners, municipalities, social services	Exists	e.g. Start: 1996 End of measures 2011
5. Combined Heat and Power Act (KWKG)	Legislative	New construction, modernization and operation of CHP-plants and heating networks	Power plant operators, energy suppliers, investors	Exists	Start: April 2002, amendment in January 2009
6. Energy Saving Ordinance (EnEV)	Legislative	Compliance with minimum standards for energy efficiency in buildings and heating/cooling systems in new construction and renovation of residential and non-residential buildings	Building owners (private and public)	Exists	Start (current version dated 1.10.2009): October 2007 Basis: Energy Saving Ordinance of 28.03.2009; next amendment 2011/2012

7. Biofuels Quota Act (BioKraftQuG)	Legislative	Minimum share of biofuels of total fuel put into circulation, and tax incentive for certain biofuels	Companies that bring fuels on the market	Exists	Start: January 2007 Duration: beyond 2020 / tax incentive for certain biofuels until the end of 2015

* Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).

** Is the expected result behavioural change, installed capacity (MW; t/year), energy generated (ktoe)?

*** Who are the targeted persons: investors, end users, public administration, planners, architects, installers, etc.? Or what is the targeted activity/sector: biofuel production, energetic use of animal manure, etc.)?

4.2. Specific measures to meet the requirements of Articles 13, 14 and 16 as well as 17 to 21 of Directive 2009/28/EC

A detailed presentation and/or evaluation of German federal and regional legislation is too extensive. At suitable points, a summary will be provided and/or regional circumstances exemplified.

4.2.1. Administrative procedures and spatial planning (Article 13(1) of Directive 2009/28/EC)

(a) List of applicable national and, where appropriate, regional legislation for licensing, certification and approval procedures and the planning that will be used on plants and associated infrastructures of transmission and distribution grids:

Licensing, certification and authorisation procedures

Plants based on renewable energy sources (RES-plants) are approved in Germany partly in accordance with pollution control legislation and partly in accordance with building legislation. A corresponding list is included in the answer to subparagraph (i).

Licensing requirements for plants according to pollution control legislation are to be found in the catalogue of plants under the Annex of the 4th Regulation on Implementation of the Federal Immission Control Act (4th BImSchV). Requirements for the construction and operation of plants are regulated by the Federal Immission Control Act (BImSchG); the 9th BImSchV also contains regulations for licensing.

Emission control legislation grants right to approval if the operator complies with the so-called basic obligations for construction and operation of a plant, i.e. protection and prevention from harmful environmental effects, compliance with waste obligations and the efficient and economical use of energy. These requirements are specified in sublegal regulations (statutory instruments, such as the 17th BImSchV, and regulations, such as the Clean Air Act (TA Luft). Other than that, no other – installation-related – public law regulations (such as building planning legislation) may prevent the construction and operation of an installation[18].

[18] At present, it is not yet possible to assess the extent to which surpluses in relation to the indicative trajectory (see Table 9) are made available for statistical Transfers.

Installations that do not require approval through pollution control legislation require either a building permit or no official authorization at all. This is regulated in the respective competent regional building code (at federal state level). Plants which are not subject to licensing requirements (in the sense of the pollution control legislation) must also meet the construction and operation requirements of the BImSchG. These are set out in §§ 22 et seq. BImSchG and are partly given concrete form through sub-legal regulations.

Depending on the anticipated environmental impact of the installation, a simplified or formal authorization procedure is applied within the BImSchG framework. The formal procedure involves public participation. Whether an additional Environmental Impact Assessment (EIA) must be carried out is determined under Annex 1 of the Environmental Impact Assessment Act (*Gesetzes über die Umweltverträglichkeitsprüfung* – UVPG).

Germany's federal structure, i.e. sovereignty of the federal states, plays a major role – together with regional and urban planning – in the implementation of licensing, certification and approval procedures for renewable energy installations. In the Annex, the legislation and administrative responsibilities at state level are described – taking individual federal states as examples.

Regional Planning

Planning legislation at Federal and federal state level contains so-called principles of spatial planning (also with regard to the content) which rule that spatial requirements for an affordable, safe and environmentally sound energy supply, including the development of energy grids, in particular renewable energies, must be taken into account. These legal principles are to be specified in regional development plans through policies and planning targets, which in turn must be observed and considered in subsequent spatially significant plans and measures of, for example, building planning or specific project approval procedures.

Building Legislation

1. Federal Urban Planning Legislation

The provisions of Article 13 of Directive 2009/28/EC are met by building regulations. Installations using renewable energy sources are building facilities which are subject to the provisions of the Building Code (*Baugesetzbuchs* – BauGB) and the Land Use Ordinance (*Baunutzungsverordnung* – BauNVO). These regulations provide several options for the approval of renewable energy plants. The applicable law depends – as with other projects – on the area where the plant is to be built. The project can be realized in planned as well as in unplanned areas. Further details are presented in the Annex under 7.3.1.

2. Building Code Regulation

The matter ‘Public Building Law’ is divided broadly between the Federal Government (building planning law) and federal states (building code

regulation). Due to the diversified and extensive legal situation in the federal states, a detailed account within the National Action Plan is not possible.

(b) Responsible ministries/authorities and their responsibilities in this area:

The approval procedure regarding pollution control legislation is regulated by federal law. The main provisions are to be found in the Federal Immission Control Act, the specific regulations (BImSchV) and administrative regulations (such as TA Luft). These regulations are the responsibility of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

The pollution control permit is subject to the conditions under § 13 BImSchG so-called 'concentration effect', i.e. it includes certain other public rulings (e.g. building permits). The competent regional authority (often referred to as the pollution control authority) is responsible for the issue of pollution control permit. It is the sole decision-making authority. The pollution control authority is located, in many cases, at the local environmental authorities.

Installations which do not need to be approved by the BImSchG either do not require approval, or require a building permit under the respective state building code (see table in Annex under 7.3.1). The respective competent state authority (usually the local planning authority) is responsible for issuing the building permit.

For certain types of installations (e.g. hydropower, geothermal power plants, some wind energy plants), the requirements depend on the Water Resources Act (*Wasserhaushaltsgesetz* – WHG), the Federal Mining Act (*Bundesberggesetz* – BBergG) and the Offshore Installations Ordinance (*Seeanlagenverordnung* – SeeAnlV); in this case the authorities designated by these Acts and Ordinances are responsible[19].

Overview of the competent ministries and authorities at national level:

- BImSchG: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (*Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit* – BMU)
- Building Law: Federal Ministry of Transport, Building and Urban Affairs (*Bundesministerium für Verkehr, Bau und Stadtentwicklung* – BMVBS)
- Building code regulations: competent ministries of the federal states
- Regional Planning Legislation: BMVBS

[19] Note: Remarks on associated infrastructure legislation are found in the respective chapters: 4.2.6 and 4.2.7 (Electricity grids), 4.2.8 (gas grids), 4.2.9 (heating/cooling systems). Furthermore, reference is made to the requirements for certification of installers (Chapter 4.2.5). A certification of biofuels and bioliquids is in progress, in the course of transposition of Directive 2009/28/EC into national legislation.

- Nature Conservation Legislation: BMU, Federal Authority for Nature Conservation (*Bundesamt für Naturschutz* – BfN)
- Water Rights: BMU
- Mining Legislation: Federal Ministry of Economics and Technology (*Bundesministerium für Wirtschaft und Technologie* – BMWi)
- BMU, BMVBS
- Offshore Installation Legislation: BMU, BMVBS, BfN, Federal Maritime and Hydrographic Authority (*Bundesamt für Seeschifffahrt und Hydrographie* – BSH)

(c) Revision with view of taking appropriate measures within the meaning of Article 13, paragraph 1 of Directive 2009/28/EC planned before the: (date)

No needs exist for implementation of the requirements of Article 13(1) of Directive 2009/28/EC with regard to pollution control legislation.

Coordination of authorities is ensured through the concentration effect of pollution control approval procedures and the relevant rules for participation of authorities. Applicants are provided with enough information on the processing of permit applications and informed about available support through application advice as required under § 2(2) of the 9th BImSchV. The administrative procedures are streamlined and expedited with appropriate time limits: The decision period is seven months for the formal procedure, for the simplified procedure it is three months. Thresholds values take into account the characteristics of each specific renewable energy technology and determine the need for pollution control authorisation. For certain types of installation, a simplified procedure is provided, which takes into sufficient account Art.13(1)(f) of Directive 2009/28/EC.

(d) Summary of existing and planned activities at regional/local level (where applicable):

At local/regional level, a large variety of measures have already been taken with regard to building regulations requirements, especially in the field of wind energy use. An exemplary overview is offered in the following table.

Table a: Local/regional planning measures for wind power

Land	Measures
Baden-Württemberg	The regional planning offices are required to establish region-wide priority areas for regionally significant wind turbine plants and define other areas as exclusion zones.
Hamburg	Proposed measure for HBauO: Wind turbines farms with a height of 15 m over ground surface will be installed in the future in allocated commercial and industrial areas and in the port area without approval procedure. This exemption should simplify and facilitate the installation of small wind turbine farms. A final decision is still pending. Proposed measures to § 4 HmbKliSchG: 5 development plans pro year with fixed energy uses.
Lower Saxony	– Regional planning designation in the LROP (State Regional Planning Program) of two suitable areas for offshore use of wind energy in the Lower Saxony coast and regional planning assessments for the two offshore wind farms 'Borkum Riffgat' and 'Nordergründe' planned in the area; – LROP specifications regarding the fixing of priority areas for wind energy in Regional Spatial Planning Program (RROP) and an indication of the minimum performance to be installed in the particularly wind rich areas of the region; – Line route designation for the expansion of the European power grid and connection to offshore wind plants; – Requirements for the repowering of wind turbines in LROP and RROP; – For the forthcoming update of the LROP, specifications for controlling the widespread use of photovoltaic are planned.
Saarland	– Reorganization or partial amendment of the State Development Plan (Landesentwicklungsplans - LEP) – Creation of a master plan *Neue Energien* (New Energy)
Saxony	Adjustments in building regulations with regard to the requirements of simplification of approval procedures. Standardization/harmonization of the catalogue of approval-free construction projects in favour of renewable energy plants; review of further simplification of procedures.
Schleswig-Holstein	Improvement of the environment for wind energy in state and regional development planning including reorganization of the State Development Plan (LEP) (extension of the designated areas for wind energy). Information, advice and networking (including the promotion of the competence centre wind energy *CEwind*, funding of the cluster management *windcomm*). Promotion of the wind energy research platform *Fino 3 Neptune* (North Sea platform for technology development and conservation)

(e) Were unnecessary obstacles or unreasonable requirements in connection with the authorisation, certification and licensing procedures applied to plants and associated transmission and distribution grid infrastructure for the production of electricity, heating or cooling from

renewable sources, and to the process of transformation of biomass into biofuels or other energy products? If so, which?

The pollution control permit procedures in place show generally no disproportionate requirements. The handling of emission legislation as a whole is appropriate and has led in many ways to improved plant design and equipment, and not to a situation of frequent permit denial. Overall, the pollution control legislation satisfies the requirements of Directive 2009/28/EC. The examined plant approval procedures meet the requirements of the Directive 2009/28/EC of rapid and coordinated procedures. They are suitable for implementation. The material facts on the approval procedures are appropriate and show no obstacles that were not justified, given the importance of renewable energies. When production of electricity, etc. from renewable energy sources is not granted approval, this is due to the need to protect against harmful environmental agents or, depending on the specific procedural facts, to protect other public interests such as nature and landscape protection, protection of outdoor areas, including monument conservation. It lies – where bounds of EU law are not in place anyway, such as nature protection law – within the implementation discretion of Member States to include other interests and give them appropriate consideration.

(f) *What level of administration (local, regional and national) is responsible for authorising, certifying and licensing renewable energy installations and for spatial planning? (If it depends on the type of installation, please specify.) If more than one level is involved, how is coordination between the different levels managed? How will coordination between different responsible authorities be improved in the future?*

The federal state governments are responsible for designating the appropriate level (and thus authority) for approval of installations requiring authorisation. The local pollution control authority is commonly located at the local environmental authorities. It has the sole power to decide – as long as the project is not associated with water use – and coordinate the cooperation with the competent authorities. Through the concentration effect of pollution control approval and the obligation to process and coordinate requirements by the authorities responsible for BImSchG-approval, the coordination of authorities, as stipulated in Directive 2009/28/EC, is also ensured.

The building permit has, under the legislation of most federal states, no concentration effect, i.e. installations that are not approved under BImSchG and which require a building permit do not benefit from a central point of contact. The local building authority is responsible for the building permit. Should additional approvals be required, the applicant must obtain these from the competent authority (e.g. local conservation authority).

(g) *How is it ensured that comprehensive information on the processing of authorisation, certification and licensing applications and on assistance to applicants made available? What information and assistance is*

available to potential applicants for new renewable energy installations on their applications?[20]

In accordance with § 2(2) of the 9th BImSchV, the licensing authority must advise the project applicant and discuss the timing of the approval process, as well as other issues relevant to the application procedure.

At the federal level, there is no further 'recommendations', in statutory or regulatory form, to the planning authorities to promote through planning the use of renewable energies. For fulfilment of duties, however, many other forms of action, such as guidelines or manuals, are sufficient. Under national law, there is no obligation to offer comprehensive information. Information distribution duties reside by the federal states and therefore the competent ministries there.

The federal state North Rhine-Westphalia, for example, has published a guide to the pollution control approval procedure. In the application forms (including attachments), all required documents/reports are listed, so that the applicant can rely on only one document. The application forms are available on the internet free of charge. In almost all cases, the regional specifications for approval can be viewed over the internet.

In Lower Saxony, a uniform program for permit application is offered to all involved installation operators, authorities and consulting firms, for the filling of pollution control permit application forms.

In Saarland, a legal basis will be created to facilitate the development of renewable energy and related approval procedures, in as far as not already conclusively stipulated by federal law. The amendment to parts of the regional development plan is to bridge the long-term revision, so as to allow for the expanded use of renewable energies in the medium term (within 12 months).

Building permits: In Brandenburg, the fully automated building permit process – using electronic signature – is in preparation. Electronic building application forms are already provided here free of charge. For waste approval procedures currently no standardized application documents are in use. The applicant receives here from the Regional Environment Authority (Landesumweltamt), as licensing authority, guidelines on the content of the application documents.

In individual cases, investors should always contact the relevant authority at federal state government level.

(h) *How is horizontal coordination facilitate between different administrative bodies, responsible for the different parts of the permit? How many procedual steps are needed to receive the final authorisation/licence/permit? Is there a one-stop shop for coordinating all steps? Are the timescales for the processing of applications submitted in advance? How long does it take, on average, until a decision on an application?*[21]

[20] See point (i)

[21] Regional data as of February and July 2010

Horizontal coordination is ensured by § 10(5) BImSchG and § 11 of the 9th BImSchV, whereby prior to granting approval under pollution control legislation, other authorities whose mandate will be affected by the project must be involved. Unless approval under other legislation (other than the BImSchG) is required, the licensing authority shall ensure full coordination of the regulatory process and the content and conditions.

The application must, in accordance with § 20(1) of the 9th BImSchV, as a rule be processed immediately, for formal procedures at the latest within a period of seven months (§ 10(6a) BImSchG); within this period, participation of public and authorities must take place. An extension of three months is possible if required, due to difficulties in examining the application, or for other reasons attributable to the applicant. During the procedure the relevant authorities (§ 11 of the 9th BImSchV) are given a time limit to issue their decision.

The simplified procedure is regulated by § 19 BImSchG, which declares inapplicable certain rules that apply to the formal approval process. In particular §§ 10(3)(5), 11 and 14 of the BImSchG (exclusion of certain objections and claims) do not apply. The deadline for the authorities' decision is only three instead of seven months and therefore much tighter than for the formal approval. The approval in the simplified procedure also has the so-called concentration effect.

Depending on specific circumstances, in individual cases there may be deviations from the legally prescribed time limits. To illustrate the time limits of legal building approval procedures, samples of federal state legislation are described in the following.

For the approval under building legislation in Brandenburg (§ 63 BbgBO) the following applies:

- 10 weeks in building permit procedures (§ 56 BbgBO), unless federal regulations provide for longer periods.
- simplified building permit (§ 57 BbgBO), about a month.
- in building notification procedures (§ 58 BbgBO), four weeks.

For planning approvals related to waste legislation, the duration is approximately three to six months (§ 31(3) KrW-/AbfG).

In Hamburg the HBauO is applied. Proceedings under § 61 HBauO have a statutory decision period of one to two months; under § 62 HBauO they have a statutory decision period of three months.

The regional spatial planning authority in Lower Saxony approves regional planning programs and must comply with a one-month time limit. There are also project-related spatial procedures, or regional planning procedures, for which, in accordance with § 15(4) ROG, the requirement to conduct a planning procedure must be established within four weeks of submitting the documents necessary and the regional planning procedure must be completed within six months after submission of all documents.

In the Free State of Saxony, the provision of application forms is regulated in a notice of 30 August 2004 by the Saxon State Ministry of Interior concerning the use of application forms in building inspection procedures (SächsABl. SDr.p. S517). The regular duration of a building permit procedure is three months with assumption of approval (§ 69(4) SächsBO).

(h) Do authorisation procedures take into account the specificities of the different renewable energy technologies? If so, please describe how. If they do not, do you envisage taking them into account in the future?

In Germany, above certain thresholds, plants are subject to federal pollution control approval. Plants below this given threshold may only need a building permit (this is organised, however, in most federal states without concentration effect).

- In accordance with BImSchG, the following must be approved[22]:
    - o combustion equipment for biomass, landfill gas, sewage gas and natural wood, and natural vegetable oils above the threshold of the 4th BImSchV.
    - o wind turbines with a total height of more than 50 m
    - o fermentation facilities where waste is used in certain quantities
- Not requiring permit under BImSchG are[23]:
    - o combustion installations for biomass, landfill gas and sewage gas below the thresholds of the 4th BImSchV
    - o wind turbines with a total height of less than 50 m
    - o fermentation facilities which fall below certain thresholds for the use of waste
    - o solar installations of any kind (photovoltaic and solar thermal)
- To be approved by other regulations as the BImSchG are[24]:
    - o hydropower plants (§ 31 Water Resources Act-WHG)
    - o geothermal systems (Federal Mining Act – BBergG)
    - o wind turbines at sea outside the territorial sea (Offshore Installations Ordinance – SeeAnlV)

(i) Are there specific procedures, for example simple notification, for small-scale, decentralised installations (such as solar panels on buildings or biomass boilers in buildings)? If so, what are the procedual steps? Are the rules publicly available to citizens? Where are they published? Is the introduction of simplified notification procedures planned in the future? If so, for which types of installation/system? (Is net metering possible?)

[22] Regional data as of February and July 2010
[23] BMU, 2005, p. 18
[24] BMU, 2005, p. 18

Notifications for small, decentralized systems are not provided for by the BImSchG, since, according to this legislation, they do not require authorisation. Most renewable energy installations require (only) building approval. With this classification, whether an installation requires a pollution control permit or not, is, due to the lower environmental relevance of such installations, already sufficiently taken into account by current law.

There are therefore no future plans for the introduction of a simplified notification procedure for certain types of installations (besides both existing licensing procedures), which would be vested with the legal effects of a pollution control approval.

Regional building codes provide to a certain extent further exemptions from building permit requirements for energy production facilities. Simple notifications are regulated at federal state level by the competent authorities. For example, small solar systems on buildings usually do not require a permit. For solar thermal or photovoltaic installations, lower building authorities are responsible, which examine the planning application, involve other authorities and transfer the application.

(j) Where are the fees associated with applications for authorisation/licences/permits for new installations published? Are they related to the administrative costs of granting such permits Is there any plan to revise these fees?

The fees for obtaining the necessary permits follow fee regulations of the individual federal states. These regulations provide that, when assessing fees, the administrative burden must be considered (see, e.g. § 3(1) *Gebührengesetz NRW*). The fees are to be found in the respective tariffs of the federal states, e.g. in North Rhine-Westphalia in the General Administrative Fee Regulations (*Allgemeinen Verwaltungsgebührenordnung).*

It is assumed that the federal states regularly review and adjust the fees.

(k) Is official guidance available to local and regional administrative bodies on planning, designing, building and refurbishing industrial and residential areas to install equipments and systems using renewable energy sources in electricity and heating and cooling, including in district heating and cooling? If such official guidance is not available or insufficient, how and when will this need be addressed?

There are no 'recommendations', in form of laws or regulations, from the Member State Germany to the planning authorities to exploit these opportunities. For fulfilment of duties, however, many other forms of action, such as guidelines or manuals, are sufficient. Appropriate actions lie within the competence of the federal states and, if they have not yet been made, will be made in due time. Moreover, numerous information sources are available at a variety of levels. A selection of contact points for publications on sustainable settlements, urban planning and climate protection, etc. are mentioned in the following:

German Energy Agency (*dena*), local energy authorities in Baden-Württemberg, Berlin and North Rhine-Westphalia, federal ministries such as the BMU, federal authorities such as the BBSR (Federal Institute for Construction, Urban and Spatial Research) or UBA (Federal Environment Agency), as well as consumer centres.

(l) Are there specific trainings for case handlers of authorisation, certification and licensing procedures of renewable energy installations?

The training of case handlers for authorisation and licensing applications is subject to the sovereignty of the federal states. As a rule, a university degree is required. Some federal states also offer further training courses for case handlers.

In Hamburg, for example, applicants require a university degree in architecture or civil engineering (see HBauO). Case handlers in Lower Saxony undergo a traineeship and preparatory service, which is later supplemented and updated through regular further training courses.

4.2.2. Technical specifications (Article 13(2) of Directive 2009/28/EC)

(a) To benefit from support schemes do renewable energy technologies need to meet certain quality standards? If so, which installations and what quality standards? Are there national, regional standards that go beyond European standards?

Technologies for the use of renewable energy sources must generally fulfil pollution control requirements and comply with quality standards fixed in Germany's various funding guidelines and laws/regulations. An overview of the relevant laws, ordinances and regulations is shown in the Annex, 7.3.2.

In addition, pursuant to § 19(1) of the EnWG, grid operators are required to comply with technical requirements (TAB) when connecting RE-installations to the power grid. These refer to VDEW and VDN guidelines, and also DIN EN and DIN-VDE standards (e.g. VDEW guidelines *Eigenerzeugungsanlagen am Niederspannungsnetz* – Private electricity generation systems at the low voltage grid).

Thermal solar collectors must comply with the quality standards defined in the funding guidelines of the Market Incentive Program (MAP) and the Renewable Energies Heat Act (EEWärmeG): According to these, collectors must exceed a specified minimum annual collector yield and be certified with the European 'Solar Keymark'. This identifies the product as ‘tested according to EN 12975’. MAP-eligible solar collectors must also comply with the requirements of the national eco-label ‘Blue Angel’ for ‘solar collectors’ RAL-UZ 73.

For **biomass plants,** in addition to the requirements of the BImSchG, technological and plant-specific provisions are made in the MAP directive and EEWärmeG, as well as in the Renewable Energy Sources Act (EEG).

For use of **solid biomass,** the 1st BImSchV must be met. Only biomass central heatings or biomass stoves with water bags are permitted by

the EEWärmeG; they must have, according to DIN EN 303-5 (1999-06), a minimum boiler efficiency of over 86 % (• 50kW) or 88 % (> 50kW).

The MAP requires a minimum boiler efficiency (combustion efficiency for furnaces) of 89 % for pellets and wood chips combustion, log wood gasification boilers and combination boilers for pellets and wood chips/logs. These requirements are also above those of the EU Directive.

The 1st BImSchV for small and medium-sized combustion plants has been amended and has come into force 22 March 2010. With this amendment, requirements for the emission behaviour of small furnaces for solid fuels has been expanded and gradually increased. For new central heating and individual room furnaces, such as stoves or fireplaces, demanding emission limits must be observed which will be further tightened on January 2015. For individual room furnaces, the amendment also provides for minimum efficiency. For existing combustion plants, the first BImSchV also sets emission limits that must be met after a certain period of time, depending on the date of the type approval testing of the plant. If the tests are failed, installations must be retrofitted to minimize dust or the combustion plants have to be shut down or replaced with low emission combustion plants. The emission performance of small combustion plants depends significantly on the type of fuel and operator behaviour. The amendment requires therefore, in addition to regular monitoring of the heating system, an inspection of the used fuels as well as a unique and mandatory operator counselling scheme.

Boilers for **liquid biomass** are, depending on their heat efficiency, installations which require licensing and must dispose of the best available technology, i.e heating technology, to receive approval under the EEWärmeG.

In the processing of **biogas to natural gas quality**, technological requirements are made in the MAP- guidelines, as well as in the EEG and EEWärmeG. Further provisions are made in the Gas Grid Access Ordinance (see point 4.2.8).

Heat pumps must meet the quality standards set in the MAP-guidelines and the EEWärmeG, which define a minimum annual co-efficient of performance calculated according to generally accepted rules such as the VDI 4650 (2009). The MAP also requires measuring equipment to evaluate the amount of electricity used and the total amount of heat supplied. The above requirements are, regarding minimum annual coefficient and hence performance, in most cases above the minimum requirements for award of the EU-eco-label ‘Euroblume’ laid down in Article 13(6)(3).

Mini-CHP-plants are required by EEWärmeG, MAP, KWKG and the mini-CHP Directive to comply with certain technical requirements, for example compliance with the TA Luft and the requirement that these facilities be ‘highly efficient’ within the meaning of the European CHP Directive.

4.2.3. Buildings (Article 13(3) of Directive 2009/28/EC)

(a) Reference to existing national and regional legislation (if any) and summary of local legislation concerning the increase of the share of energy from renewable sources in the building sector:

- Law to promote renewable energy for heating purposes (Renewable Energies Heat Act – EEWärmeG)
- Regulation on energy-saving thermal insulation and energy-saving systems in buildings (Energy Saving Ordinance – EnEV)
- Building Code
- Baden-Württemberg: Renewable Heat Act (EWärmeG) (see point 7.3.3 for details)

(b) Responsible Ministry(/ies)/authority(/ies):

- EEWärmeG: Responsible at federal level: BMU

  The obligation to use renewable energy sources is fulfilled by the federal states, which determine the relevant competent regional authorities.
- EnEV: Responsible at federal level: BMWi, BMVBS.

  The energy saving regulations are implemented by the federal states, which designate for this purpose the responsible regional authorities, e.g. through specific regulations which determine competences and implementation.
- Building Code: Responsible at federal level: BMVBS
- EWärmeG BW: Responsible is the Ministry for the Environment, Nature Conservation and Transport in Baden-Württemberg.

(c) Revision of rules, if any, planned by: (date)

- EEWärmeG:

  § 18 EEWärmeG obliges the Federal Government to submit a progress report on the EEWärmeG to the Bundestag until 31.12.2011, and thereafter every four years. This report is intended to detect the possible need of adapting regulations to market developments. A fundamental revision of the law is therefore to be expected no earlier than 2012; an adjustment to the directive 2009/28/EC is aimed at, under the *Europarechtsanpassungsgesetzes* (European Law Adaptation Act) to 5.12.2010.
- EnEV: A revision is planned for 2012

(d) Summary of the existing and planned measures at regional/local levels:

Point (d) and (e) are shown together in point (e).

(e) Are there minimum levels for the use of renewable energy in building regulations and codes? In which geographical areas and what are these requirements? (Please summarise.) In particular, what measures have

been built into these codes to ensure the share of renewable energy used in the building sector will increase? What are the future plans related to these requirements/measures?

At federal level, the Renewable Energies Heat Act (EEWärmeG), which came into force 1 January 2009, rules that in all new buildings the heat energy demand must be met proportionally by renewable energies. The heat energy needs must be covered at least 15 % through solar thermal energy, 30 % by biogas in CHP-use or 50 % by liquid or solid biomass, heat pumps or geothermal energy. Alternatively, heat energy needs can be covered to 50 % by heat from cogeneration plants or from waste heat, or mainly through district heating, or the standards of energy efficiency in the energy saving regulations must be exceeded by 15 %. More information is available in Chapter 4.4 and listed in particular in points (b) and (m).

At federal level, currently no regulations exist for the mandatory use of renewable energies in existing buildings. These regulations can, however, be adopted by the federal states. Baden-Württemberg has, with the Renewable Heat Act (EWärmeG), passed a corresponding state law. According to this legislation, from 1 January 2010, after the refurbishment of an existing building which includes the replacement of a boiler, at least 10 % of the heat energy needs must be covered by renewable energies (for details see Annex 7.3.3). Other regional governments have announced the introduction of similar regulations or created the power of authority that allows such regulations to be introduced at local level.

(f) What is the projected increase of renewable energy use in buildings until 2020 (If possible differentiating between residential – 'single-unit' and 'multiple unit', commercial, public and industrial.) (To answer this question you may use a table as Table 6 below. Data could be given yearly, or for selected years Both heating and cooling and electricity consumption from renewable energy sources should be included.)

On current estimates, it is assumed that the amount of heating and cooling generated and consumed from renewable energies in buildings will, based on the 2005 level, double in Germany by 2020 (approx. 4 896 ktoe). Because of the difficult data situation (due mainly to the federal structure of Germany) an exact breakdown of expected increases in the individual categories is currently not possible. In principle, however, it is expected that in 2020 the overwhelming amount of renewable heating and cooling will be consumed in residential buildings, followed by commercial buildings. It can also be assumed that the amount of renewable energies used for heating and cooling in non-residential buildings will increase 2005-2020 disproportionately compared to residential buildings. By 2020, it is expected that there will be an increase in the use of renewable heating in residential buildings by 70-80 % compared to 2005, while for non-residential buildings a multiplication of 2005 levels of consumption for the same period are probable, even if, admittedly, in public and industrial buildings the starting levels are low.

The share of electricity from renewable sources used in the building sector is to be considered separately. This corresponds approximately to the renewable share in the national electricity mix. For the year 2020, according to the Federal Government target, at least 30 % of the electricity used in buildings will come from renewable sources. In addition, a part of the electricity produced on building roofs and facades (mainly from PV systems) can be in principle used directly in the buildings themselves. The quantity of this private consumption is, however, difficult to estimate at this stage, as it is not sure what impact the promotion of renewable generated electricity for private consumption will have in the coming years.

(g) Have obligations for minimum levels of renewable energy in new and newly refurbished buildings been considered in national policy? If so, what are these levels? If not, how will the appropriateness of this policy option be explored by 2015?

For new buildings, a corresponding obligation-to-use has been introduced at federal level with the EEWärmeG; the federal state Baden-Württemberg introduced such an obligation for existing buildings, while other federal states are discussing this option. We therefore refer to the answer to question (e).

The EEWärmeG is evaluated regularly. The first progress report will be presented by the Federal Government in 2011. The progress reports make suggestions for further development of the EEWärmeG, which are then implemented through a legislative process.

(h) Please describe plans for ensuring the exemplary role of public buildings at national, regional and local level by using renewable energy installations or becoming zero energy buildings from 2012 onwards. (Please take into account the requirements under the EPBD).

The exemplary role is ensured by an amendment to the EEWärmeG, which is based on the exemplary use of renewable energies in Federal, federal state and municipal buildings. For this purpose, both guidelines for the use of renewable energies as well as for measures to significantly increase efficiency, within the meaning of Article 13(4) and (5) of this Directive, will be introduced. The relevant legislative procedure (European Law Adaptation Act for Renewable Energy) is currently undergoing approval and is expected to be concluded before the end of 2010.

This statutory exemplary role function will be flanked by the Federal Government's program for energy-saving renovation of federal buildings, which will enhance the energy qualities of federal buildings as a whole. This program for the energy-saving refurbishment of federal buildings in the immediate federal administration (supreme federal authorities) for the period 2006-2009, with funds of 120 million euros per year, has been successfully implemented. A continuation at the previous level is currently being discussed. 5 % of the funds are earmarked for high-tech measures (e.g. fuel cells).

In addition, the Federal Government, in its National Energy Efficiency Action Plan (EEAP) from September 2007, has set the target of reducing energy-related CO_2-emissions by 30 % in the period 2008-2012 (base year 1990) in all buildings in the business area of the Federal Government and has published a guide for sustainable construction in federal buildings.

At regional/local level also, some federal states have initiated projects and plans specifically designed to increase the share of renewable energy in public buildings. An overview of this is shown in the Annex, 7.3.4.

(i) How are energy efficient renewable energy technologies in buildings promoted?

For the building sector, the Market Incentive Program (MAP) with program sections BAFA and KfW (the latter also called 'Renewable Energy Premium') are particularly relevant, as well as the KfW-programs in the context of the Federal CO_2 Building Rehabilitation Program with the sections: *Energieeffizient Sanieren* (Energy-efficient Renovation) *Energieeffizient Bauen* (Energy-efficient Construction) and the program *Eneuerbaren Energien Standard*. They are described in Chapter 4.4, Section II: Financial support, point (a).

4.2.4. Information provision (Articles 14(1), 14(2) and 14(4) of Directive 2009/28/EC)

(a) Indication of any national or regional legislation (where available) regarding the provision of information within the meaning of Article 14 of Directive 2009/28/EC:

The active dissemination of environmental information is generally regulated by the environmental information regulations of Federal and federal state governments. The Environmental Information Act of the Federal Government (*Umweltinformationsgesetz* – UIG) regulates public access to environmental information, as also contained in Article 14 of Directive 2009/28/EC. Federal information providers are encouraged under § 10 UIG to inform the public – to an appropriate extent – actively and systematically about the environment, e.g. policies, plans and programs related to the environment.

In a broad sense, the provision of information within the meaning of Article 14 is regulated in the relevant laws by means of disclosure and publication requirements, as well as the introduction of certification systems:

- Renewable Energy Sources Act (EEG) and Biomass Power Sustainability Ordinance (Biomassestrom-Nachhaltigkeitsverordnung – Bioster-NachV)
- Renewable Energies Heat Act (EEWärmeG)
- Energy Saving Ordinance (EnEV)
- Building Code (BauGB)

In the federal states, in accordance with § 10 UIG, regulations for informing the public are in force.

(b) Responsible body/(ies) for dissemination of information at national/regional/local levels:

The federal ministries and the subordinate authorities are responsible for dissemination of information at national level. The Federal Environment Ministry (BMU) offers a wide range of information (brochures, leaflet downloads, data/statistics, etc.) at http://www.bmu.de or at http://www.erneuerbare-energien.de. For the material and energy-based use of biomass, the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) under http://www.bmelv.de and the Agency of Renewable Resources (FNR) under http://www.nachwachsende-rohstoffe.de, offer extensive information and consultancy services.

Due to the federal structure of the Federal Republic of Germany, regional ministries (or senate administrations, authorities) take appropriate action at federal state level. Energy agencies (public or partly private) exist in Berlin, North Rhine-Westphalia, Saarland and Baden-Württemberg. At municipal level, the responsibility lies with the local public administration (i.e. climate and energy work groups, energy commissioners). In accordance with the UIG or the federal state's environmental information laws, information providers can include, beside public authorities, legal or natural persons of private law, in as far as they perform public functions or provide public services while under control of the public administration.

The federally-funded *Agentur für Erneuerbare Energien e.V.* (Agency for Renewable Energy – AEE) provides information about the key benefits of energy supply based on renewable energies. In addition to the support it receives from the Federal Government, the AEE is also funded by companies and associations within the renewable energy industry. The German energy agency (*dena*) sees itself as a competence centre for energy efficiency and renewable energy. At regional level also, energy agencies and/or information centres have been established.

The public-law (mostly regional law) chambers (Chamber of Trade, Chamber of Architects, etc.) promote the interests of their members and regulate vocational training. Due to mandatory membership, the chambers serve to ensure quality standards and are major multipliers.

The Federal Ministry of Environment promotes the information and networking of the competent education and training bodies through overarching conferences and through grants for research projects and campaigns. By way of example, the research projects *powerado powerado-Plus* (www.powerado.de) and the travelling light exhibition tour for 4 to 10-year-olds (www.leuchttour.de) should be mentioned here.

Private organizations (craftsmen, architects, engineers) and associations are also an important part of the information infrastructure.

To be mentioned here, for example, is the technology-specific nationwide campaign by the solar industry, *Woche der Sonne* (www.woche-the-sonne.de).

(c) Summary of existing and planned activities at regional/local level (where applicable):

The measures at regional level include campaigns to the individual technologies, status reports with overviews of contact points and funding, pilot projects, demonstration projects, the creation of information centres, exemplary procurement measures in the public sector, the provision of relevant research findings and the development of guides and check-lists. The following table lists examples of some of these measures at the regional and local level:

Table b: Information campaigns on a regional/local level

Bundesland/City	Measure	Target Group
Berlin	**Berliner ImpulsE Programm** Information, training, exchange of experiences on renewable energy and energy efficiency. Instruments are an annual conference (Berlin Energy Days), a quarterly magazine, a monthly newsletter and training courses. More information on the Internet at: http://www.berliner-impulse.de	Public administration, trade and industry, housing industry, disseminators and students.
Baden-Wurttemberg	**Zukunft Altbau** Information, awareness and motivation for energy-efficient renovation and use of renewable energies. Instruments are advertisements, website, brochure, information hotline. More information on the Internet at: http://www.zukunftaltbau.de	Consumers, homeowners, builders, craftsmen, architects
Baden-Wurttemberg	**Informationszentrum Energie** (located at the Economy Ministry BW) Initiation, coordination and implementation of actions on renewable energy. Free supply of brochures, publications, funding overviews, checklists. Forwards these to craftsmen, planners, energy consultants and municipalities.	Consumers, homeowners, builders, craftsmen , architects, municipalities
Baden-Wurttemberg	**Qualifizierungskampagne Erneuerbare Energien** Knowledge on renewable energies through seminars, conferences, learning modules More information on the Internet at: http://www.energie-aber-wie.de	Craftsmen, planners, population
Hesse	**Support programs** aimed at projects for skills and information transfer and dissemination of energy efficiency technologies and renewable energy technologies (Policies to promote activities in accordance with § § 4-8 Hessian Energy Act, Part II, No. 4)	Legal persons
Hesse	**Hessische Energiesparaktion (HESA)** HESA is a large and ever-growing cooperation to promote energy savings especially in older buildings in Hesse, but also new buildings where the use of renewable energy is an integral part. It offers a wealth of information and events including the Hessian energy pass, current lists of consultants, energy consulting day, training courses, regional advisory activities, media work. Information at www.energiesparaktion.de	Population, craftsmen , trades, etc.

Mecklenburg-Vorpommern	**Landeszentrum für erneuerbare Energien -Leea-** The national centre will include a building area of 2400 sqm – divided into exhibition and office sections. It will have an event exhibition, special exhibition, performance show with company presentations and interactive demonstration and experience areas designed to make renewable energies 'tangible'. The regional centre serves as a focal point for renewable energies. It will bundle expertise, grid companies, societies and associations as well as inform and educate consumers and businesses. The centre will be built by the municipal utility Neustrelitz GmbH and will be run by an operating company founded to this avail (Leea GmbH).	Consumers, companies, societies, associations, homeowners
Lower Saxony	**Geschäftsstelle Geothermie** Preparation and provision of regional data bases, individual counseling, advice on investment planning, public relations. For more information: www.lbeg.niedersachsen.de	Homeowners, builders, craftsmen, local
Lower Saxony	**Niedersachsen Netzwerk Nachwachsende Rohstoffe – 3N** Central point of contact, advice, assistance and knowledge transfer, public relations, organization of congresses, conferences, seminars, training. For more information: www.3-n.info	Economy, science and administration
Lower Saxony	**ForWind** Information and knowledge transfer, public relations, training, preparation and provision of data bases. For more information: www.forwind.de	Public research institutes, industry, administration, policy-makers, students
Rheinland-Pfalz	**Solarinitiative Rheinland-Pfalz 2015** The Solar Initiative seeks to activate public, private and commercial roofs for the use of solar energy. One target is to use 100 000 roofs for PV in Rheinland-Pfalz in 2015. Otherparts of the campaign include promotion of roof restoration or promotion of research and development.	Public, private and commercial building owners, planners, craftsmen and research institutions.
Schleswig-Holstein	**Landeswettbewerb '100-Prozent-Erneuerbare-Energien-Kommune'** (discipline 'Energy Olympics' of the initiative *Ne-ko – Energieeffizienz in Kommunen*) In 2011 new focus of *Ne-ko – Energieeffizienz in Kommunen*: state competition *Modellregion zur Erprobung dezentraler Energieversorgungsstrukturen, der Kraft-Wärme-Kopplung sowie zur Entwicklung kommunaler Energiekonzepte*.(Model Region for Testing of Decentralized Energy Supply Structures, Cogeneration and Development of Local Energy Concepts)	Municipalities, population

Thuringia	**Thüringer Energie- und Greentech Agentur (ThEGA)** Advice and information on the subject of renewable energy, energy efficiency and green technology, bringing together different agents; pushing projects	Companies, research and educational institutions, municipalities and population
Municipal level	**Solarbundesliga** Local competition for the installation of solar thermal and photovoltaic systems. More information on the Internet at: http://www.solarbundesliga.de/	Municipalities, homeowners, builders, craftsmen , architects, industry and commerce, housing, multipliers, population
Municipality Morbach (Rheinland-Pfalz)	**Morbacher Energielandschaft** Full installation of renewable energy on conversion areas for the realization of energy self-sufficiency of the municipality until 2020, and for demonstration purposes. More information on the Internet at: http://www.energielandschaft.de/	Population, farmers, businesses, communities, opinion leaders, industry and commerce

For information at regional level, see also the cross-regional information campaigns funded by, or conducted in cooperation with, the Federal Government, listed in Table c.

Table c: Cross-regional information campaigns

Title	**Measure**
Municipalities active for climate protection	Conferences for local authorities: comprehensive information on all aspects of renewable energy and energy efficiency
100% Renewable Energy Regions	Congress on implementation strategies for districts and municipalities
Bioenergy-regions	With the 'bioenergy-regions', the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) promotes networks with innovative concepts which exploit the development potentials of bioenergy. The goal is to increase regional output and create jobs.

(d) Please indicate how information is made available on supporting measures for using renewable energy sources in electricity, heating and cooling and in transport to all relevant actors (consumers, builders, installers, architects, suppliers of relevant equipment and vehicles). Who is responsible for the adequacy and the publishing of this information? Are there specific information resources for the different target groups, such as end consumers, builders, property managers, property agents, installers, architects, farmers, suppliers of equipment using renewable energy sources, public administration? Are there information campaigns or permanent information centres in the present, or planned in the future?

Competence for information provision lies with the authorised bodies in accordance with § 10 of the UIG and corresponding regional law, i.e. the government/public administration and private institutions controlled by these (see 4.2.4.b). The federal states have set up in part independent information centres or agencies (e.g. Energy Information Centre in Baden-Württemberg, NRW Energy Agency, Berlin Energy Agency).

The Federal Government provides information on federal support to the respective websites of the competent ministries and subordinate offices. A website was set up especially for information on renewable energy (www.erneuerbare-energien.de). The portal includes all federal funding measures in the areas of electricity, heating and cooling and transport. Publications by the Federal Government on funding opportunities (brochures, flyers, studies) can be obtained here directly. Information about local funding opportunities is provided by the federal states.

The information service BINE http://www.energiefoerderung.info/ (funded by BMWi and BMU) provides information for private persons about support in the areas of renewable energy and energy efficiency at national, regional and local level. For private, commercial and institutional investors a synchronisable funding compass is available in CD-Rom format.

In addition to funding overviews, there are targeted offers (e.g. brochure *Fördergeld für Energieeffizienz und Erneuerbare Energien – Private Haushalte, Unternehmen, Öffentliche Haushalte* [Funding for Energy Efficiency and Renewable Energy – Households, Enterprises, Government], *Fördermöglichkeiten für Schulen und Bildungseinrichtungen* [Funding for Schools and Educational Institutions', *Möglichkeiten der Forschungsförderung* [Opportunities for Research Funding], etc.). Members receive targeted information, in part through chambers and trade organizations.

Furthermore, the Federal Ministry for Environment, Nature Conservation and Nuclear Safety (BMU) has been running a national Climate Protection Initiative since 2008. The purpose of this is to tap into the existing potentials for reducing emissions cost-effectively and to promote innovative pilot projects for climate protection. The Climate Protection Initiative is financed from proceeds of the auctions of emissions certificates. Information on the climate protection initiative is available on the web at http://www.bmu-klimaschutzinitiative.de/.

(e) Who is responsible for publishing information on the net benefits, costs and energy efficiency of equipment and systems using renewable energy sources for heating, cooling and electricity? (Supplier of the equipment or system, public body or someone else?)

All information centres mentioned under point (b) of this section inform consumers about the cost benefits of each technology. Furthermore, equipment manufacturers and suppliers are responsible for providing publications on technical data and cost data for installations and installation equipment. Trade associations also provide publications on manufacturer data. Consumers also always have the option of

assessing information on technical details and test comparisons about different installations (biomass boilers, wood pellet, solar systems, etc.) through neutral bodies such as the consumer protection foundation *Stiftung Warentest*.

Indirectly, minimum standards for installations and equipment arise from national standards such as for efficiency, annual performance factors or heat recovery rate. Certification systems can also give indications of the minimal technical characteristics of installations.

(f) How is guidance for planners and architects provided to help them to properly consider the optimal combination of renewable energy sources, high efficiency technologies and district heating and cooling when planning, designing, building and renovating industrial or residential areas? Who is responsible for that?

National legislation guarantees an examination of the possibilities of funding renewable energies through planning authorities and the appropriate control of developments in this area. The obligation to inform resides by the planning authorities, who are expected to be well acquainted with the legal situation provided by the EEWärmeG and the EnEV is assumed. Furthermore, there are federal guidelines for a general audience in form of recommendations in publications of the Federal Government. Specific recommendations for planners and architects have not been published by the Federal Government so far. The Federal Government does, however, as part of its public outreach efforts, offer comprehensive, general information on renewable energy sources (see, for example http://www.erneuerbare-energien.de and http://www.nachwachsende-rohstoffe.de).

In some cases, federal states, chambers and associations have created their own guidelines (e.g. guidelines for energy-optimised planning in Essen, guidelines for energy in the building industry or specific planning instructions for local construction projects in Cologne and Kassel, design principles and guidelines of the VDI for planning offices and industry planners, etc.) to integrate renewable energy in urban planning measures.

(g) Please describe the existing and planned information, awareness raising and training programmes for citizens on the benefits and practicalities of developing and using energy from renewable sources. What is the role of regional and local actors in the designing and managing these programmes?

An overview of the programs is presented in the notes under 7.3.5.

The role of regional and local actors in the planning and management depends on the type of measure. Most measures run under a central umbrella campaign, but are nevertheless planned and implemented by local actors. The involvement of local actors in the past has proven to be useful. The local level creates acceptance and strengthens regional structures/grids in the area of renewable energy.

4.2.5. Certification of installers (Article 14(3) of Directive 2009/28/EC)

(a) Reference to existing national and/or regional legislation (if any) concerning certification or equivalent qualification schemes for installers according to Article 14(3) of the Directive 2009/28/EC:

Article 14(3) of Directive 2009/28/EC refers to certification and qualification systems for installers of biomass boilers and stoves, solar systems, geothermal systems and heat pumps, which involve mainly activities in the field of crafts. The structure of craft training in Germany is regulated by laws and training regulations.

Here we are concerned primarily with the installer trade. This trade is subject to licensing (§ 1(2) and Annex A(24) of the Crafts Code (*Handwerksordnung* – HwO). The independent operation of a trade is permitted only to establishments which are listed in the register of craftsmen. Prerequisite for registration is passing the master's examination.

Prerequisite for admission to the master's examination is passing the journeyman's examination. Basis for the apprenticeship is the regulation on vocational training for installation mechanics for sanitation, heating and air conditioning systems of 24 June 2003 (*Verordnung über die Berufsausbildung zum Anlagenmechaniker für Sanitär-, Heizungs- und Klimatechnik* – BGBl I S. 1012). The final exam consists of a theoretical and a practical part. The training includes the mounting of technical supply systems, and the integration of sustainable energy and water-management systems.

The master training program which takes place after the apprenticeship is governed by regulations on the master's examination and the examination requirements in Parts I and II of the *Installateur- und Heizungsbauer-Handwerk* (Installer and Heating Fitter Craft) of 17 July 2002 (BGBl I S. 2693). The qualifications listed in the regulations refer to equipment and systems for the supply and disposal of gas, water, air, heat and other energy sources and media, including sanitary facilities. This also covers installations for the use of renewable energies such as biomass boilers, photovoltaic and solar thermal systems and heat pumps. The qualifications are demonstrated in a practical and a theoretical part of the master's examination.

The installations mentioned in Article 14(3) involve also other crafts, like the electrical and roofing trade. These too are subject to approval, with training regulations for the journeyman's and master's examinations, similar to those installers must undertake.

Regulations can also be adopted for further training of craftsmen. These are, on the one side, training regulations of the Federal Ministry for Education and Research under § 42 HwO, and, on the other side, further training examination regulations of the trade chambers according to § 42a HwO. To ensure that training regulations exist by the end of 2012 which fully comply with the stipulations of Annex IV to Directive 2009/28/EC, it is planned, as part of the law transposing the

Directive (European Law Adaptation Act for Renewable Energy) into the EEWärmeG, to transfer relevant requirements.

(b) Responsible body/(ies) for setting up and authorising certification/qualification schemes by 2012 for installers of small-scale biomass boilers and stoves, solar photovoltaic and solar thermal systems, shallow geothermal systems and heat pumps:

Responsible for the adoption of training regulations is the Federal Ministry of Economics and Technology. The journeyman's examination is taken before a board of examiners from the Chamber of Trades and Crafts (*Handwerkskammer*); the master's examination is taken before a master's examination board (state examination authority at the Chamber of Trades and Crafts).

(c) Are such certification schemes/qualifications already in place? If so, please describe.

Yes, see a).

(d) Is information on these schemes publicly available? Are lists of certified or qualified installers published? If so, where? Are other schemes accepted as equivalent to the national/regional scheme?

The relevant laws and regulations for technical training are accessible to everyone over the internet or from the responsible institutions, such as the chambers of trades and crafts.

When a company is listed in the register, a trade card is issued (§ 10 (2) HwO). In the trade card, name and address of the holder is registered, company site, craft activity and date of entry in the register. In case of a legitimate interest, specific information from the register of craftsmen will be issued (§ 6 (2) HwO).

The recognition of professional qualifications from nationals of other EU Member States for crafts requiring certification shall be accredited by the rules implementing Directive 2005/36/EC (Professional Qualification Directive), which is the EU/EEA-trade regulation of 20 December 2007 (BGBl I S. 3075).

(e) Summary of the existing and planned measures at regional/local levels (where relevant):

Technical training is regulated by federal law. It is currently foreseen that the implementation of Article 14(3) of Directive 2009/28/EC will be done through adoption of training examination regulations of the regional chambers under § 42a HwO. An amendment to the EEWärmeG will ensure the binding of these regulations to the requirements set out in Annex IV of Directive 2009/28/EC; here we point out at the answer to question a.

4.2.6. Electricity infrastructure development (Article 16(1) and Article 16(3) to (6) of Directive 2009/28/EC)

(a) Reference to existing national legislation concerning requirements related to the energy grids (Article 16):

The following table provides an overview. Indented in italics are detailed references as well as the regulations which are provided by the previously mentioned act.

Table d: National legislation on energy grids

Act/Regulation	Content
EnWG	Law on electricity and gas supply. Comprehensive energy economic and legal framework.
KraftNAV	*Regulations governing the grid connection of plants for the production of electric energy.*
StromNZV	*Regulation for access to electricity grids. Regulation of grid access and the design of grid access by grid users.*
StromNEV	*Regulation about fees for access to electricity supply grids. Contains a definition of the method for determination of grid fees, including the establishing of fees for local feeds.*
ARegV	*Regulation on incentives-regulation of energy grids. Regulates which elements of the grid costs are allocated to what extent to the grid fees.*
NAV	*Regulation on general conditions for grid connection and its use for low voltage electricity supply.*
EEG	Act on the priority of renewable energy.
§ § 5 et seq	*Access to the grids*
§ 8	*Demand, transmission and distribution*
§§ 9ff	*Capacity Expansion and feed-in management*
§§ 13ff	*Costs*
EnLAG	Act on the expansion of power lines. Acceleration of grid development through needs determination of individual grid routes, conditions for underground cables as an alternative to overhead lines in pilot projects
UVPG, Nature Conservation Law, Planning Law, Pollution Control Law	Significant importance in the planning process. Covered by the concentration effect of the approval procedure.
SDLWindV	Regulation on system services by wind turbines
SeeAnlV	Ordinance on Offshore Installations Seaward of the Limit of the German Territorial Sea, Planning procedures in the AWZ

(b) How is it ensured that transmission and distribution grids will be developed with a view to integrating the targeted amount of renewable electricity while maintaining the secure operation of the electricity system? How is this requirement included in the transmission and distribution operators' periodical grid planning?

The requirement to grid development by operators is already implemented with §§ 11 and 12 EnWG. The general requirement to development as defined under EU regulations is specified and expanded here to include obligations to optimisation and enhancement.[25] In addition, the requirement to grid development planning is concretised, which facilitates the examination of compliance with development requirements and increases their enforceability[26].

An appropriate and targeted development of electricity grids is ensured, in view of integration of electricity from renewable energies, by two approaches in particular: an individual requirement of plant operators and a general requirement to development of grid operators.

- First, each plant operator is given by the EEG an individually enforceable right to immediate grid development (§ 9 EEG) and a claim for damages in the case of culpably delayed grid development by grid operators (§ 10 EEG). This is supplemented by a compensation claim in case of feed-in management measures (§ 11 EEG, see also Chapter 4.2.7). Through these rules, grid development for the benefit of electricity from renewable energy sources is given preference and potentially expedited[27]. These legal requirements are likely to exert their effect mainly in the area of distribution grids (low, medium and some high-voltage).
- Moreover, in accordance with § 12(3a) EnWG in combination with § 14(1), grid operators are required to produce a report on grid development planning every two years. This report is to be drawn up on the basis of power plant construction and load forecast. Implementation status of the planned grid development project will be documented[28] as part of reporting obligations. The additional demand for grid development activities, resulting from the use of wind energy by 2015, was determined with the involvement of relevant stakeholders as part of the *dena* Grid Study I. A determination of the expansion needs until 2020 is currently being developed under the *dena* Grid Study II, the results of which should be available in 2010. In addition, there are the regulations of EnLAG, with which the energy-needs of a total of 24 projects have been established. These rules pertain only to transmission grids (high voltage level).

[25] BMU, 2005, p. 17

[26] Optimization means expansion of existing grid capacity through innovative operational strategies ('dynamic rating'); enhancement means the extension of the existing grid capacity through additional parallel transmission systems or replacement of conductor cables through cables with higher power transmission capacity

[27] BMU 2010a

[28] BMU 2010a

With this, the requirement for grid development in Germany is sufficiently defined. Adequate compliance could, in accordance with BMU (2010A), be achieved through strict application of §§ 30, 31 EnWG.

Implementation of the third EU energy market package will bring changes to grid development planning. It provides that grid operators draw up annual grid development plans, which include specific grid development planning.

The illustrated map (see 7.3.6) in the annex to Chapter 4.2.6 gives an overview of necessary grid development measures in Germany. The UCTE Transmission Development Plan[29] was initially consulted, also results of the *dena* grid study and the priority projects of the TEN-E Directive. In addition, the list of urgent projects mentioned in the Power Line Expansion Act (*Energieleitungsausbaugesetz* – EnLAG) has been provided.

(c) What will be the role of intelligent grids, information technology tools and storage facilities? How will their development be ensured?

The concepts mentioned will make a key contribution in the future to the integration of electricity from renewable energies. The integrated energy and climate program of the Federal Government emphasizes, for instance, the necessary creation of storages, the use of optimisation options and the possible contribution of electric mobility to intelligent integration in the future energy system.[30] The Federal Government wants to develop modern energy grids into intelligent grids, and foster the connection of electricity grids with information and communication technologies.[31]

The existing incentives include in particular § 118(7) EnWG, which stipulates that grid fees for newly constructed pump storage plants will be dropped for ten years.

In addition to legal requirements concerning the introduction of variable tariffs (§ 40(3) EnWG) and intelligent meters (§ 21b(3a) and (3b) EnWG), development will be ensured mainly through project-specific grants. Examples are:

- *E-Energy – IKT-basiertes Energiesystem der Zukunft* (E-Energy – ICT-based Energy System of the Future) to support pilot projects in pilot regions
- Electric Mobility: *Nationaler Entwicklungsplan Elektromobilität* (National Development Plan for Electric Mobility)[32], Research funding under the second stimulus package, creation of the *Nationalen Plattform Elektromobilität* (National Electric Mobility Platform) for coordination of all stakeholders.

[29] See the Federal Grid Agency for Electricity, Gas, Telecommunications and Post 2009
[30] UCTE 2008
[31] Federal Government 2007
[32] CDU, CSU, FDP 2009

(d) Is the reinforcement of the interconnection capacity with neighbouring countries planned? If so, which interconnectors, for which capacity and by when?

A reinforcement of the interconnection capacity with neighbouring countries is planned. The plans are documented in particular in the UCTE Transmission Development Plan (now ENTSO-E), which brings together the plans of the individual transmission system operators. In addition, the need for individual lines is identified in the EnLAG and/or in the TEN-E Directive. Details are provided in a table in the Annex, 7.3.7.

(e) How is the acceleration of grid infrastructure authorisation procedures addressed? What is the current state and average time for getting approval? How will it be improved? (Please refer to current status and legislation, bottlenecks detected and plans to streamline procedure with timeframe of implementation and expected results.)

The complexity of planning and other authorization procedures are considered to be the main reason for protracted planning periods and delays in the development of grid infrastructure.[33] The general procedual steps for authorisation procedures in Germany are established in the Administrative Procedure Act (*Verwaltungsverfahrensgesetz* – especially Part V, § § 63-78 VwVfG). Essential features are the concentration effect and the need for public participation in projects requiring planning approval. Overall, the procedure is complex, but it does lead to the elimination of parallel authorisation procedures – and possible follow-up disputes. The complexity therefore has a time-saving effect.[34]

Additionally, the EnWG includes a number of expediting measures, in particular Article 7 of the Infrastructure Planning Acceleration Act (*Infrastrukturplanungsbeschleunigungsgesetz*) which amends the EnWG accordingly. Among the main expeditive measures are:

- Shortening of deadlines
- Estoppel (§ 43b No. 1)
- Waiver of the suspensive effect of appeals (§ 43e (1))
- Granting planning permission on request, provided that no EIA must be carried out (§ 43b No 2)
- Legal pre-effect of expropriation (§ 43b EnWG 3): In planning approval and planning procedures for power lines, decisions on admissibility of expropriation will be legally binding. Potentially time-consuming verification steps by the expropriation authority are no longer needed.
- Preferential treatment of 110 kV underground cables in a 20 km wide corridor along the North Sea and Baltic Sea (§ 43 p. 3 EnWG).

In addition, the EnLAG has ascertained the urgent need for the projects listed in the requirement plan annexed to the act. This eliminates the

[33] Federal Government 2009

[34] e.g. European Commission 2006

need of approval authorities having to identify energy need and urgent demand for these projects. The EnLAG also stipulates that for priority projects of the EnLAG legal action will be restricted to one instance (Federal Administrative Court as the first and last instance). The EnLAG has also established regulations for the use of underground cables at extra-high voltage level within the framework of pilot projects and costs regulations for underground cables at high voltage level.

Finally, there is the requirement, in accordance with § 9 EEG, of immediate optimisation, enhancement and development to ensure the generation, transmission and distribution of electricity from renewable energy sources.

To what extent these measures will actually have an accelerating effect and whether the current duration of procedures of about ten years can be significantly reduced[35] will only be revealed in the sequel.

(f) How is horizontal coordination facilitated between different administrative bodies, responsible for the different parts of the permit

As part of regional planning procedures which take place in Germany at federal level, line routing can and will take into account relevant land-use policies. In addition, each approval procedure has a concentration effect, whereby a proper consideration of other interests, like nature conservation, is ensured. Further details are given in Chapter 4.2.1

One exception is the approval of cross-border submarine cables that pass through the EEZ, such as the planned cable between Germany and Norway. These require a separate approval procedure in accordance with the SeeAnlV.

(g) Are priority connection rights or reserved connection capacities provided for new installations producing electricity from renewable energy sources?

In Germany, these installations are granted immediate and priority grid connection under the provisions of the EEG (§ 5). In addition, grid operators are obliged to feed into the grid the total available power immediately and to transmit and distribute it (§ 8). These obligations of the operators constitute absolute priority access.

Capacity reservation is not possible. However, the grid operator may not refuse due to lack of grid capacity. Instead, operators are required to optimise their grids, enhance and expand them, to enable grid access.

Two limitations arise, however, concerning entitlement to priority access. First, the operator is not obliged to grid development if it is not economically reasonable (§ 9 (3)). In addition, the feed-in obligation is restricted if in individual cases supply security is threatened (§ 11).

(h) Are any renewable installations ready to come online but not connected due to capacity limitations of the grid? If so, what steps are taken to resolve this and by when is it expected to be solved?

[35] BMU 2010a

The Clearing House EEG – a neutral body for resolving disputes and implementation issues of the EEG – has received some requests recently, mainly from operators of photovoltaic systems in southern Germany, in which potential plant operators indicate that the installations are ready to come online, but grid operators would not connect them on short notice.[36] It could not be determined to what extent limitation of grid capacity is the cause of the failure of grid connection. The cause of this situation is extremely high figures for advance purchases of installations due to the anticipatory effect of the planned reduction of remuneration for photovoltaic installations due on 1 July 2010. A systemic problem is not apparent.

(i) *Are the rules on cost sharing and bearing of grid technical adaptations set up and published by transmission and distribution system operators? If so, where? How is it ensured that these rules are based on objective, transparent and non-discriminatory criteria? Are there special rules for producers located in peripheral regions and regions with low population density? (Cost bearing rules define which part of the costs is covered by the generator wishing to be connected and which part by the transmission or distribution system operator. Cost sharing rules define how the necessary cost should be distributed between subsequently connected producers that all benefit from the same reinforcements or new lines.)*

The relevant regulations are laid down by law (§§ 13-15 EEG). Preparation and publication of these regulations by grid operators therefore does not happen.

There are no separate regulations for generating plants in marginal areas.

(j) *Please describe how the costs of connection and technical adaptation are attributed to producers and/or transmission and/or distribution system operators.How are transmission and distribution system operators able to recover these investment costs? Is any modification of these cost bearing rules planned in the future? What changes do you envisage and what results are expected? (There are several options for distributing grid connection costs. Member States are likely to choose one or a combination of these. According to the 'deep' connection cost charging the developer of the installation generating electricity from renewable energy sources bears several grid infrastructure related costs (grid connection, grid reinforcement, and extension). Another approach is the 'shallow' connection cost charging, meaning that the developer bears only the grid connection cost, but not the costs of reinforcement and extension (this is built into the grid tariffs and paid by the customers).*

(k) *A further variant is when all connection costs are socialised and covered by the grid tariffs.)*

The costs of grid connection to the nearest, suitable grid connection point are borne by the operator. Additional costs incurred from a

[36] BMU 2006

differing connection point allocated by the grid operator, are borne by the latter (§ 13 EEG).

The costs of measures to optimise, enhance and expand the grids are borne, in accordance with § 14 EEG, by the system operators. Through a levy on the grid fees, grid operators will recover the costs incurred. The recovery of costs is enabled by the general energy requirements of the EnWG and relevant regulations (particularly ARegV). The additional costs incurred by grid operators because of their responsibilities under the EEG are in principle recoverable; they are, however, subject to an efficiency test by the Federal Grid Agency.

(l) *Are there rules for sharing the costs between initially and subsequently connected producers. If not, how are the benefits for subsequently connected producers taken into account?*

All costs of grid optimisation, expansion and development are borne by the operator. Therefore producers connected at a later point have no cost advantages.

(m) *How will it be ensured that transmission and distribution system operators provide new producers wishing to be connected with the necessary information on costs, a precise timetable for processing their requests and an indicative timetable for their grid connection?*

The general procedure for obtaining grid connection for new producers is regulated in the ordinance on grid connection for electricity generating installations (*Kraftwerks-Netzanschlussverordnung* – KraftNAV). It applies to all power generating plants of over 100 MW capacity, leaving EEG and KWKG regulations unaffected. The KraftNAV defines information requirements of grid operators mainly in terms of technical parameters, expected costs and guidelines for the agreement on schedules between grid subscribers and grid operators. For connection to low voltage power distribution grids the Low Voltage Connection Ordinance (*Niederspannungsanschlussverordnung* – NAV) is applied. Due to the definition in § 1(1) NAV, however, it does not apply to the connection of installations for the production of electricity from renewable energy sources.

Because of energy divisions defined by the KraftNAV, it applies only to offshore wind plants in the territorial sea as well as to individual large wind farms on land. The provisions of the EEG apply for all other installations producing electricity from renewable energy sources, in addition to general energy requirements. According to § 5(5) of the EEG, producers and grid operators are obliged to provide each other on request within eight weeks with all available documents required to determine the appropriate grid connection point and the implementation of grid compatibility testing. Regarding the implementation of grid connection, § 7(2) EEG merely states that the connection point must meet the technical requirements of the grid operator, which in turn shall publish these in the internet in accordance with § 19(1) EnWG. As part of the European Law Adaptation Act (EAG), an amendment of § 5(5) is planned, to ensure the submission of a detailed timetable for the application process and a timetable for grid connection of installations.

4.2.7. Electricity grid operation (Article 16(2) and Article 16(7) and (8) of Directive 2009/28/EC)

(a) How is the transmission and distribution of electricity from renewable energy sources guaranteed by transmission and distribution system operators? Is priority or guaranteed access ensured?

The transmission and distribution of electricity from renewable energy sources is guaranteed in Germany through regulations in the EEG. The grid operator must buy electricity from renewable sources preferentially and without delay, transmit and distribute it (§ 8 EEG).

Distribution grid operators that feed-in electricity into their grid, transmit it to transmission grid operators. Transmission system operators implement a nationwide compensation in conformity with the Equalisation Scheme Ordinance *(Ausgleichsmechanismusverordnung* – AusglMechV). Under this regulation, transmission system operators are required to market the total amount of electricity they receive on the spot market and/or to market without limits a suitable electricity exchange on the intraday market, so that the entire quantity of electricity is sold. Any expenses incurred are charged proportionally by the transmission system operators, as part of financial allocations, to all electricity companies supplying end customers.

With this, since January 2010 no physical allocations of electricity from renewable energy sources to end customers take place, as previously did in conformity with §§ 34-39 EEG. The preferential transmission and distribution of electricity from renewable energy sources is, however, still ensured.

(b) How is it ensured that transmission system operators, when dispatching electricity generating installations give priority to those using renewable energy sources?

In Germany there are two regulations governing the priority use of installations producing electricity from renewable energy sources:

- According to § 8(1) of the EEG, grid operators are required to purchase, transmit and distribute preferentially the total amount of electricity from renewable energy sources. Only in situations where the grid operator's requirement to purchase stands against safe and reliable power supply, the operator can, with a so-called feed-in management, in accordance with § 11 EEG, down-regulate renewable energy installations with a capacity of over 100 kW.
- In accordance with § 13 EnWG, transmission system operators (and according to § 14 EnWG distribution system operators also), are required to counteract threats to reliable supply through grid-specific or market-related measures (in accordance with paragraph 1) or active intervention in the feeds (in accordance with paragraph 2). These measures may also affect the priority of renewable energy.

The priority use of renewable energy is therefore guaranteed in principle. However, in reality it depends on the ranking order of these measures and the question of which installations are regulated in which

order. Differing statements have been made about this in studies Schumacher (2009), for example, concludes that plants producing electricity from renewable energies may be limited only when conventional power stations no longer are in the grid, whereas Salje (2006) argues that priority feed, according to the EEG, is only subject to § 13 of the EnWG.

Random tests show that transmission grid operators, after exhausting all measures according to § 13(1) EnWG also limit plants for electricity production from renewable energies within the framework of § 13(2) EnWG.[37]

As a result, the relationship between § 11 EEG and § 13(1) and (2) EnWG is now interpreted differently. With a view to situations in which renewable energies cover a high percentage of AC power (e.g. strong winds at low load), legal improvements can only be made with future experiences and future grid-related detailed studies.

(c) *How are grid- and market-related operational measures taken in order to minimise the curtailment of electricity from renewable energy sources? What kinds of measures are planned and when is implementation expected? (Market and grid design that enable the integration of variable resources could cover measures such as trading closer to real time (changing from day-ahead to intra-day forecasting and rescheduling of generators), aggregation of market areas, ensuring sufficient cross border interconnection capacity and trade, improved cooperation of adjacent system operators, the use of improved communication and control tools, demand-side management and active demand-side participation in markets (through two-way communication systems – smart metering), increased distributed production and domestic storage (e.g. electric cars) with active management of distribution grids (smart grids).)*

The supply of electricity from renewable energy sources is, based on § 8 EEG, is to be preferentially purchased, transmitted and distributed by grid operators. Limitations may arise due to the threat to safety and reliability of supply, because grid operators are entitled to intervene in such cases. The circumstances for these interventions are defined in § 11 EEG and §§ 13 f EnWG and discussed in Chapter 4.2.7 (b).

Grid-related measures include primarily grid circuits; market measures include mainly the use of balancing energy, contractually agreed switchable loads, information about bottlenecks and congestion management, and mobilizing additional resources through countertrading and redispatch.

(d) *Is the energy regulatory authority informed about these measures? Does it have the competence to monitor and enforce implementation of these measures?*

[37] Clearing House EEG 2010

According to § 11 of the EEG, grid operators must publish feed-in management measures immediately on their websites – an explicit obligation to inform the regulatory authorities is not provided.

The reasons for the adjustments and the measures taken must be communicated to those affected and to the regulatory authorities immediately, according to § 13(1) and (2).

(e) Are plants generating electricity from renewable energy sources integrated in the electricity market? Could you please describe how? What are their obligations regarding participation in the electricity market?

In principle, electricity from renewable energy sources is fostered in Germany through a fixed feed-in tariff, which is regulated by the EEG. Hence an active participation of installation operators in the electricity market does not take place; however, plant operators can sell the electricity produced *monthly* to third parties, via direct marketing – or a percentage of it. The grid operator should be informed in advance of the time period – and possibly the amount – in which it is to be directly marketed. In this case the operator is subject to the same rights and obligations as every other electricity producer. This concerns mainly the obligation to deliver and maintain a road map and to purchase balancing energy if deviations from the notified road map occur.

Even if this electricity is subject to support under the EEG, it has an influence on the power markets, as the transmission system operators sell electricity volumes on the stock market within the framework of the EEG balancing mechanism.

According to § 64 EEG, the Federal Government also has the possibility to issue ordinances for the perpetuation, demand-oriented feed-in and for the improved grid and market integration of electricity from renewable sources.

(f) What are the rules for charging transmission and distribution tariffs to generators of electricity from renewable energy sources?

Grid fees, as well as transmission and distribution tariffs are charged in Germany only for the take-up of electrical energy.

Producers of electricity from renewable energy sources are therefore not charged transmission and distribution tariffs.

4.2.8. Biogas integration into the natural gas grid (Article 16(7) and Article 16(9) and (10) of Directive 2009/28/EC)

(a) How is it ensured that the charging of transmission and distribution tariffs does not discriminate against gas from renewable energy sources?

Improved feed-in conditions for biogas treated to reach natural gas quality (also called bio-methane) into the gas grid have been achieved with the Ordinance for the Promotion of Biogas Supply into the Existing

Gas System (Verordnung zur Förderung der Biogaseinspeisung in das bestehende Erdgasnetz) from 8 April 2008. There were changes made i.e. to:

- Gas Grid Access Ordinance (GasNZV)
- Gas Grid Fees Ordinance (GasNEV)
- Incentive Regulation Ordinance (ARegV)

Furthermore, the Energy Act (EnWG) was adjusted accordingly. The Renewable Energy Sources Act (EEG), Federal Immissions Control Act (BImSchG), and the Renewable Energies Heat Act (EEWärmeG) generate demand for biomethane.

This results in the following overall picture:

- Preferential rights for biomethane (processed to attain natural gas quality)
- Priority grid access for biomethane gas, where technically and economically reasonable
- Gas grid connection requirement for gas grid operators, where technically and economically reasonable.
- Gas grid connection costs will be split between biomethane suppliers and grid operators. Grid connection points pass into ownership of the grid operator.
- Costs of operating the connection point is borne by the grid operator
- Grid flat rate (0.7 cents/kWh) borne by the biomethane supplier because of operator's grid costs.
- Extended balancing: Biogas-balancing of 12 months with a 25 % flexibility framework. This ensures a further simplification of the transport of processed biogas into the natural gas grids.

Should problems in practical implementation arise, these will be examined by the competent ministries and monitored through appropriate research projects in the future. On 19 May 2010, the Federal Cabinet presented the draft revision of the Gas Grid Access Ordinance drawn up by the Federal Minister of Economics and Technology. This draft includes proposed changes in the regulatory framework for biogas feed-ins, with which the conditions for the supply of biogas will be improved and developed. The Federal Council approved, with minor amendments, the Federal Government's draft on 9 July 2010.

(b) Has any assessment been carried out on the need to extend the gas grid infrastructure to facilitate the integration of gas from renewable sources? What is the result? If not, will there be such an assessment?

Yes, examination of the gas infrastructure and its suitability for biomethane integration took place through various research projects. Some examples are:

- Agency of Renewable Resources (FNR) (ed.): *Einspeisung von Biogas in das Erdgasnetz* (Feeding of biogas into the natural gas grid)
- BMBF joint project *Biogaseinspeisung* (Biogas feed-in) (see website: http://www.biogaseinspeisung.de/)
- BMU contribution *Gasnetze der Zukunft* (Gas Grids of the Future) (see website: http://www.umsicht.fraunhofer.de/presse/bericht.php?titel=100622_gasnetzederzukunft)

There is no need for expansion. The area of Germany is almost completely crisscrossed with suitable high pressure pipelines. In addition, if local intake capacity bottlenecks happen, operators are required to feedback biomethane at high pressure into the upstream grid, to increase the entry capacity of gas at the feed-in point.

(c) Are technical rules on grid connection and connection tariffs for biogas published? Where are these rules published?

See answer to point (a). All mentioned laws are available on the Internet.

The worksheets of the German Association for Gas and Water Industry (*Deutschen Vereinigung des Gas- und Wasserfaches e.V.* – DVGW) define the essential requirements for gas grids in the public service. These regulations can be purchased at the DVGW. For the biogas feed-in, the following rules are particularly relevant:

- DVGW G 260 (*Gasbeschaffenheit* [Gas Quality])
- DVGW G 262 (*Nutzung von Gasen aus regenerativen Quellen in der öffentlichen Gasversorgung* [Use of Gases from Renewable Sources in Public Gas Supply])
- DVGW G 280-1 (*Gasodorierung* [Gas Odorisation])
- DVGW G 280-2 (*Umstellung der Odorierung von Gasen in der öffentlichen Versorgung* [Odorisation Change of Gases in Public Supply])
- DVGW G 685 (*Gasabrechnung* [Gas Billing])
- DVGW testing basis VP 265-1 (*Anlagen für die Aufbereitung und Einspeisung von Biogas in Erdgasnetze* [Installations for Processing and Feeding Biogas into Natural Gas Grids])

Grid operators are also required by the gas grid access regulation to inform on their websites about network structure, utilisation and pipeline routes. The effects of these specific biogas regulations will be evaluated until 31 May 2011.

4.2.9. District heating and cooling infrastructure development (Article 16(11) of Directive 2009/28/EC)

(a) Please provide an assessment of the need for new district heating and cooling infrastructure using renewable energy sources and contributing to the 2020 target. Based on this assessment, are there plans to promote such infrastructures in the future? What are the expected contributions of large biomass, solar and geothermal [38] facilities in the district heating and cooling systems?

In order to achieve the objective of the EU Directive 2009/28/EC and allow for the efficient generation and transfer of renewable heat into the building sector, there is a need to build new heating and cooling network infrastructures, or expand and intensify existing ones. In particular district heating networks and solutions will play a greater role than they have in recent years.

Based on this assessment, are there plans to promote such infrastructures in the future?

In the current legal basis, a variety of promotion and incentive systems already exist.

The Combined Heat and Power Act (KWKG) which came into effect 1 January 2009 is a key component in increasing the contribution of electricity from CHP-plants (even if not exclusively from renewable energies) and the promotion of construction and development of heating networks. According to § 7a(1-3) (adopted version of 25 October 2008): 'The compensation payment per milimeter nominal diameter of newly installed heating pipe is one euro per meter of path. According to sentence 1, the compensation payment may exceed 20 % of identifiable investment costs for the new construction or development, but may not exceed a total of 5 million euros per project. Identifiable investment costs are all costs which have actually been incurred – for necessary third party services – for the new construction or development of the heating network. The sum of the premium payments for heat supply grids must not exceed 150 million euros per calendar year.'

In addition, district heating networks which are supplied with heat from renewable energy sources can receive funding within the framework of the Market Incentive Program (MAP) specifically within the KfW-program *'Erneuerbare Energien'* ('Renewable Energy'), section *'Premium'.* According to MAP funding guidelines in the current version of 20 February 2009, with amendments of 17 February 2010, the construction or extension of heating networks is eligible for funding [39] which:

a) are supplied at least by 20 % solar radiation energy, provided that otherwise heat is used almost exclusively from high efficiency cogeneration plants or from heat pumps, or that

[38] Vattenfall Europe Transmission GmbH 2009, 50Hertz Transmission GmbH, 2010

[39] Im deutschen Sprachgebrauch wird üblicherweise von 'Geothermie' gesprochen.

b) at least 50 % of heat is supplied from renewable energy sources,

as well as the construction of the building transfer stations in heating networks in accordance with letters a or b.

The biogenic portion of municipal waste is considered renewable energy under this regulation (heat from waste incineration).

The local heating networks have to demonstrate in average over the entire fundable grid a minimum heating value of 500 kWh per year and pipeline meter (excluding supply pipes). The redemption subsidy for first development is 60 euros per newly built pipeline and otherwise 80 euros per newly built or reinforced meter of pipe, the maximum, however, being one million Euros (maximum funding amount). The funding limit is increased to 1.5 million euros if heat is supplied into the heating network from purely deep geothermal plants. If a claim for compensation payment, in accordance with § 7a KWKG exists, the redemption subsidy accordingly decreases.

Net investment costs for each building transfer station are included in the fundable investment costs, for which, at the time of commissioning of the eligible heating network, a binding connection contract was concluded and for which no access obligation exist. The redemption subsidy is 1800 euros per building transfer station.

In addition, various incentives are in place within the framework of the law to promote renewable energies in heating, the EEWärmeG, which requires new buildings to use a proportionate share of renewable energies to meet heating needs (see 4.2.3). This requirement may also be satisfied by the supply of long-distance heating or cooling, if the heat:

a) is to a substantial proportion from renewable energies,

b) is at least 50 % from facilities for the use of waste heat,

c) is at least 50 % from CHP-plants or

d) is at least 50 % from a combination of measures mentioned in letters a to c .

In addition, § 16 EEWärmeG also gives local authorities the possibility to establish an obligation to connect to and use public district heating and cooling.

Another component is the CHP bonus in the EEG. This is particularly granted for CHP-plants based on renewable energies, provided the heat is fed into a district heating network.

Indirect incentives for the development of local heating systems based on renewable energy are given by the EnEV as well as by KfW's funding programs for energy-efficient construction and renovation (CO_2-building refurbishment program). The technical rules referred to in the energy saving regulation determine the calculation method for establishing the primary energy factors for local and district heating networks. These are relevant for determining the primary energy values

according to EnEV. The use of renewable energies leads to very low primary energy factors and consequently low primary energy values of the buildings connected – or to be connected. Since the amount of KfW-funding is linked to the energy level achieved, this may increase the incentive for building owners to aim for grid-connected heating – especially on the basis of renewable energies – or for investors to fund grid-connected renewable energy plants. Similarly, the same effect can be achieved with regard to the fulfilment of levels prescribed by the energy saving regulations.

What are the expected contributions of large biomass, solar and geothermal facilities in the district heating and cooling systems?

Overall, a significant contribution of more than 2 500 ktoe/a (100 PJ/a) is expected in 2020 (see Table 11). The heat from biomass will still dominate, but there will be a significant increase in heat supply from large solar thermal systems, and in particular from deep geothermal systems (see point 5.1).

4.2.10. Biofuels and other bioliquids – sustainability criteria and verification of compliance (Articles 17 to 21 of Directive 2009/28/EC)

(a) How will the sustainability criteria for biofuels and bioliquids be implemented at national level? (Is there legislation planned for implementation What will be the institutional setup?)

The sustainability criteria for biofuels and other liquid biofuels have been implemented in two regulations – the current Biomass Sustainability Ordinance (*Biomassestrom-Nachhaltigkeitsverordnung* – Bioster-NachV) and the Biofuels Sustainability Ordinance (Biokraft-NachV). Both regulations implement the sustainability requirements of the Directive on the Promotion of the Use of Renewable Energy Sources 2009/28/EC.

In accordance with Bioster-NachV, meeting sustainability requirements is a prerequisite, from 1 January 2011, for the compensation of renewable electricity under the EEG. CHP operators receive an additional bonus for renewable raw materials as remuneration under the EEG only if the condition of greenhouse gas reduction by 35 % is fulfilled. This also applies to so-called vegetable oil from old installations.

According to Biokraft-NachV, to meet sustainability requirements is a prerequisite, from 1 January 2011, for recognition of biofuels on the biofuels quota and for the granting of tax benefits under the Energy Tax Act (*Energiesteuergesetz* – EnergieStG). Also biomethane processed to natural gas quality which is used as fuel must meet the sustainability criteria to be considered for the biofuels quota or benefit from tax relief.

(b) How will it be ensured that biofuels and bioliquids that are counted towards the national renewable target, towards national renewable energy obligations and/or are eligible for financial support comply with the sustainability criteria set down in Article 17(2) to (5) of Directive

2009/28/EC? (Will there be a national institution/body responsible for monitoring/verifying compliance with the criteria?)

Sustainability proof is provided in Germany with the help of non-governmental certifying bodies. The Federal Agency for Agriculture and Food (*Bundesanstalt für Landwirtschaft und Ernährung* – BLE) is responsible for the authorisation and monitoring of certification schemes and certification bodies. The authorisation of certification systems and certification bodies is ongoing. The BLE has approved two certification systems and twelve certification bodies (as of 16 June 2010).

(c) *If a national authority/body will monitor the fulfilment of the criteria, does such a national authority/body already exist? If so, please specify. If not, when is it envisaged to be established?*

See answer to point (b)

(d) *Please provide information on the existence of national law on land zoning and national land register for verifying compliance with Article 17(3) to (5) of Directive 2009/28/EC. How economic operators can access to this information? (Please provide information on the existence of rules and distinction between different land statuses, like biodiversity area, protected area etc; and on the competent national authority who will monitor this land register and changes in land status.)*

The protection of certain parts of nature and landscape for conservation purposes is carried out in Germany on the basis of §§ 22 et seq. of the (Federal Nature Conservation Act (*Bundesnaturschutzgesetz* – BNatSchG) in conjunction with federal states' conservation laws. According to § 22(4) and § 30(7) of the BNatSchG, protected parts of nature and landscape, or biotopes protected by law, must be registered and identified. Details of the registration, access to the register and identification are based on federal state law.

(e) *As far as protected areas are concerned, please provide information under which national, European or international protection regime they are classified.*

The protection regime for parts of nature and landscape under conservation depends on the relevant protection statement (see § 22(1) BNatSchG), whereby there are special regulations for Natura 2000 areas (§§ 31 et seq. BNatSchG). The legally protected biotopes are directly protected by law (§ 30 BNatSchG and conservation laws of the federal state).

(f) *What is the procedure for changing the status of land? Who monitors and reports at national level on land status changes? How often are the land zoning register updated (monthly, annually, bi-annually, etc.)?*

Area or content-related changes in protected parts of nature and landscape follow the same procedure and in the same form (act, regulation, etc.) as the original procedure placing them under protection.

(g) How is compliance with good agro-environmental practices and other cross-compliance requirements (required by Article 17(6) of Directive 2009/28/EC) ensured and verified at national level?

If companies prove that they receive direct payments under Regulation (EC) No 73/2009 or subsidies for area-related measures under the council's Regulation (EC) No 1698/2005 of 20 September 2005, the criteria named above is considered to be fulfilled. Evidence can consist of direct payment notices or requests for direct payments can be used for possible spot checks.

(h) Do you intend to help develop voluntary 'certification' scheme(s) for biofuel and bioliquid sustainability as described in the second subparagraph of Article 18(4) of Directive 2009/28/EC? If so, how?

Currently there are no plans.

4.3. Regulations of the Member State or group of Member States to promote the use of energy from renewable sources in the electricity sector

Legislation

Legal basis for the use of renewable energies for electricity generation in Germany is the Renewable Energy Sources Act (EEG). It first came into force on 1 April 2000 and has been evaluated at regular intervals in the form of progress reports, after which appropriate adjustments have been made. These were the *Gesetz zur Neuregelung des Rechts der Erneuerbaren Energien im Strombereich (*Act Revising the Renewable Energies Legislation in the Electricity Sector*)* of 1. August 2004 and the *Gesetz zur Neuregelung des Rechts der Erneuerbaren Energien im Strombereich und zur Änderung damit zusammenhängender Vorschriften* (Act Revising the Renewable Energies Legislation in the Electricity Sector and Amendment of Related Regulations) of 1 January 2009, which form the currently valid legal basis. The next review will be done in a progress report to be submitted not later than 31.12.2011. As a result of unforeseen developments in the prices of photovoltaic systems, non-scheduled adjustments of compensation schemes for photovoltaic systems are planned for the 1 July 2010 and 1 October 2010. The next regular revision of the Act is scheduled for 1 January 2012. The Act is to be valid indefinitely.

In addition to the general regulations, it includes mainly regulations for the connection of installations for production of electricity from renewable energy sources in public supply grids and the take-on, transmission and distribution of the renewable electricity generated. In addition, it contains provisions to the design of compensation schemes, to balancing the amount of electricity purchased and compensation payments, to the transparency of the system, to legal protection, to administrative procedures and to the power to issue ordinances, guidelines for progress reports and transitional provisions.

Quantitative expansion targets that had been defined in the applicable versions of the Act could be achieved or surpassed before the time limit set.

(a) (a) What is the legal basis for this obligation/target?

The legal basis is the Act Revising the Renewable Energies Legislation in the Electricity Sector and Amendment of Related Regulations, which, in turn, contains the currently applicable version of the Renewable Energy Sources Act (EEG).

(b) Are there any technology-specific targets?

Technology-specific targets do not exist.

(c) What are the concrete obligations/targets per year (per technology)?

The EEG includes in § 1(2) the target of a minimum 30 % share of electricity from renewable sources by 2020, which will steadily continue to be increased afterwards. This target is not defined in terms of technology or year.

(d) Who has to fulfil the obligation?

The Federal Government creates the necessary conditions for the achievement of the targets and takes appropriate action.

(e) What is the consequence of non-fulfilment?

See above.

(f) Is there any mechanism to supervise fulfilment?

The Act will be evaluated at regular intervals through progress reports. It contains sector-specific descriptions of developments, points out undesirable developments and makes recommendations for appropriate adjustments, such as a correction of the compensation rates. The progress report is followed by a new version of the Act, which accordingly takes into account the proposals for adjustments. As part of the Workgroup Renewable Energies Statistics (Arbeitsgemeinschaft Erneuerbare Energien – Statistik – AGEE-Stat), the development of renewable energy is recorded both application-specific (electricity, heat, fuel) and sector-specific. This database enables a fast target/current status comparison.

(g) Is there any mechanism to modify obligations/targets?

Target adjustments are made in the context of law revisions on the basis of the regular EEG progress reports.

Financial support

Preliminary note: The EEG feed-in tariffs are understood and described as financial support in the following points (a-o):

(a) What is the name and a short description of the scheme?

In the applicable version of the Renewable Energy Law (EEG), sector-specific tariffs are set for electricity from renewable energies fed into the public supply grid. The amount of compensation follows the principle of cost-covering compensation and is based on the specific electricity production costs of the specific sectors. The plant operator receives the feed-in tariff from the grid operator, whose network he supplies. Through a nationwide allocation scheme, compensation payments are distributed equally to all operators and passed on to electricity

customers. From government side, payment of the feed-in tariffs is not budget-relevant.

In addition, there is the possibility of low-interest loans through the KfW's funding programs, mainly the program Renewable Energy *(Erneuerbare Energien*) from program section *Standard.* The program addresses individuals and charitable organizations which feed-in the generated power, as well as domestic and foreign companies (mostly privately owned), companies in which municipalities, churches or charitable organizations are involved, self-employed professionals and farmers. The low-interest loans can be used for investment in installations for electricity production in accordance with the EEG, cogeneration plants and for small heat production installations (which do not fall into the program section *Premium*). In the field of electricity generation from renewable energy sources, these are mainly electricity from solar energy (photovoltaic), solid biomass until 5 MW thermal input, biogas, wind power, hydropower, geothermal energy and one or more kinds of renewable energies with energy storages or load management (collaborative projects). It funds the construction, acquisition or development of such installations. Not funded is the purchase of used installations.

(b) Is it a voluntary or obligatory scheme?

The Renewable Energy Act contains a binding obligation to the grid operator for compensation for fed-in electricity from renewable sources. Thus, it is an obligatory measure.

(c) Who manages the scheme? (Implementing body, monitoring authority)

There is no implementing body, in the strict sense, for granting the feed-in tariff according to the EEG, since it provides a framework for business relations within the private sector. Grid connection and tariffs are handled by the grid operators, as are the nationwide balancing payments and electricity volumes. The compensation mechanisms have been newly regulated through the Equalisation Scheme Ordinance (*Verordnung zur Weiterentwicklung des bundesweiten Ausgleichsmechanismus* – AusglMechV) which came into force 1 January 2010. Implementation remains the responsibility of grid operators. They are responsible for providing information to both the public and to the Federal Grid Agency. The Agency collects the data of all energy providers, distribution and transmission operators, examines these and hands them over – at least in part – to the Federal Ministry for Environment, Nature Conservation and Nuclear Safety, who monitors the law. In this sense, the Federal Grid Agency acts as the supervisory authority.

(d) What are the measures taken to ensure availability of necessary budget/funding to achieve the national target?

The tariff obligation for the purchasing grid operator under the Renewable Energy Sources Act, together with the planned allocation of the total compensation sum through transmission system operators and, ultimately, its passing on to electricity customers ensures that the

total amount of compensation is not budget-relevant. According to the AusglMechV, transmission system operators must sell the electricity at best price on the spot market. The total remuneration is reduced by the electricity price obtained there.

(e) How is long-term security and reliability addressed by the scheme?

The Act is valid for an unlimited period. The feed-in tariff is granted at present level over a period of 20 years (15 years for large hydropower plants) plus start-up year. This is enshrined in the Renewable Energy Sources Act, and offers investors a high degree of investment security, since changes based on progress reports, for reasons of legitimate expectations, can only lead in exceptional cases and for important reasons of general interest, to a less favourable treatment of existing installation operators. The regular evaluation cycle also contributes to long-term security.

(f) Is the scheme periodically revised? What kind of feed-back or adjustment mechanism exists? How has the scheme been optimised so far?

The EEG 2009 establishes the obligation to evaluate the Act by the Federal Government for 31 December 2011, as well as the ensuing regular four-year cycle submission of a progress report. In an amendment, based on the results of the progress reports, compensation and reduction rates are adjusted according to economic conditions and the state of the market, to ensure that the development targets defined in the EEG are achieved as efficiently and low-cost as possible. This procedure has been successfully practised since the introduction of the EEG in 2000 and has proved its worth.

(g) Does support differ according to technology?

The feed-in tariffs are sector-specific, having been calculated and fixed on the principle of cost-covering compensation, i.e. based on the relevant electricity production costs. Evaluations have proven this approach to be sustainable.

(h) What are the expected impacts in terms of energy production?

It is assumed that by means of the legally guaranteed feed-in tariff, the 2020-target of at least 30 % electricity consumption from renewable energies will be achieved in Germany, and also the subsequent continuous development, if a feed-in tariff should still be required in the future.

(i) Is support conditional on meeting energy efficiency criteria?

Since, according to the EEG, the actual amount of electricity produced is compensated, this mechanism causes a strong incentive for installations to be efficient, i.e. to aim to minimise technical losses and achieve a high electricity yield. Specific criteria are applied in the biomass sector: For example, the CHP-bonus will only be granted if it is a cogeneration plant, which corresponds to the high efficiency criteria of the EU. The technology bonus, which promotes the use of selected, innovative technologies, is only granted if the electricity is produced

through heat-power-cogeneration and thus the biomass is used with maximum efficiency.

(j) Is it an existing measure? Could you please indicate national legislation regulating it?

Sector-specific feed-in tariffs for electricity from renewable energy sources exist in Germany since the entry into force of the EEG on 19 March 2000. This was replaced on 1 August 2004 by the Act Revising the Legislation on Renewable Energy Sources (EEG) in the Electricity Sector (*Gesetz zur Neuregelung des Rechts der Erneuerbaren Energien (EEG) im Strombereich*), which in turn, on January 1 2009, was replaced by the Act Revising the Legislation on Renewable Energy Sources in the Electricity Sector and Amending Related Provisions (*Gesetz zur Neuregelung des Rechts der Erneuerbaren Energien im Strombereich und zur Änderung damit zusammenhängender Vorschriften*), which is the currently applicable version of the EEG. The latter forms the binding legal basis for granting the feed-in tariffs.

(k) If it is planned to be a measure? When would it be operational?

The measure has been implemented. A statutory revision is scheduled for January 1 2012. The progress report on which the revision is based, is supported by a number of research projects already in preparation.

(l) What start and end dates (duration) are set for the whole scheme?

The measure is not subject to time limits.

(m) Are there maximum or minimum sizes of system which are eligible?

The sector-specific feed-in tariffs are, in a technologically and economically meaningful way, differentiated through power categories to avoid both over or under-funding. In general, there are no minimum or maximum system sizes, unless environmental or economic factors require these – such as for the use of liquid biomass to produce electricity.

(n) Is it possible for the same project to be supported by more than one support measure? Which measures can be cumulated?

The EEG contains the so-called ‘dual marketing ban’, which prevents the dual marketing of produced electricity. Electricity for which a feed-in tariff under the EEG has been granted cannot be marketed as ‘green electricity’, for example. The combined use of feed-in remunerations and schemes within the Joint Implementation and Clean Development Mechanism from the Kyoto Protocol is not allowed.

The EEG-remuneration can, however, be combined with an investment in form of low-interest loans (see Chapter 4.3 point (a) ‘Financial Assistance’).

(o) Are there regional/local schemes? If so, please detail using the same criteria.

Since the introduction of the EEG, no new feed-in tariffs have been introduced at regional or local level.

Specific questions for feed-in fixed tariffs:

(a) What are the conditions to get the fixed tariff?

1) Only power generation plants using exclusively renewable energy sources or mine gas are entitled to compensation under EEG.

2) Since January 2009, photovoltaic systems must be registered at the Federal Grid Agency (*Bundesnetzagentur*) in a system register. Without such a registration, the right to remuneration is not provided.

3) With the start of feed-in, the plant operator is obliged to feed all of its generated electricity into the grid and make it available for operators. The only exception is electricity which the operator itself, or a third party, consumes directly from the operator's grid – without it being a public supply grid.

4) The technical and operational requirements contained in the EEG contained must be complied with.

(b) Is there a cap on the total volume of electricity produced per year or of installed capacity that is entitled to the tariff?

There is no cap.

(c) Is it a technology specific scheme? What are the tariff levels for each?

The EEG feed-in tariffs are differentiated by sector; the amount of compensation, according to the principle of cost recovery, is determined for each sector individually. In general, the use of all renewable energies should be promoted.

Below, the compensation rates as of 31 December 2009 are displayed. Compensation rates for photovoltaic systems have been adjusted on 1 July 2010 and will be again on 1 October 2010. The amendments are listed in the text.

Table e: Compensation of electricity from hydropower under EEG 2009.

Installations up to 5 MW – new installations	
Performance share	EEG 2009 compensation in ct/kWh
up to 500 kW	12.67
500 kW to 2 MW	8.65
2 MW to 5 MW	7.65
Systems up to 5 MW – modernized/revitalised plant	
Performance share	EEG 2009 compensation in ct/kWh
up to 500 kW	11.67
500 kW to 2 MW	8.65
2 MW to 5 MW	8.65
New and renovated installations over 5 MW	
Performance increase	EEG 2009 compensation in ct/kWh
up to 500 kW	7.29
up to 10 MW	6.32
up to 20 MW	5.80
up to 50 MW	4.34
up 50 MW	3.50
Scale	
For Hydropower plants with a capacity of over 5 MW under EEG 2009: from 5 MW: 1.0 %. Hydropower plants with a capacity up to 5 MW are not subject to scale.	

Table f: Compensation of electricity from landfill gas, sewage gas and mine gas under EEG 2009

Landfill gas plants	
Performance share	EEG 2009 compensation in ct/kWh
Up to 500 kW_{el}	9.00
500 kW_{el} to 5 MW_{el}	6.16
Sewage gas	
Performance share	EEG 2009 compensation in ct/kWh
Up to 500 kW_{el}	7.11
500 kW_{el} to 5 MW_{el}	6.16
Mine gas plants	
Performance increase	EEG 2009 compensation in ct/kWh
Up to 500 kW_{el}	7.16
500 kW_{el} to 1 MW_{el}	7.16
1 MW_{el} to 5 MW_{el}	5.16
From 5 MW_{el}	4.16
BONUSES for landfill gas, sewage gas and mine gas	
	EEG 2009 compensation in ct/kWh
Technology bonus for installations with a capacity of up to 5 MW_{el} under Annex 1l EEG 2009	
Innovative plant technology	2.00
For gas processing with landfill and sewage gas:	
a) Max. capacity up to 350 Nm ³/h:	2.00
b) Max. capacity up to 700 Nm ³/h:	1.00
Scale	
For electricity from landfill gas, sewage gas and mine gas for EEG 2009: 1.5% of base tariff and bonuses.	

Table g: Remuneration of electricity from biomass by EEG 2009.

Basic remuneration	
Performance share	EEG 2009 compensation ct/Wh [3]
up to 150 kW_{el}	11.67[1]
150 kW_{el} to 500 kW_{el}	9.18
500 kW_{el} to 5 MW_{el}	8.25
5 MW_{el} to 20 MW_{el}	7.79[2]
1) Old installations also	
2) Only if the electricity is produced in combined heat and power	
3) Base remuneration for electricity generation from biogas is increased by 1.0 cents/kWh for old and new plants requiring pollution control licensing – proportionately until 500 kW – if corresponding limits of formaldehyde are adhered to under emission reduction requirements of the TA Luft (Clean Air Act). This does not apply to plants using gas taken from the gas grid.	
BONUSES for Biomass I	
Technology bonus	
up to a capacity of 5 MW_{el} under Annex 1	EEG 2009 compensation ct/kWh
Innovative plant technology	2.00
For gas processing	
a) max. capacity up to 350 Nm3/h	2.00
b) max. Capacity up to 700 Nm3/h	1.00
CHP-Bonus	
Only for the share of electricity which is CHP-electricity	EEG 2009 compensation ct/kWh
Up to output of 20 MWel	3.00[1]
1) Also applies to old plants when they are operated as defined under KWK iSv Annex 3 of 31.12.2008 and otherwise for old plants proportionately up to a power of 500 kW, if the requirements of Annex 3 are met.	

BONUSES Biomass II	
NawaRo Bonus	
Performance share up to 150 kW_{el}	EEG 2009 compensation ct/kWh
Biomass with the exception of biogas	6.00
Biogas	7.00
Using at least 30 % liquid manure[1]	+4.00
With a predominant use of landscape management residues	+2.00
Performance share up to 500 kW_{el}	EEG 2009 compensation ct/kWh
Solid biomass	6.00
Liquid biomass	0.00[2]
Gaseous biomass (excluding biogas)	6.00
Biogas	7.00
Using at least 30 % liquid manure[1]	+1.00
With predominant use of landscape management residues	+2.00
Performance share up to 5 MW_{el}	EEG 2009 compensation ct/kWh
solid biomass	4.00
Liquid biomass	0.00[2]
Gaseous biomass	4.00
Wood combustion	2.50
From wood combustion from short rotation plantations and landscape management residues	4.00
1) Does not apply to plants using gas taken from the gas grid	
2) Applies only to facilities that are put into operation after 1.1.2009	
Scale	
For electricity from biomass plants under EEG 2009: From 1 January 2010 1 % on annual base compensation and bonuses	

Table h: Compensation for electricity from geothermal energy under EEG 2009.

Basic compensation	
Performance share	EG 2009 compensation ct/kWh[1)]
up to 10 MW_{el}	16.00
from 10 MW_{el}	10.50
1) For plants in operation until 31.12.2015 the compensation increases at 4.00 ct/kWh	
Bonuses	
Heat Bonus	EEG 2009 compensation ct/kWh
Plants up to 10 MW_{el} with heat use as under Annex 4	3.00
Technology bonus	EEG 2009 compensation ct/kWh
For plants up to 10 MW_{el} petrothermal technology	4.00
Scale	
For geothermal energy under EEG 2009: 1.0% on compensation and bonuses	

Table i: Compensation of electricity from wind power on land under EEG 2009.

Basic compensation	
	EEG 2009 compensation ct/kWh
Initial compensation	9.20
Basic compensation	5.02
Bonuses for wind turbine plants on land	
System Service Bonus	EEG 2009 compensation ct/kWh
If meeting new technical requirements increase in the initial compensation for systems with	
Initial operation 2002-2008 with upgrading up to 01.01.2011	0.70 (limited to 5 years)
Initial operation 2009-2014	0.50
Repowering	EEG 2009 compensation ct/kWh
For the period of initial compensation	0.50
Scale	
For wind turbine plants on land under EEG 2009: 1.0% on compensation and bonuses	

Table j: Remuneration of electricity from offshore wind energy under EEG 2009.

Offshore wind energy	EEG compensation 2009 ct/kWh[1)]
Initial compensation	13.00
Basic compensation	3.50
1) For plants in operation until 31.12.2015 the compensation increases by 2.00 ct/kWh	
Scale	
Wind-Offshore under EEG 2009: Until 2014 0 %. From 2015: 5%	

Table k: Compensation of electricity from photovoltaics under EEG 2009.

Roof installations	
Power share	EEG 2009 compensation ct/kWh
up to 30 kW	43.0[1)]
30 kW to 100 kW	40.91
100 kW to 1 000 kW	39.58
1 000 kW	33.00
1) For own use of electricity produced, compensation of 25.01 ct/ kWh	
Open space installations	
Regardless of power share	EEG 2009 compensation ct/kWh
	31.94
Scale for solar radiation energy EEG 2009[2)]	
Roof installation	
On base compensation and bonuses	
Installations up to 100 kW	2010: 8.0%
	From 2011: 9.0%
Installations over 100 kW	2010: 10.0%
	from 2011: 9.0%
Open space installations	
On base compensation and bonuses	
	2010: 10.0%
	from 2011: 9.0%
2) The degression rates	
a) Increase by 1.0 percentage points for the following calendar year, if at the Federal Grid Agency reported performance is	
(1) in 2009: 1500 megawatts	
(2) in 2010: 1700 megawatts	
(3) in 2011: Exceeds 1900 megawatts	
b) Decrease by 1.0 percentage points for the following calendar year, if at the Federal Grid Agency reported performance is	
(1) in 2009: 1000 megawatts	
(2) in 2010: 1100 MW	
(3) in 2011: 1200 megawatts below	

Changes to the EEG 2009 through amendment in July 2010 in relation to photovoltaic compensation:

- The compensation for roof installations is lowered in each case once by 13 % on 1 July 2010 and by 3 % on 1 October 2010.
- The reduction on 1 June 2010 of compensations for open space installations on conversion areas is one-time an additional 8 % and, for other areas, 12 %. As of 1 October 2010, a further reduction of 3 % will ensue.
- The annual reduction in compensation, i.e. the degression, will be adjusted closer to market growth. If the 3 500 megawatt target is exceeded, compensation rates fall by 1 % at the end

of 2010 and by 3 % end of year 2011 – over the degression rate provided by the EEG of 9 % – for each additional 1 000 MW of market volume. The degression may increase up to maximum 13 % at the end of 2010. If the market growth is below the lower limit of 2 500 megawatts, compensation rates fall by 1 % in 2010 and 2.5 % in 2011, per 500 MW below the limit. At the end of 2010, the degression can decrease by maximum 3 %.

- The benefit for households with an average household electricity price of net 20 cents per kilowatt hour, which do not feed solar power feed into the grid, but use it themselves, amounts to 3.6 cents per kilowatt hour if they consume less than 30 % of their annually produced solar electricity themselves. If private use of electricity is over 30 %, the benefit amounts to 8 cents per kilowatt hour. The industry will also profit from this regulation on own use, because it will be extended to include systems of up to 500 kW installed capacity.
- In addition, the surface categories were changed for open space installations which receive compensation under the EEG.

(d) Are there other criteria differentiating tariffs?

The level of the feed-in tariffs is based on the electricity production costs of the respective technology. Cost-covering compensation is aimed at.

(e) For how long is the fixed tariff guaranteed?

The compensation is guaranteed for 20 years plus year of starting operations (for large hydropower plant, 15 years).

(f) Is there any tariff adjustment foreseen in the scheme?

The compensation is granted over the entire period at a constant level. The calculation of electricity generation costs includes an adjustment to inflation. A technology-specific adjustment to this effect was made to wind energy. Wind turbines receive a higher initial compensation rate, which, depending on location conditions, can be granted for at least the first five years after commissioning. This period is extended accordingly if there is shortfall compared to a reference installation. Thus the efficiency of the installation is guaranteed.

By contrast, the EEG provides annual degression rates for feed-in tariffs for new installations. The percentage by which compensations fall differs depending on the technology used.

The annual compensation degression is for:

- Hydropower plants with a capacity of over 5 MW, 1 %
- Landfill gas, sewage gas and mine gas, 1.5 %
- Biomass and geothermal energy, 1 %,

- Offshore wind energy from 2015, 5%
- Onshore wind energy, 1%
- Photovoltaic free field systems, 10% in 2010 and 9% from 2011,
- Photovoltaic systems on buildings with a capacity up to 100 KW, 8 % in 2010 and 9 % from 2011,
- Photovoltaic systems on buildings with a capacity greater than 100 KW, 10 % in 2010 and 9 % from 2011.

See also sub-point (c) about adjusting the tariffs for photovoltaics.

4.4. Regulations of the Member State or group of Member States to promote the use of energy from renewable sources in the heating and cooling sector

In the Integrated Energy and Climate Program for Germany, the Federal Government has committed itself to increasing the share of renewable energies in the heating/cooling sector to 14 % of final consumption of energy by 2020. The EEWärmeG was adopted to achieve this goal – in addition to schemes already in place. In this Act, owners of new buildings are required to provide a share of the energy used for heating/cooling from renewable energies.

Furthermore, there are laws and regulations that provide additional requirements for use of renewable energies for other actors. For example, the EnEV prescribes component requirements for energy-saving renovation measures for buildings. Both builders and owners of premises are required to observe these provisions. In addition, there are funding programs which provide financial support to special target groups for the use of renewable energies.

Federal measures directly connected to the increase of renewable energies in the heating/cooling sector are the above-mentioned EEWärmeG, the Market Incentive Program (MAP) and funding programs of the KfW banking group for the development of renewable energies. These are described in detail within this chapter. Additional measures which contribute indirectly to the development of renewable energies in the heating/cooling sector are mentioned here, but, for reasons of clarity, will not be further discussed within Chapter 4.4:

KfW funding programs for energy-efficient construction and renovation (CO_2 building renovation program), which promote – if not exclusively – the development of renewable energies, i.e. *Energieeffizient Bauen* (Energy efficient Construction), *Energieeffizient Sanieren* (Energy Efficient Renovation) or *Energieeffizient Sanieren – Kommunen* (Energy-efficient Renovation – Local Authorities) and *Sozial Investieren- Energetische Gebäudesanierung* (Social Investment- Building Refurbishment).

Energy Saving Ordinance (EnEV): The Ordinance lays down mandatory minimum requirements and rules for calculating primary energy needs and thermal insulation of buildings, but does not set any targets. The EnEV is

based on the Energy Saving Act. Builders and building owners are required to comply with it.

Heat-and-power Cogeneration Act (KWKG): The Act regulates the funding of old and new combined heat and power (CHP) plants and the development and construction of heating networks into which heat from CHP-plants is fed. The purpose of the Act is to contribute to the increase of electricity production from CHP in Germany to 25%.

Guidelines on the promotion of mini-CHP plants: Since 2008, these guidelines promote through investment grants the new construction of CHP-plants up to 50 kW_{el}, to achieving the target of doubling the share of electricity from CHP-plants by 2020 to about 25 %.

Energy Tax Act (EnergieStG): The Energy Tax Act provides tax relief for energy products used for combined heat and power production if the CHP plant has a monthly or annual efficiency of at least 70 %. There is also a tax exemption for biogas which is combusted immediately after production – that is, without prior input into the gas grid – or is used in a CHP-plant.

BMU Environmental Innovation Program: The program is used to finance projects with innovative character on an industrial scale.

(a) How are the support schemes for electricity from renewable energy sources adapted to encourage the use of CHP from renewable energy sources?

The Renewable Energy Sources Act (EEG) grants a CHP-bonus, provided that proof is furnished of compliance with recognized rules of technology and heat use, as established in a positive list (certification for both points required from environmental verifiers).

(b) What support schemes are in place to encourage the use of district heating and cooling using renewable energy sources?

Renewable Energies Heat Act (EEWärmeG): The EEWärmeG acknowledges compliance as part of an alternative measure if the heat energy needs are met directly from a local or district heating network (to a significant share from renewable energies: at least 50 % from waste heat plants, at least 50 % from CHP-plants or at least 50 % through a combination of these measures)

Furthermore, § 16 allows for the implementation of an obligation of connection and use. According to this Article, municipalities and municipal associations can make use of a national legislation which authorises them to justify the obligation to be connected to and use the public district heating network, for the purpose of climate and resource protection.

Market Incentive Programme (MAP), KfW-Program Renewable Energy (Program section 'Premium'): This program supports the construction and development of a heating network supplied from renewable energy sources. The heating network must be supplied at least

- 50 % with heat from renewable energy sources or at least

- 20 % from solar radiation energy, in the case that otherwise almost exclusively high-efficiency heat from CHP-plants or heat pumps is used.

The biogenic share of municipal waste is considered renewable energy under this regulation (heat from waste incineration). A minimum heat turnover of 500 kWh on average per year per meter pipeline must be evidenced over the whole heating network.

(c) What support schemes are in place to encourage the use of small-scale heating and cooling from renewable energy sources?

Market Incentive Programme (MAP) / KfW program for renewable energies, (program section 'Premium'): For details on the supported installations, see answer to II. Financial Support (questions from 4.3 to 4.4) point (a)

KfW's funding program for energy-efficient construction and renovation (CO_2-Building Renovation Program): KfW programs do not prescribe minimum sizes in the different technologies, so even small installations can receive funding (except program *Erneuerbare Energien* [Renewable Energy] which has minimum size requirements).

(d) What support schemes are in place to encourage the use of heating and cooling from renewable energy sources in industrial applications?

Since it is not clear what falls under the category 'industrial application', it may be said that the previously mentioned programs also apply to industrial applications (i.e. generation of process heat), in as far as the company (and partly the public sector) are eligible to apply. However, here EU-regulations for maximum allowable aid intensities must be observed.

The EEWärmeG lays down the mandatory share of renewable energies in heat use for new constructions (residential and non-residential); this includes water heating, space heating and air conditioning. Not included in this obligation are process heat requirements.

The KfW Banking Group offers, alongside programs for private and corporate investors, also special programs for companies (SMEs and large enterprises) (see for example, the *ERP-Umwelt- und Effizienzprogramm* [ERP-Environment and Efficiency Program], and the *BMU-Umweltinnovationsprogramm* [BMU Environmental Innovation Program]).

More questions from Chapter 4.3

I. legislation

(a) What is the legal basis for this obligation/target?

Act to Promote Renewable Energy for Heating Purposes (Renewable Energies Heat Act – EEWärmeG)

of 7 August 2008 (BGBl I p. 1658), amended by Article 3 of the Act of 15 July 2009 (BGBl I p. 1804).

Guidelines for the support of measures to use renewable energies in the heating market (Market Incentive Program – MAP):

from 9 July 2010 (first version 1999, repeatedly evaluated and updated). The need-based promotion of renewable energy for heating purposes is enshrined in EEWärmeG 2012. The bases for the promotion are specified in the said guidelines.

KfW Program Renewable Energy (program section 'Premium')

Part of the MAP and hence the EEWärmeG.

(b) Are there any technology-specific targets?

No.

(c) What are the concrete obligations/targets per year (per technology)?

The aim of the EEWärmeG is to contribute to increasing the share of renewable energies in final consumption of energy for heating (space, water, cooling and process heating) by 2020 to 14 %. There are no specific targets per year. The Federal Government is motivated to keeping the 14 % target. The Act itself requires builders to supply some of the energy needed for heating and cooling from renewable energy sources, or to implement an alternative measure defined by the Act.

(d) Who has to fulfil the obligation?

According to EEWärmeG, owners of newly built premises must meet this obligation.

The federal states can set down an additional obligation stipulating the use of renewable energies in buildings already constructed. The federal state Baden-Württemberg has already introduced a corresponding obligation (see e.g. 4.2.3)

(e) What is the consequence of non-fulfilment?

Failure to comply with the EEWärmeG obligation is a misdemeanour that is punishable by a fine of up to fifty thousand euros.

(f) Is there any mechanism to supervise fulfilment?

Pursuant to § 10 EEWärmeG, obliged parties have to provide evidence of fulfilment before the competent authority and, in case of purchase of biomass fuels, save all bills and provide them on demand. The competent authorities in the federal states must control, through appropriate sampling methods, fulfilment of the obligation and accuracy of the evidence. To do so, they are entitled to access land and buildings, including apartments. The jurisdiction of the implementing authorities is determined by regional law.

(g) Is there any mechanism to modify obligations/targets?

EEWärmeG

In accordance with § 18 EEWärmeG, the Federal Government must present the German Bundestag a progress report on this Act until 31 December 2011, and thereafter every four years. It should report in particular on:

1. the state of market introduction of installations for the production of heating and cooling from renewable energy sources with view to achieving the purpose and target under § 1,

2. technical development, cost development and profitability of these installations,

3. the saved amount of mineral oil and natural gas and the resulting reduction in emissions of greenhouse gases and

4. the enforcement of the Act.

The progress report makes recommendations for further development of the Act.

MAP, KfW Program Renewable Energy (section 'Premium')

As part of the EEWärmeG, the guidelines will also be regularly evaluated and adjusted if necessary. (See point EEWärmeG)

II. Financial support (questions from 4.3 to 4.4)

(a) What is the name and a short description of the scheme?

EEWärmeG

It establishes for owners of new buildings an obligation to use a certain share of renewable energies or other measures defined. In § 13, financial support for the use of renewable energies for heat generation is set down with up to 500 million euros per year from 2009 to 2012, in the case that it is not used for performance of duties.

MAP

Support in accordance with § 13 EEWärmeG.

The MAP awards investment subsidies for renewable energy technologies in the heating sector. The promotion is subject to the 'Guidelines for the support of measures to use renewable energies in the heating market' (*Richtlinien zur Förderung von Maßnahmen zur Nutzung erneuerbarer Energien im Wärmemarkt*). The current version is from 9 July 2010.

Under the current funding scheme following technologies are supported:

- solar collector systems up to 40 m² gross collector area,
- solar collectors with more than 40 m² gross collector area on one-and two-family houses with high buffer storage volumes,
- automatically fed installations for combustion of solid biomass for thermal use, up to and including 100 kW nominal thermal output,
- efficient heat pumps,

Particularly innovative technologies for heating and cooling from renewable energy sources in accordance with these guidelines:

- large solar collectors from 20 to 40 m² gross collector area,
- secondary emission reduction and efficiency improvement measures
- installations for burning solid biomass up to and including 100 kW nominal thermal output,

KfW Programme Renewable Energy

Program Section 'Premium'

The KfW Program Renewable Energies 'Premium' is part of the market incentive program. The promotion is subject to the 'Guidelines for the support of measures to use renewable energies in the heating market'. The current version is from 9 July 2010. In this section of the MAP, low-interest loans with repayment subsidies are granted for renewable energy heat produced in large installations.

Mainly small and medium enterprises are supported. Under the current funding guidelines, following technologies are supported:

- large solar collector systems with more than 40 m^2 gross collector area (solar thermal installations)
- large automatically fed biomass plants for combustion of solid biomass for thermal use, with more than 100 kW nominal thermal output.
- strictly combined heat and power biomass plants (CHP) with up to a maximum of 2 MW nominal thermal output
- heating networks which are supplied from renewable energy sources with heat turnover of at least 500 kWh per year per meter path
- large heat storages with more than 20 m^3 which are supplied from renewable energy
- Installations for the processing of biogas to natural gas quality with integration into a natural gas grid
- Biogas lines for untreated biogas, from 300 m linear distance
- Installations for the development and use of geothermal energy (more than 400 m drilling depth) and other related costs:
  - Installations for the exclusive thermal use of geothermal energy (program module *Anlagenförderung* [installation funding])
  - Production and injection wells for these installations (program module *Bohrkostenförderung* [Drilling Funding])

- For all installations: Additional compensations for the planning of drilling with special technical risks (program module *Mehraufwendungen* [Additional expenses])

Program Section Standard

The KfW-Program Renewable Energy is designed for long-term low-interest funding of measures for the use of renewable energies. The program section *Standard* promotes the use of renewable energy to generate electricity, or electricity and heat, in combined heat and power (CHP). (In contrast to the program section *Premium* which supports mainly larger plants for the use of renewable energies in the heating market, with even better financial conditions).

(b) Is it a voluntary or obligatory scheme?

EEWärmeG

Mandatory.

MAP, KfW-Program Renewable Energy (program section 'Premium')

Voluntary.

(c) Who manages the scheme? (Implementing body, monitoring authority)

EEWärmeG

Enforcement lies by the federal states. These determine the relevant bodies.

Responsible ministry: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

MAP

The implementation of this measure is carried out by the Federal Office of Economics and Export Control (*Bundesamt für Wirtschaft und Ausfuhrkontrolle).* Responsible ministry is the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

KfW Programme Renewable Energy ('Premium')

The KfW banking group on behalf of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

(d) What are the measures taken to ensure availability of necessary budget/funding to achieve the national target?

EEWärmeG, MAP, KfW Program Renewable Energy (program section 'Premium')

The EEWärmeG stipulates that, for the promotion of renewable energy for heating, for the years 2009-2012 need-based funds of up to 500 million euros are to be made available each year. The MAP's financial resources, including the KfW-program Renewable Energy *Premium*, is set down in the corresponding federal budget.

(e) How is long-term security and reliability addressed by the scheme?

EEWärmeG

The Act is valid indefinitely. Support of the Federal Government's sectoral target is established by law.

MAP, KfW-Program Renewable Energy (program section 'Premium')

The support is fixed in the EEWärmeG until 2012.

(f) Is the scheme periodically revised? What kind of feed-back or adjustment mechanism exists? How has the scheme been optimised so far?

Reference to Chapter 4.4, Part I. legislation point (g)

EEWärmeG

So far no optimisation.

MAP, KfW-Program Renewable Energy (program section 'Premium')

The effects of financial support from the Market Incentive Program will undergo regular scientific evaluations. The results of the scientific evaluation are incorporated into program changes. In the past there have been several adjustments to the support scheme. Adjustment measures are: changes in compensation rates, in technical requirements and to procedure and verification methods. For example, in an amendment from 5 December 2007, local heating networks supplied from renewable energy sources were introduced as a separate funding point. Funding of local heating systems had before only been possible in conjunction with a heating installation eligible for MAP-funding. Funding is made through a KfW-loan with interest subsidy.

(g) Does support differ according to technology?

MAP, KfW-Program Renewable Energy (program section 'Premium')

Yes. The amount of the repayment subsidy differs depending on the technology.

(h) What are the expected impacts in terms of energy production?

EEWärmeG (MAP, KfW Program Renewable Energy (program section 'Premium')

Support for the achievement of the sectoral target in 2020.

(i) Is support conditional on meeting energy efficiency criteria?

Support of heating/cooling installations based on renewable energy is in general tied to efficiency criteria. Here, we refer to Chapter 4.2.2.

EEWärmeG

The EEWärmeG describes an obligation to use; funding is provided mainly through the MAP, which ties support to energy efficiency criteria.

MAP, KfW Program Renewable Energy (program section 'Premium')

The funding guidelines include requirements for all technologies to ensure that high quality and efficient products are fostered. Heat pumps must be 'efficient' (i.e. electric heat pumps must have low power requirements) in order to be granted support. In addition, through a bonus system, the most efficient use of renewable energy technologies or the use in energy-efficient buildings (e.g. bonus for highly efficient solar circulation pumps, efficiency bonus for use in particularly well-insulated buildings, etc.) is rewarded.

The MAP also supports highly efficient biomass CHP-plants feeding into local heating networks.

(j) Is it an existing measure? Is it the action already? Could you please indicate national legislation regulating it?

All measures already exist. See Chapter 4.4: I. Legislation

(k) Is this a planned scheme? When would it be operational?

Not applicable. See point (j).

(l) What start and end dates (duration) are set for the whole scheme?

See Chapter 4.4: II. Financial support point (s)

(m) Are there maximum or minimum sizes of system which are eligible?

EEWärmeG

The EEWärmeG only makes provisions for the ratios of use of the respective technologies, but not for the absolute sizes of the installations.

MAP

Solar collectors up to and including 40 m² gross collector area,

- Solar collectors with more than 40 m² gross collector area on one-and two-family houses with high buffer storage volumes,
- Automatically fed plants for combustion of solid biomass for thermal use up to and including 100 kW nominal thermal output,
- Manually loaded systems for the combustion of solid biomass for thermal use with 15-50 kW nominal thermal output (wood gasification boilers),

Solar collector systems for combined hot water and space heating must have a minimum collector area of 9 m² for flat panels and 7 m² for vacuum tube collectors.

Following heat storage volumes per square meter of gross collector area are required as buffer storage:

- 40 litres (for flat plate collectors)
- 50 litres (for vacuum tube collectors)
- 100 litres (for first installation of solar collectors of more than 40 m² gross collector area on one-or two-family houses for combined water heating and heating support).

In accordance with these guidelines, the most innovative technologies for heating and cooling from renewable energy sources are:

- Large solar collectors from 20 m² up to and including 40 m² gross collector area,
- Secondary measures for emission reduction and efficiency improvement for installations of solid biomass combustion, up to and including 100 kW heat output. No size indications are provided for heat pumps.

KfW-Program Renewable Energy (program section 'Premium')

- Large solar collectors with more than 40 m² gross collector area (solar thermal). (Here clear size indications are made for collector area per m² per unit, or per m² per person, or per m² per MWh [for non-residential buildings])
- Large automatically fed biomass plants for combustion of solid biomass for thermal use of more than 100 kW and a maximum of 2 MW nominal heat output
- Strictly combined heat and power biomass plants (CHP) to a maximum of 2 MW nominal heat output
- Heating networks which are fed mainly from renewable energy sources, heat output of at least 500 kWh per year per meter line (alternatively, heating networks fed from at least 20 % solar radiation energy, provided that otherwise almost exclusively heat from high-efficiency CHP-plants or heat pumps is used)
- Large heat accumulators with more than 20 m³, which are supplied from renewable energy sources
- Biogas lines for untreated biogas, from 300 m linear distance.

No size indications are given for installations for the processing of biogas to natural gas quality, with integration into a natural gas grid, and for installations for the development and utilization of geothermal energy.

(n) Is it possible for the same project to be supported by more than one support measure? Which measures can be cumulated?

EEWärmeG

In principle, measures which fulfil obligations of the EEWärmeG cannot be funded through the MAP. Exceptions apply in the case of use obligation for existing buildings under regional legislation as well as in the KfW-program for renewable energies 'Premium'. The specific funding eligibility depends in each case on the guidelines for the MAP.

MAP, KfW Program Renewable Energy (section 'Premium')

Accumulation with other public funding is allowed provided other regulations have not been specified. Total funding may not exceed:

a. in the case of investment subsidies, twice the amount of funding granted under these guidelines and

b. for all aid measures, the maximum aid intensity allowed by the European Union.

No accumulation with EEG and KWKG possible (exception: payments for heating networks) is possible, except for biomass CHP-plants up to a heating capacity output of 2 MW.

The cumulative effect is not possible with support from the KfW program *Energieeffizient Sanieren* (Energy-efficient Renovation).

The co-financing of the KfW-funded program for renewable energy systems from other KfW programs/program variants or ERP programs is *not* possible (exception: *Fündigkeitsrisiko Tiefengeothermie* [Deep geothermal energy exploration risk]). Also excluded is a combination of a loan from the *program section 'Standard'* with a loan from the *program section 'Premium'* of the KfW program Renewable Energies, for the same investment measure. The combination of a loan from the KfW program Renewable Energy with other funding (loans or allowances/subsidies) is possible, provided that the sum of loans, allowances or subsidies does not exceed the sum of expenses. In the case of deep geothermal energy, the proportion of public funding may not exceed 80 % of eligible net investment costs. A parallel application of ERP and KfW loans for other investment measures is possible.

(o) Are there regional/local schemes? If so, please detail using the same criteria.

We refer to the answers in question 4.2.3. In addition, there are partly subsidies from power supply companies (including municipal utilities, gas distributors) for solar thermal systems, biomass heating, CHP-plants and heat pumps. On the part of MAP, these are combinable to a certain amount. The restriction on funding cumulations by power supply companies is not consistently known and exceeds the requirements of this National Action Plan.

III. Specific questions for financial support for investment:

(a) What is granted by the scheme? (subsidies, capital grants, low interest loans, tax exemption or reduction, tax refunds)

EEWärmeG

No financial support, instead obligation to use.

MAP

Investment grants.

KfW Program Renewable Energy 'Premium'

Low-interest loans with repayment grants.

(b) Who can benefit from the measure? Is it specified for certain technology(/ies)?

EEWärmeG

See Chapter 4.4: I. Legislation, point (d)

MAP, KfW Program Renewable Energy (section 'Premium')

Eligible are:

- individuals,
- self-employed,
- municipalities, municipal authorities and local government organizations (with high-profile public projects),
- companies in which municipalities have a major stake in, and which are below SME-thresholds for turnover and employees
- non-profit organizations,
- small and medium-sized enterprises as defined in Annex 1 of Regulation (EC) No. 800/2008 (General Block Exemption Regulation) (to the maximum allowable aid intensity),
- other companies only in the case of special eligibility for certain measures (deep geothermal, large solar collectors (> 40m²), local heating networks, heat (> 20m³)

Application eligibility applies to the owners, leaseholders or tenants of the property, property part, building or part of building, on or in which the installation has been built or will be located, as well as for energy service companies commissioned by these (contractors). Leaseholders, tenants or contractors will need the written permission of the owner of the property to be allowed to build and operate the installation.

Not eligible are:

- manufacturers of installations or installation components eligible for funding and
- the Federal Government, the federal states and their institutions.

(c) Are applications continuously received and granted or are there periodical calls? If periodical, could you please describe the frequency and conditions?

EEWärmeG

No applications, but an obligation.

MAP

Continuous application acceptance, approval in accordance with the available budget

4.5. Regulations of the Member State or group of Member States to promote the use of energy from renewable sources in the transport sector

(a) What are the concrete obligations/targets per year (per fuel or technology)?

The amount of quota for biofuels is for diesel fuel 4.4 % and for petrol 2.8 % (by-energy). Since the year 2009 an overall quota applies, beyond both fuels. Initially it was 5.25 %; for the period 2010 to 2014 it amounts to 6.25 %. The minimum unchanged quotas for gasoline and diesel fuel continue to be applied. From the year 2015, the reference value for biofuel quotas will be changed from the current energy rates to net greenhouse gas reduction values.

The following tables list the energy petrol, diesel and overall quotas until the year 2014 as well as the net greenhouse gas reduction rates (the total amount of gasoline and diesel fuel plus the gasoline or diesel fuel replacement biofuel) from the year 2015.

Table l: Energy quota of diesel and gasoline fuels by 2014

Year	Gasoline quota	Diesel quota	Overall quota
2007	1.2%	4.4%	–
2008	2.0%	4.4%	–
2009	2.8%	4.4%	5.25%
2010-2014	2.8%	4.4%	6.25%

Table m: Net greenhouse gas reduction quotas for use of biofuels

Year	Net greenhouse gas reduction quota
2015-2016	3%
2017-2019	4.5%
From 2020	7%

(cf. BImSchG § 37a)

(b) Is there differentiation of the support according to fuel types or technologies? Is there any specific support to biofuels which meet the criteria of Article 21(2) of the Directive?

For conventional biofuels, which are not part of mixtures with fossil fuels, a proportional tax exemption is granted, for a transitional period until the end of 2012, provided that these are not used to meet the quota obligation. Second-generation biofuels, biogas and bioethanol fuel (E85) are tax-deductible until 2015. The details of the tax benefits for biofuels are established in consideration with the EU's ban on overcompensation.

As mentioned in (a), from the year 2015, the reference values for biofuel quotas will be changed from the current energy rates to net greenhouse gas reduction values

The rule of double-counting certain biofuels to the energy biofuel quota will be implemented by ordinance.

There currently exist no legal obligations for the traction current of electric vehicles or electric-powered rail vehicles. However, the National Development Plan Electric Mobility (*Nationalen Entwicklungsplan Elektromobilität*) states that the traction for electric vehicles is to be covered in the future by additional renewable energies. The Federal Government will, within the framework of implementation of the National Development Plan Electric Mobility, explore how this objective can be realized.

Questions from Chapter 4.3

Support schemes can be regulatory, providing for targets and/or obligations. They may provide financial support either for investment or during the operation of a plant. There are also soft measures like information, education, or awareness-raising campaigns. As soft measures are described above, this assessment should focus on regulatory and financial measures.

Please describe existing schemes with legal reference, details of the scheme, duration (indicating start and end dates), past impact and explain whether any reform or future schemes are planned and by when. What are the expected results?

Regulation

<u>Regulation</u> can set target(s) and obligations. In case there is such an obligation please detail it:

(a) What is the legal basis for this obligation/target?

On 1 January 2007, the Biofuel Quota Act (*Biokraftstoffquotengesetz* – BioKraftQuG) came into force. The purpose of this Act is to replace the previously existing widespread tax benefits for biofuels by a regulatory requirement. The regulation was carried out by an Amending Act (*Artikelgesetz*), which contains the necessary amendments to the Energy Tax Act (*Energiesteuergesetz* – EnergieStG) and the Immission Control Act (BImSchG). The regulations were again amended by the Amendment Act to the Promotion of Biofuels (*Gesetz zur Änderung der Förderung von Biokraftstoffen)* which came into force the 21 July 2009. The tax relief rates for biodiesel and vegetable oil fuel were also amended by the Growth Acceleration Act (*Wachstumsbeschleunigungsgesetz*) from 22 December 2009.

(b) Are there any technology-specific targets?

The targets apply to fuels for road transport. There are currently no specific targets for other carriers.

(c) What are the concrete obligations/targets per year (per technology)?

The minimum share of biofuel (in accordance with BImSchG § 37a) can be provided by the addition of gasoline or diesel fuel, by putting into

circulation pure biofuel or (in the case of BImSchG § 37a(3), sentence 2 and 3 and in the case of paragraph 3a) by addition of bio-methane to natural gas fuel, if the biomethane meets the requirements for natural gas under § 6 of the Regulation on Composition and Distinction of Qualities of Fuels (*Verordnung über die Beschaffenheit und die Auszeichnung der Qualitäten von Kraftstoffen*) in its current version.

The specific targets are presented under 4.5, first point (a).

(d) Who has to fulfil the obligation?

Since 2007, companies that market fuels are required to sell a statutory minimum share (quota) in the form of biofuels. The fulfilment of this mandatory quota can be transferred to third parties.

(e) What is the consequence of non-fulfilment?

According to § 37c BImSchG, the competent authority applies a levy calculated according to the energy value of the missing amount of biofuel. For the petrol quota, the levy amounts to 43 euro per gigajoule, for the diesel fuel quota and overall quota, the charge is 19 euros per gigajoule. The Federal Ministry of Finance established as competent body the so-called *Biokraftstoffquotenstelle* (Biofuel Quota Authority) at the main customs office in Frankfurt (Oder).

(f) Is there any mechanism to supervise fulfilment?

Monitoring of compliance lies with the authorities of the Customs Administration of the Federal Republic of Germany.

(g) Is there any mechanism to modify obligations/targets?

Until 31 December 2011, the Federal Government will report to the German Bundestag on the development of greenhouse gas mitigation of biomass and on biomass potentials, taking into consideration sustainability aspects; it will recommend, if necessary, an adjustment of the above-mentioned quotas. Until 31 December 2011, the Federal Government will examine whether further measures need to be taken as a result of the biomethane quantities on the fuel market until then.

The Federal Government will present to the German Bundestag and the Bundesrat every four years, starting 1 July 2012, a report on the implementation and effects of an ordinance containing the requirements mentioned (in BImSchG § 37d(2)(3)), to ensure that the promotion of biofuels does not have negative environmental or social effects.

Financial support

Financial support can be classified in various ways. Examples are

financial support for investment, capital grants, low interest loans, tax exemptions or reductions, tax refunds, tender schemes, renewable energy obligations with or without green certificates (tradable green certificates), feed-in tariffs, feed-in premiums, voluntary schemes.

For any scheme you use, please give a detailed description answering the following questions:

(a) What is the name and a short description of the scheme?

Biofuels are promoted for a limited period through a tax; the specific form and duration of the tax benefit is dependent on the type of biofuel.

(b) Is it a voluntary or obligatory scheme?

It is a voluntary scheme. Claimants are not obliged to make use of it.

(c) Who manages the scheme? (Implementing body, monitoring authority)

The authorities of the Customs Administration of the Federal Republic of Germany.

(d) What are the measures taken to ensure availability of necessary budget/funding to achieve the national target?

The biofuels quota in particular ensures that the target for 2020 will be met. Under current legislation, tax benefits for biofuels will only be granted until the end of 2015. For traditional pure biofuels (biodiesel, vegetable oil fuel), tax benefits expire to a large extent end of 2012 already.

(e) How is long-term security and reliability addressed by the scheme?

The period in which the tax incentives are granted is precisely fixed by law. After that, biofuels will be promoted mainly through the biofuels quota.

(f) Is the scheme periodically revised? What kind of feed-back or adjustment mechanism exists? How has the scheme been optimised so far? How the measure has been optimized?

The scheme is regularly checked for compliance with the EU legislation on competition and energy tax, and adjusted if necessary.

(g) Does support differ according to technology?

Specific details of the tax benefits depend on type of biofuel.

(h) What are the expected impacts in terms of energy production?

The measure will boost production of biofuels on a transitional basis. The major funding instrument is, however, the biofuels quota.

(i) Is support conditional on meeting energy efficiency criteria?

Support through tax incentives and quota legislation will only be provided in the future if biofuels prove to be sustainable – manufactured in compliance with a minimum greenhouse gas reduction potential. Consideration of energy efficiency criteria is not directly relevant for support.

(j) Is it an existing measure? Could you please indicate national legislation regulating it?

The tax incentives for biofuels is regulated in § 50 of the Energy Tax Act.

(k) Is this a planned scheme? When would it be operational?

The tax incentive is already established and will run – depending on the type of biofuel – no later than until the end of 2015.

(l) What start and end dates (duration) are set for the whole scheme?

This depends on the type of biofuel. Under current legislation, fiscal support for conventional pure biofuels (biodiesel, vegetable oil fuel) largely expires in the year 2012. Certain types of biofuels (such as biogas, ethanol fuel, second-generation biofuels) will be granted tax incentives until the end of 2015.

(m) Are there maximum or minimum sizes of system which are eligible?

Tax incentives for biofuels do not promote any system.

(n) Is it possible for the same project to be supported by more than one support measure? Which measures can be cumulated?

In principle, biofuels which are already being supported over the biofuels quota cannot be promoted through tax incentives. Only to second-generation biofuels are exempted from this rule.

(o) Are there regional/local schemes? If so, please detail using the same criteria.

The Federal Government has no information regarding this.

Specific questions for financial support for investment:

(a) What is granted by the scheme? (subsidies, capital grants, low interest loans, tax exemption or reduction, tax refunds)

(b) Who can benefit from this scheme? Is it specified for certain technology(/ies)?

(c) Are applications continuously received and granted or are there periodical calls? If periodical, could you please describe the frequency and conditions?

Currently, the Federal Government does not provide measures of financial support for investments.

4.6. Specific measures for the promotion of the use of energy from biomass

4.6.1. Biomass supply: both domestic and trade

Table 7: biomass supply 2006 (m^3 as Fm/$t_{FM/OIL}$ or ktoe)[40]

Sector of origin		domestic resources	Imports		Exports	Net	Primary energy production (ktoe)
			EU	Non-EU	EU/non EU		
A) Biomass from forestry[41]:	*of which:*						
	1. direct supply of wood biomass from forests and other wooded land for energy generation	29.557 m Fm	0.115 m Fm	-	-	29.672 m Fm	6162
	2. indirect supply of wood biomass for energy generation	15.756 m Fm	1.725 m Fm		-	17.481 m Fm	3630

[40] Effect: http://www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/map_kfw_verlauf_09.pdf

[41] Typical factor for conversion of *solid* cubic meters (in German Fm, in the forestry and wood industry standard for designating an m^3 of solid wood) into *stacked* cubic feet (in German Rm, in the forestry and wood industry standard designation for 1 m^3 layered wood, including air spaces): 1.4; solid cubic meters into dumped cubic meters (in German Sm^3, *dumped* cubic meters of wood parts): 2.43

B) Biomass from agriculture and fisheries:	*of which:*					
	1. agricultural crops and fishery products directly provided for energy generation	15.331 m t_{FM}	6.362 m t_{FM}	-	21.693 m t_{FM}	6 688
	2. agricultural by-products/processed residues and fishery by-products for energy generation	6.079 m t_{FM}	0.35 m t_{oil}	-	6.429 m $t_{FM/oil}$	669
C) Biomass from waste:	*of which:*					
	1. biodegradable fraction of industrial solid wastes, including organic waste (biodegradable garden and park waste, food and kitchen waste from households, restaurants, canteens and retailers, comparable waste from food processing plants), **and landfill gas**	3.457 m t_{FM}	negligible		3.457 m t_{FM}	477
	2. biodegradable fraction of industrial waste (including paper, cardboard, pallets)	0.864 m t_{FM}	0.061 m t_{FM}	0.370 m t_{FM}	0.555 m t_{FM}	215
	3. Sewage sludge	3.217 m t_{FM}	0.220 m t_{FM}	0.002 m t_{FM}	3.435 m t_{FM}	263

A detailed overview of the availability of biomass for the year 2007, including the non-mandatory information in Table 7, is found in the Annex under 7.3.8. The presentation in the Annex, as well as in the Annex to Table 7, was made in energy units (PJ or ktoe) because these are more accurate and easier to compare, through the particular biomass fractions with their different conversion routes and fuel characteristics (e.g. water content, heat value, biogas yield).

Table 7a: Estimated availability of domestic biomass in 2015 and 2020[42] (m^3 as $Fm/t_{FM/Oil}$ or thousand t oe)

Sector of origin		2015		2020	
		Expected amount of domestic resource	**Primary energy production (ktoe)**	**Expected amount of domestic resource**	**Primary energy production (ktoe)**
A) Biomass from forestry:	**1. direct supply of wood biomass from forests and other wooded land for energy generation**	41.060 - 42.327 million cubic meters (Fm)	8527 - 8790*	39.447 m Fm	8192 **
	2. indirect supply of wood biomass for energy generation	17.139 m Fm	3559 **	18.174 m Fm	3774 **
B) Biomass from agriculture and fisheries:	**1. agricultural crops and fishery products directly provided for energy generation**	22.390 m t_{FM}	6903	24.713 m t_{FM}	7619
	2. agricultural by-products/processed residues and fishery by-products for energy	7.803 - 10.331 m $t_{FM / oil}$	812 - 1075 *	11.244 - 17.903 m $t_{FM / oil}$	1170 - 1863*
C) Biomass from waste :	**1. biodegradable fraction of municipal solid waste including biowaste** (biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises, and comparable waste from food processing plants) **and landfill gas**	5.537 m t_{FM}	764	4.327 m t_{FM}	597
	2. biodegradable fraction of industrial waste (including paper, cardboard, pallets) [43]	2.837 m t_{FM}	1099	3.761 m t_{FM}	1457
	3. sewage sludge	3.435 m t_{FM}	263	3.435 m t_{FM}	263

Information to derivation see Annex 7.3.8.

* Range defined by successful launch of the fuels of the second generation (upper value) and delayed development of this segment (lower value)

** Extensive utilization of the domestic potential, expected is additional demand for imports

Please specify on what basis the biodegradable fraction of municipal solid waste and of industrial waste was calculated.

The amount of biodegradable municipal and industrial waste used for energy production is based on statistical data and values taken from literature as well as surveys on the substrates used by biogas plant operators.

More information on the derivation and details of the conversion factors is also provided in the Annex.

[42] Biomass from forestry should also include biomass from forest-based industries. Under the category of biomass from forestry processed solid fuels, such as chips, pellets and briquettes should be included in the corresponding subcategories of origin. à pellets are not counted here but not shown separately in C2.

[43] The estimate for 2015 and 2020 for the use of available biomass energy includes only domestic biomass. Total biomass demand can be greater and need to be met additionally through imports or these may also be possible due to market mechanisms.

What is the estimated role of imported biomass up to 2020? Please specify the quantities expected (ktoe) and indicate possible import countries.

The 'scenario with further efficiency measures' of the National Renewable Energy Action Plan (see Tables 10-12) expects a biomass demand of about 21 000 ktoe (880 PJ) of final energy, corresponding to a primary energy demand in biomass of about 33 400 ktoe (1 400 PJ). The contribution of domestic biomass is expected not to exceed 23 900 ktoe (1 000 PJ) of primary energy in 2020 (see Table 7a). The corresponding difference of approximately 9 500 ktoe (400 PJ) between biomass demand and domestic supply could be covered through other energy yield increases in energy crops (e.g. through breeding progress), increased energy use of forest wood and landscape management residues, the cultivation of fast growing tree species on agricultural land and future cultivation of energy crops on compensation areas under nature protection law.

Biomass is importable as a raw material or as processed biomass fuel. The determing/crucial factor is transportability, which depends on material quality and the infrastructure available. The best technical conditions for import is given by biomass and bioenergy sources with high energy density, coupled with established logistics concepts. These conditions currently exist for:

- liquid bioenergy sources (biodiesel, bioethanol, vegetable oil)
- solid bioenergy sources and raw materials with high bulk density (pellets, grains and seeds, etc.)
- biomethane (biogas processed to natural gas quality) over the natural gas grid.

The import of biomass and bioenergy sources is realised at a significant scale when the products are available at lower prices in the international market than domestically. Whether and to what extent this happens depends on different developments.

Liquid biofuels produced from tropical raw materials (especially biodiesel from palm oil and bioethanol from sugar cane) often have much lower production costs than comparable German and European products; in the long and medium term, this could also apply to biogenic solid fuels (raw material plantation wood), if appropriate treatment steps are available on the market (e.g. BtL, torrifaction); these biomass and bioenergy sources therefore have a high import potential.

Any significant import of biomass is subject to sustainability standards which define the requirements for producing biomass. These are currently being implemented for biofuels and other liquid bioenergy sources and could in principle be transferred to other bioenergy sources. At present there is not enough experience with the market availability of sustainably produced biomass.

In the case of wood energy, the demand may be greater in 2020 than the domestically available turnover from forestry reported in Table 7a. The import of woody biomass is one possibility to bridge the 'timber gap'. However, the nature and extent of import requirements is uncertain because they are affected by how the supply of raw materials for industrial use develops and

by the issue of to what extent short rotation plantations (SRP) for wood energy production will be established on the new farmland areas which are expected to become available.

With an appropriate policy environment, biomethane imports could acquire significant relevance. Currently there is uncertainty as to whether and how such conditions will be created and hence as to whether imports can actually be expected.

Against this backdrop, neither the physical import potential nor the demand for imports can be estimated for 2020; the biofuel sector could become highly relevant.

In addition to the information provided above, could you please describe the current situation of agricultural land used for dedicated energy production as follows:

Table 8: 2006 agricultural area used for energy crop cultivation

agricultural area used for energy crop cultivation	Area (ha)
1) areas for fast-growing trees (willow, poplar)	1200
2) areas for other energy crops such as grasses (reed canary grass, switchgrass, Miscanthus), millet	1100
3) grain	300000
4) oilseeds[44]	1120000
5) sugar beets	1600
6) silage maize	260000

[44] The theoretically necessary import quantities of pellets were taken into account in section 'A2) indirectly available wood biomass for energy production'.

4.6.2. Measures to increase biomass availability, taking into account other biomass users (agriculture and forest-based sectors)

Mobilisation of new biomass sources:

(a) Please specify how much land is degraded.

(b) Please specify how much unused arable land there is.

(c) Are any measures planned to encourage unused arable land, degraded land, etc. to be used for energy purposes?

a-c)

It is quite likely that no significant reserves of unused arable land will emerge in the Federal Republic of Germany. In many federal states, measures have been taken to preserve permanent pasture.

Scenarios of the Federal Institute for Construction, Urban and Spatial Research (*Bundesinstituts für Bau-, Stadt- und Raumforschung* – BBSR)[45] expect that small areas of partly sealed, undeveloped brownfield and urban recycling areas – which are not agricultural land – could be available for biomass production. It will need to be considered in each case, taking into account regional and spatial planning aspects, if and to what extent such areas are relevant for sustainable biomass production.

(d) Is energy use of certain already available primary material (such as animal manure) planned?

The National Biomass Action Plan[46] (as described in Chapter 4.2 b), plans to tap into residues and by-products that are not in competition with food production or other material usages. Examples are agricultural and forestry residues such as crop residues, straw, manure, dung, small timber, wood residues and waste from manufacturing industries, such as spent grain, potato slop or pomace but also offal. Other biomass which can be added to the 'existing resources' are organic waste from the bio-waste bins, market waste, kitchen waste, municipal green residues or landscape management residues. However, these waste streams essentially are, through composting or fermentation, already being used for energy or as raw material. Through these established recycling routes – without financial support – an ecologically sound biological waste recycling is being carried out. It is particularly important to consider that the deflection of individual bio-waste streams can, in individual cases, cause the operation of biogas or composting plants to no longer be economically and/or technically feasible and so, in addition to those deducted waste streams, cause other waste substances to fall out of the material (and energy-related) waste recovery. The amendment to the Recycling and Waste Management Act (*Kreislaufwirtschaftsgesetzes*) with the introduction of compulsory separate collection will lead to a further increase in recoverable bio-waste, which will contribute to energy production, such as for biogas,

[45] Fall by-products from the production of biomass fuels from oil, some of which are for non-energy use, such as animal feed.
[46] DBFZ 2010

through the established recycling routes. The amendment of the EEG will also promote the extension of existing composting installations through additional fermentation stages, so as further the exploitation of the energy potential of organic waste.

According to the National Biomass Action Plan, through research, development and demonstration, the potentials of by-products and residues from agricultural production, such as straw, will be made increasingly available. The use of manure and unused organic waste (including landscape management residues) is supported by incentives in the EEG (the introduction of the manure bonus, landscape conservation bonus and increased base compensation for installations up to 150 kW in the EEG, 2009).

(e) Is there any specific policy promoting the production and use of biogas? What type of uses are promoted (local, district heating, biogas grid, natural gas grid integration)?

The focus of the National Biomass Action Plan lies in a strategic policy orientation towards the expansion of the bioenergy share in energy supply in Germany, based on the guiding principles of sustainability, efficiency and profitability.

In order to achieve the Federal Government's targets of development of renewable energies, it is planned to use bioenergy in the three areas of heating, electricity and fuel.

In the National Biomass Action Plan, specific measures have been formulated for the expansion of biogas production and use; however, targets have been set for bioenergy in general, not specifically for biogas. In the view of the Federal Government, production and utilization of biogas is not to be considered and promoted in isolation from other biomass uses, to avoid unwanted effects such as competition distortion or exacerbation of competitive land uses.

Specific objectives for biogas feed are defined in the Gas Grid Access Ordinance (*Gasnetzzugangsverordnung*). The target is to facilitate the feed-in of Germany's existing biogas potential of 6 billion m³ per year by 2020 and 10 billion m³ per year by the year 2030. The biogas is to be increasingly used in the cogeneration of heat and power and utilized in the fuel sector. Currently about 200 million m³ of natural gas can be replaced by biomethane (cf. Chapter 4.2.8).

The Federal Government's biomass development plan includes a range of strategic measures designed to specifically promote the development of biogas:

The development of biogas production and use is promoted through various legal regulations, such as the Renewable Energy Sources Act, the Renewable Energies Heat Act or the Gas Grid Access Ordinance and the Gas Grid Payment Ordinance. The above legal provisions provide measures such as the obligation to use renewable heat (including the use of biogas in combined heat and power) in new buildings, the development of combined heat and power, the integration of biogas plants in micro-grids, the processing of biogas to natural gas

quality – so-called bio-methane – and its feed-in into the gas grid. In addition to its use for power and heat generation or biomethane with cogeneration (CHP), biogas can also be used as a fuel.

With the Biofuels Sustainability Ordinance (Biokraft-NachV) regulations were laid down for the sustainable production of the biomass used in biogas production; these are, for the use of biogas as a fuel, from 1 January 2011 mandatory; two certification systems and twelve certification bodies have been provisionally authorised for their implementation (as of 16 June 2010).

In addition to the program *Nachwachsende Rohstoffe* (Renewable Resources) of the BMELV, the programs *BioEnergie 2021* (Bioenergy 2021) of the BMBF or *Optimierung der energetischen Biomassenutzung* (Optimisation of Biomass for Energy) under the National Climate Protection Initiative of the BMU, support research and development projects in the field of biogas.

The programs under the Joint Task Improvement of Agricultural Structures and the Coastal Protection (GAK), i.e. the *Agrarinvestitionsförderungsprogramm* (Agricultural Investment Support Program – AFP), and the program *Integrierten ländlichen Entwicklung* (Integrated Rural Development – ILE) which includes the promotion of bioenergy plants, local heating systems and biogaspipelines, as well as support schemes of the *Landwirtschaftlichen Rentenbank* (Agricultural Pension Bank), i.e. the program *Energie vom Land* (Energy from the Country), can all be availed of for biogas expansion. Plants processing biogas to natural gas quality – with feed-in into a natural gas grid – biogas pipes and heating grids supplied by renewable energies are also promoted within the framework of the KfW program Renewable Energy Sources, section ‘Premium’.

In addition to the BMELV Action Program *Energie für morgen* (Energy for Tomorrow), which envisions the increase in biomass supply, the development of knowledge transfer, the reduction of technical barriers, the change in legal framework and investment incentives mainly for rural areas, various ministries have issued a number of programs to promote the development of biomass use and the promotion of biogas.

The BMELV advisory project *Regionale Bioenergieberatung und Öffentlichkeitsarbeit Energiepflanzen* (Regional Bioenergy Advice and Public Work Energy) provides farmers and foresters with the necessary know-how for successfully operating and producing within the bio-energy or biogas sector.

(f) *What measures are planned to improve forest management techniques in order to maximise the extraction of biomass from the forest in a sustainable way?* [47] *How will forest management be improved in order to increase future growth? What measures are planned to maximise the extraction of existing biomass that can already be put into practice?*

To avoid social and ecological damage, forestry biomass production must be sustainable. Therefore, the **National Biomass Action Plan** determines, through model calculations, reserves for energy uses of wood (especially hardwoods and forest wood residues) through the expansion of wood uses. The forest plays a major role here as a potential supplier of raw materials for the sustainable supply of biomass for energy uses. An important core issue of the Biomass Action Plan is to reconcile the projected increase in demand for wood for recycling and energy use, and the associated increase of timber use, with the sustainability of forest management, and thus to balance the varied demands on the forest with its sustainability. This includes not only the examination of the availability of sustainable forest wood reserves (particularly through timber yield increases), but also an efficient use of wood raw material (e.g. possible value-adding multiple 'cascade use'). Other relevant approaches are the potential extraction of additional timber outside the forest (e.g. short rotation plantations, timber from landscape) as well as improvements in the logistics and technology of wood supply. In this context, it is also necessary to ensure that sustainability rules as laid down, for example, for biofuels and liquid biofuels in the EU Directive 2009/28/EC, are defined in such a way that they do not hinder but foster sustainable forestry biomass use.

To increase the efficiency of forestry associations, in 2007 the **Joint Task of Improvement of Agricultural Structures and Coastal Protection (GAK)** introduced a performance bonus (so-called mobilisation premium) for the independent industry-wide marketing of wood supply through a forestry association.

Furthermore, training measures were implemented for further professionalisation of the management in forestry associations.

When mobilising reserves of wood, requirements of soil protection and nature conservation (sufficient amount of dead wood, protection of the habitats of endangered species, conservation of biodiversity) are to be given equal weight to economic demands and interests based on sustainability.

Impact on other sectors:

(a) *How will the impact of energy use of biomass on other sectors based on agriculture and forestry be monitored? What are these impacts? (If possible, please provide information also on quantitative effects.) Is the monitoring of these impacts planned in the future?*

[47] BMU, BMELV 2009

Several surveys are carried out at regular intervals – with data preparation and analysis – such as regular recording of numbers of biomass plants and capacities, assessment on import and export of relevant material flows.

The impact of energy use of biomass in other sectors can in principle be very diverse. These include, for example, micro-and macro-economic, environmental, geographic, social or regulatory impact. Due in part to observable deficits in the institutional framework of developing and emerging countries, the import of biomass from such sources must be examined for adverse social and environmental risks. Within the framework of the EU Renewable Energy Directive, the EU Commission is requested to regularly report on the environmental and social implications of biomass use, in particular with regard to food availability. Member States are requested to take measures to ensure that operators provide reliable information and data on this.

Likewise, other sectors could have an impact on the energy use of biomass, which perhaps cannot be fully charted. The analysis of cause-effect relationships is complicated by other factors. Ecological balance sheets or life cycle assessments can also provide approaches for an analysis. The results of such studies can only be compared across sectors if they part from the same basic assumptions and use similar methodologies for the issues examined in each case.

(b) What kind of development is expected in other sectors based on agriculture and forest that could have an impact on the energy use? (E.g. could improved efficiency/productivity increase or decrease the amount of by-products available for energy use?)

Against the backdrop of a rising world population, global food and feed demand will increase, together with the demand for energy and material biomass products. Within this context and with a view to 2020, Germany is expecting increased land use competition. In addition, environmental and conservation targets for the preservation of landscapes and habitats (Natura 2000 areas and nature reserves) are linked to space requirements which significantly restrict forest biomass use. Space requirements from transport and settlement activities interact with production of food or feed and/or renewable materials, so it is not sufficient to consider merely agricultural and forestry development trends of land use. These additional factors aggravate the possibility of making clear statements about possible land use changes.

To shape the economically and ecologically efficient development of bioenergy and simultaneously defuse potential competing uses, further potentials should be exploited, such as forest wood residues, biomass residues from landscape management and other organic waste whose use does not imply competition for land use. In the new version of the EEG, this has been taken into account with the bonuses for manure and technology and the plant combination of biogas and composting plants, and also by provisions for the effective use of biomass (e.g. cogeneration operation as compensation requirement for plants over 5 MW_{el} or for plants which use biomethane).

In the following, different impacts on some of the sectors mentioned in a) will be described, which may affect their energy use

For instance, an expansion of bioethanol production leads to an increase in grain slop, which then is available for animal feed or for fermentation in biogas plants. By-products from biodiesel production, such as rape cake or glycerol can also be used as animal feed or in the chemical industry and can thus contribute to improved profitability of bioenergy production. Changes in bio-ethanol or diesel production can lead to changes in the availability of by-products and thus have an impact on adjacent sectors.

Other effects are achieved by increases in crop yields or by enhanced plant efficiency. They can contribute to potential increases of cultivation areas for energy crops. For example, further efficiency gains in livestock and feed production can, to some extent, lead to a decrease in acreage requirement. Land which has been made available by these means could then be used for food production, but also for the production of biomass for energy and recycling.

If the partly massive expansion of energy crop cultivation in developing countries, despite EU-wide implemented sustainable schemes, leads to undesirable social and environmental effects, production would fall into disrepute, both in source countries and with local consumers, and biomass import could then be impeded (e.g. palm oil).

Finally, with a view to the efficient use of raw materials, the importance must be stressed of integrated approaches to energy and material use of renewable resources (cascade use, biorefinery) – the research and implementation of which belongs to the objectives of the Federal Government.

4.7. Planned use of statistical transfers between Member States and planned participation in joint projects with other Member States and third countries

Preliminary remark:

Germany welcomes the flexible cooperation mechanisms to achieve the targets established in Articles 6 to 12 of the Directive. The combination of efficient and stable national support systems and voluntary mechanisms for cooperation will benefit all Member States. Member States may continue to control the long-term remodelling of their energy supply, optimize the specific incentives and effects of their support systems and thus tap into their national potentials in the most profitable way for the consumer. Through focused cooperation for the use of renewable energy potentials with other Member States, cost advantages and common synergies can be utilised while achieving the targets. This will ensure that the development of renewable energy in all Member States can move forward effectively and efficiently.

Germany will reach its national target of 18 % of energy from renewable sources in gross final consumption of energy in 2020 through national measures to produce energy from renewable sources; Germany is therefore

not dependent on the use of flexible mechanisms for cooperation. However, Germany has an interest in ensuring that the flexible cooperation mechanisms can be successfully used by Member States, because we see here promising opportunities for targeted collaboration in the further development of renewable energies, for the benefit of all participating Member States. Therefore, Germany has already conducted two international workshops on cooperation mechanisms and is in talks with several countries about the possibilities and problems to be addressed in the implementation and use of cooperation mechanisms. Germany will, as Co-Chair of the working group on flexible cooperation mechanisms, actively support this process within the IEE Concerted Action on the implementation of Directive 2009/28/EC.

According to current estimates on the development of renewable energies from 2010 to 2020, Germany will surpass its target of 18 % in 2020 with an estimated 19.6 %. As shown in Table 9, Germany could, for 2011-2019, potentially transfer to other Member States excess amounts above the indicative trajectory, in accordance with Article 4(3)(a), by means of the various flexible mechanisms for cooperation. Basically, it is also conceivable to tap into further potentials for cooperation through joint projects.

4.7.1. Procedural aspects

(a) Describe the national procedures (step by step) established or to be established, for arranging a statistical transfer or joint project (including responsible bodies and contact points).

The national procedures for the organization of statistical transfers and joint projects are currently being tested and developed. On the basis of this preparatory work, it is planned to publish guidelines on the use of flexible mechanisms for cooperation. Responsible authority is the Federal Ministry for Environment, Nature Conservation and Nuclear Safety (BMU), Division KI II 3. An information service for flexible cooperation mechanisms will be established to reply to any requests.

(b) Describe the means by which private entities can propose and take part in joint projects either with Member States or third countries.

In the future, private individuals may also contact the information center mentioned above. As mentioned in (a), details for the use of cooperation mechanisms and procedures for the participation of private actors are being tested and developed.

(c) Give the criteria for determining when statistical transfers or joint projects shall be used

An exhaustive list is currently not possible. Based on recent examination and discussion, the following criteria for the use of cooperation mechanisms appear to be relevant:

- How can own target fulfilment be ensured? In this context, the following points are particularly relevant:
    - o the time horizon of the planned agreement for statistical transfer or for the joint project (short-or long-term cooperation);

- o the actual development of the expansion of renewable energies in Germany compared to the indicative trajectory of the Directive and compared to the national development path projected by Germany in this National Action Plan;
- o the possibility of contractual risk distribution/minimization in view of uncertainties in the forecast of own target developments (particularly relevant for long-term agreements).

- To what extent will the costs of the transferred energy be borne and to what extent will the indirect costs for the development of renewable energies be considered (administrative costs, infrastructure and integration costs)?

For joint projects in Germany the following is additionally relevant:

- Is it a particularly low-cost potential? What impact does it have on the cost of own target fulfilment? Is the risk of rising costs taken into adequate account in the cooperation agreement?
- Are infrastructure measures (especially network development) necessary? Are these included in the cooperation agreement?
- Is it a particularly innovative project (role model function, innovative technologies, hard-to-reach potentials that can be better tapped into through a joint effort)?
- The choice of incentives within a joint project and their compatibility with respective national support systems of the participating countries and with the EU Directive 2009/28/EC.

In addition, the following issues must be addressed when investing abroad:

- financing;
- public acceptance of a government investment in renewable energies in another Member State, which only virtually benefit consumers in Germany. This is partly dependent on:
  - o the cost of the own support system in relation to local benefits (transition to low carbon economy, environment protection at its source, energy security, local employment, technology innovation and learning curve effects in combination with other technologies, etc.);
- potential technology advances through joint projects with particularly innovative and promising technologies;
- the exemplary role of the joint project.

(d) What is going to be the mechanism to involve other interested Member States in a joint project?

The directive provides, for the implementation of joint projects, bilateral or multilateral cooperation agreements between Member States. Germany seeks, therefore, the exchange with other Member States about potentials and possible configurations of joint projects and other

cooperation mechanisms. This exchange will proceed – with due transparency – as part of the Concerted Action in the working group led by France and Germany, 'Cooperation Mechanisms and National Renewable Energy Action Plan'.

(e) Are you willing to participate in joint projects in other Member States? How much installed capacity/electricity or heat produced per year are you planning to support? How do you plan to provide support schemes for such projects?

Although Germany will reach its national target through national measures for the production of energy from renewable sources, Germany remains interested in the successful use of flexible mechanisms for cooperation with other Member States and sees promising opportunities for specific collaborations in the further development of renewable energies for the benefit of all Member States concerned. Therefore, Germany is also interested in joint projects with other countries and, in principle, prepared to participate. Actual participation and the nature and extent of the support will depend on the options which arise, the yet to be resolved legal and economic issues and the individual project environment.

4.7.2. Estimated excess production of renewable energy compared to the indicative trajectory which could be transferred to other Member States

This information has been entered in Table 9.

4.7.3. Estimated potential for joint projects

(a) In which sectors can you offer renewable energy use development in your territory for the purpose of joint projects?

As indicated in 4.7.1, Germany is currently examining how joint projects can be carried out in Germany. This includes considering the type of sectors and technologies used as well as procedures for site selection.

(b) Has the technology to be developed been specified? How much installed capacity/electricity or heat produced per year?

See Chapter 4.7.3 point (a)

(c) How will sites for joint projects be identified? (For example, can local and regional authorities or promoters recommend sites? Or can any project participate regardless its location?)

See Chapter 4.7.3, point (a)

(d) Are you aware of the potential for joint projects in other Member States or in third countries? (In which sector? How much capacity? What is the planned support? For which technologies?)

The potential for joint projects in other Member States are only known to Germany to the extent that they are published by the Member States in their national estimates. Germany has no reliable information on potential for joint projects in third countries.

(e) Do you have any preference to support certain technologies? If so, which?

Basically, Germany is open – in technology terms – to possible support of joint projects. Relevant criteria are not only the technology costs and the relevance of technology for the achievement of the European target 2020, but also the potential for the further development of innovative technologies such as solar thermal power plants or offshore parks.

4.7.4. Estimated demand for renewable energy to be satisfied by means other than domestic production

Table 9: Estimated surplus/deficit in the production of renewable energy compared to the indicative trajectory which could be transferred to/from other Member States [Germany] (ktoe)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Estimated surplus in the forecast		5930	7058	5866	6997	4657	5917	3842	5088		1387
Estimated surplus in the NREAP		5703	7065	5507	7105	4761	6453	4130	5976		3065
Estimated deficit in the forecast		0	0	0	0	0	0	0	0		0
Estimated deficit in the NREAP		0	0	0	0	0	0	0	0		0

In the forecast to the National Renewable Energy Action Plan published in December 2009, Germany expected to cover its demand for energy from renewable sources up to 2020 through domestic production. In addition, Germany expected to exceed its national target of 18 % renewable energy in gross final consumption of energy in 2020 by 0.7 % points. The surplus of renewable energy estimated in the forecast is expected to reach its peak with about 7 000 ktoe in the years 2012 and 2014 and decreases then to about 1 400 ktoe in 2020. The estimated surplus in detailed quantities is listed in Table 9.

For the 'scenario with additional energy efficiency measures' of the present National Action Plan, the potential surplus has been recalculated due to a larger, more detailed data base. In this National Action Plan Germany also expects to reach its national goal of 18 % renewable energy without the use of cooperation mechanisms. The expected surplus of renewable energy compared to the indicative trajectory peaks – as in the estimate – in 2014 with over 7 100 ktoe, and then falls. In 2020, Germany is likely to achieve a surplus of 3 065 ktoe (128 PJ) of renewable energy.

5. ASSESSMENTS

5.1. Total contribution expected of each renewable energy technology to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in electricity, heating and cooling and transport

Tables 10-12 summarize the expected contributions of renewable energy in electricity, heating and cooling and transport in the EFF scenario of the National Action Plan. It should be noted that all details in Tables 10-12 are to be regarded as

estimates and *not* as fixed targets or limits for the development of renewable energies. If the development of any specific technology should progress more positively than is currently anticipated, these technologies would make a correspondingly higher contribution to energy supply than estimated in Tables 10-12.

Table 10 summarizes the expected development of the installed capacity and gross electricity production of technologies for production of electricity from renewable sources between 2005 and 2020. For sector heating/cooling, Table 11 describes the contribution of the different technologies to providing renewable energy in the scenario discussed here. The development of consumption of energy from renewable sources in the transport sector until 2020 is broken down in Table 12 according to technology. The numerical values for the base year 2005 are based for the three sectors on statistical data from the AGEE-Stat[48]. The estimation of the development of renewable energies 2010-2020 is based on an update of the data from the reference scenario 2009[49]. The scenario EFF, however, anticipates a slower increase in heat production from renewable sources as the reference scenario 2009, particularly in the field of solar power and biomass. By contrast, electricity production from solar and wind energy is increased significantly compared to the reference scenario 2009. Hydropower, however, was adjusted downwards in the EFF scenario, according to latest estimations of potential[50], but also due to uncertainties in the statistical output data. Own assessments have been for the development of renewable energies in the transport sector (see below).

Electricity sector

In the present scenario it is assumed that the high growth momentum that renewable energies have shown, particularly in the electricity sector in recent years, will in principle continue. A crucial factor is the assumption that, for the electricity sector, the priority regulation of the EEG on the connection of plants generating electricity from renewable sources to power grids and the feed-in of electricity based on renewable energies will be maintained over a longer period. At the same time, the degression of the feed-in tariffs, in accordance with the current version of the EEG, will be updated continuously. As soon as technologies for producing electricity from renewable sources can subsist without financial incentives in their competition with conventional technologies, they will be gradually released from EEG support[51].

In the base year 2005, plants producing electricity from renewable energy sources with a total capacity of 27 898 MW were in operation, producing 61 653 GWh of electricity. The largest contributor to the production of electricity from renewable sources was wind energy with 43 %, followed by hydropower with 32 % and biomass with 23 %. Under the present scenario, the installed capacity of all plants producing electricity from renewable energy by 2020 will quadruple with almost 110 934 MW; the amount of electricity produced will increase, with 216 935 GWh, by a factor of 3.5 compared to 2005. Renewable energies will then cover 38.6 % of the gross consumption of electricity in Germany. The strongest build-up will take place in the use of wind and solar energy. In 2020, the share of wind energy in electricity from

[48] Recommendations are to be taken from a report of the Ad Hoc Working Group II of the Standing Forestry Committee on the mobilization and efficient use of wood and wood residues for energy production (see July 2008). The report is available on: http://ec.europa.eu/agriculture/fore/publi/sfc_wgii_final_report_072008_en.pdf.

[49] BMU 2009b, applying the normalization rules for electricity production from wind and water power in accordance with Annex II of Directive 2009/28/EC

[50] BMU 2009a

[51] BMU 2010b

renewable sources will amount to 48 %. Electricity from biomass, photovoltaics and hydropower follow with respectively 23 %, 19 % and 9 %.

The potential of 'large' **hydropower** (power > 1 MW) which can be activated in Germany at present is almost fully exploited. 'Small' hydropower, with capacities under 1 MW per plant, can only make a relatively small contribution to the increase in electricity production from hydropower. Uncertainties in the statistical starting point for both installed capacities and for electricity production from hydropower in Germany require a conservative estimate of the development of hydropower until 2020. In principle, however, Germany assumes that the output of hydroelectric plants will increase 2010-2020 by about 250 MW and the amount of electricity produced by around 2 000 GWh. In this scenario, it is assumed that by 2020 a total of 4 309 MW of hydropower will be installed. The largest part of the development takes place in the size category > 10 MW. The 20 000 GWh/a of electricity generated in 2020 present the lower limit of electricity production which is actually expected. If an improvement and consolidation of statistical methods for the collection of installed capacity and electricity generation from hydropower were to ensue before progress reports to the National Renewable Energy Action Plan are drawn up, the expected electricity production from hydropower until 2020 will be updated in these reports.

In the base year 2005, with an installed capacity of 0.2 MW and an electricity production of 0.2 GWh/a, the contribution of **geothermal energy** to the generation of electricity from renewable sources was negligible. The successful start of geothermal energy is expected to be implemented on the basis of hydrothermal systems, and later through hot dry rock (HDR) systems, which will lead to an installed capacity of 298 MW by 2020. This will lead to the generation of 1 654 GWh/a electricity. Because of the low efficiency of electricity generation from geothermal heat, the development of such facilities must go hand in hand with the utilisation of waste heat in the respective district heating grids, which contributes quite significantly to the profitability of geothermal power production.

The use of **solar energy** for electricity generation takes place in Germany almost exclusively in PV systems. In 2008, PV systems with a total capacity of 1 500 MWp were installed in Germany. This scenario assumes a future development of photovoltaic systems in Germany of annually 3 500 MWp/a from 2012 to 2020. In 2010 a development of 6 000 MWp and in 2011 a development of 4 500 MWp is expected. This leads to an installed capacity of 51 753 MW in 2020 and a resulting electricity production of 41 389 GWh/a. Unlike photovoltaic power, concentrated solar energy will, also in 2020, make no significant contribution to electricity supply in Germany.

The use of **tidal, wave and other ocean energy** in Germany is still in the research and development stage. It is expected that tidal, wave and other marine energy power stations will make no significant contribution to electricity supply in Germany.

In the case of **wind energy** use on land, it is assumed that in some federal states existing restrictions will be largely lifted regarding the setup of large new plants in previously unused locations and regarding the repowering of already used sites. In addition, improved compensation provided by the amendment of the Renewable Energy Act (EEG 2009) leads to an overall more favorable investment climate. Starting from the build-up in 2008 with an amount of 1 675 MW/a, the annual installation in 2009 will remain almost unchanged, and then drop slightly to 1 000 MW/a until around 2013. This will be followed quickly by a significant rise because of

the high replacement demand for equipment from the early 2000s, to 1 500 MW/a in 2016 and 2 000 MW/a in 2020. These combined events will lead to an installed capacity of onshore wind power of 35 750 MW by 2020. The development of onshore wind energy could possibly proceed faster and lead to higher installed capacity than is currently assumed in the National Action Plan.

The scenario assumes that, after the start of offshore wind energy in 2009, further installations will proceed relatively quickly. With a power increase to 150 MW, end of 2010 could mark the beginning of wind energy use on an industry relevant scale. Provided that the start is successful, performance could increase to 10 000 MW by 2020. From today's perspective, however, this development is still a relatively optimistic trend and requires the successful installation and commissioning of the first wind plants, as well as the timely development of appropriate power grids and infrastructure on the coast. Due to the steady increases in per unit installed capacity and hub height, the average utilization of the installations is growing. For 2020, an average of approx. 2 100 hours per year is assumed for onshore and approximately 3 250 hours per year for offshore turbines[52] . Overall, therefore, in the year 2020 45 750 MW of wind power will be installed, which will produce 104 435 GWh/a electricity (taking into account the normalisation rule for wind power in accordance with Annex II of Directive 2009/28/EC; see also Table z in Chapter 7.4) .

As a consequence of the existing priorities in favor of the stationary use of **biomass**, production of electricity from biomass rises significantly from 14 025 GWh/a in the base year 2005 to 49 457 GWh/a in 2020, whereby the installed capacity and electricity from waste biomass stagnates in the period 2010-2020. In the year 2020, depending on the biomass source type, 23 438 GWh/a will originate from biogas (including sewage and landfill gas), 1 450 GWh/a from liquid fuels and 24 569 GWh/a from solid fuels (including the biogenic fraction of municipal waste). In 2020, more than 35 % of electricity will be generated through biomass in CHP with recovery of waste heat in district heating systems and/or larger individual objects. Incentives are provided by the current Renewable Energy Act (EEG).

Heating and cooling sector

Promotion of the use of renewable energies in the heating and cooling sector is, due to the confusing structure of the heating market, with its numerous actors, much more difficult than in the electricity sector. Nonetheless, the present scenario assumes that existing funding instruments such as the Renewable Energies Heat Act (EEWärmeG) or the Market Incentive Programme (MAP) will create incentives for a significant development of renewable energies in the heating market. The scenario is also based on the assumption that the vast majority of the heating systems installed prior to the year 2000, will be gradually replaced until 2020, creating opportunities for the replacement of conventional combustion plants through installations based on renewable energy. In addition, to facilitate the effective use of solar and geothermal energy, the development of the necessary local heating networks will be pushed forward. Nevertheless, it is likely that the associated structural transformation of heat supply will happen at a relatively slow pace, so that, also in the year 2020, individual combustion plants will dominate the heating market.

In the base year 2005, 7 706 ktoe energy from renewable sources were used in the sector of heating and cooling, and by far the largest proportion of that derived from

[52] BMU 2009a

biomass (94 %). The share of solar thermal energy (3 %) is almost negligible in 2005, as are heat pumps (3 %) and deep geothermal energy. More than half the renewable heating and cooling is provided by biomass in private households. For the year 2020, the present scenario anticipates almost a doubling of the contribution of renewable energies in the heating and cooling sector, with 14 431 ktoe (604 PJ). The structure of renewable energies in this sector will change greatly 2005-2020: Although biomass, with 79 %, still provides the largest contribution, now solar thermal energy, with 9 %, and environmental heat made available through heat pumps, with 8 %, also significantly contribute to the use of renewable energy in the heating and cooling sector. A steadily increasing share of the renewable heat generated is distributed through local heating systems to the consumers who are supplied by biomass, geothermal and solar systems (in association with seasonal heat storages). For the year 2020, according to the scenario, the share of network heating (2 560 ktoe) in total renewable heating and cooling used will be 18 % (see Table 11).

In the field of **geothermal energy,** the scenario expects a significant increase in the number of installations and heat provided: While in 2005 only 12 ktoe of heat from hydrothermal systems could be used, the relatively rapid development of geothermal energy enables a use of ktoe 686 in 2020. Indispensable prerequisite, however, is the expansion of a local heating infrastructure with a corresponding market for the heat.

For **solar thermal** installations, a significant growth is expected by 2020, both in terms of individual installations and of local heating systems. In the base year, 238 ktoe were provided from solar collector systems – the vast majority of them from individual installations. By 2020, the scenario assumes a heat volume of 1 245 ktoe from solar thermal plants. Local heating systems (with appropriate heat storages) then provide already over 35 % of solar-generated energy.

The annual level of investment in **biomass** and biogas plants will, after the rapid increase in recent years, level out to approx. 3 000 MW_{th}/a. The heat supply from biomass will increase 2005-2020 by 56 % – from 7 260 to 11 355 ktoe. The share of biogas will increase at the expense of the share of solid biomass from 2 % in 2005 to 15 % by 2020. The proportion of liquid biomass for heat supply remains relatively constant at a low level in 2020. As part of the extension of local heating systems based on solid biomass and biogas, the share of biomass furnaces in households in total renewable heat provided by biomass, sinks from 61 % in 2005 to 53 % in 2020.

The supply of heating energy through **heat pumps** will grow distinctly until 2020. Two effects are decisive for this: first, the increase in newly installed capacity of heat pumps; secondly, the expected increases in the annual coefficient of heat pumps due to progress made by heat pump technology and, in particular, through improved maintenance, control, sizing and installation. In this scenario, the heat pumps using ambient heat increased from 196 ktoe in 2005 to 1 144 ktoe in 2020.

Transport sector

In the National Renewable Energy Action Plan, the share of renewable energy in the transport sector includes biofuels for gasoline and diesel engines, but also takes into account electricity and hydrogen from renewable sources and the use of biogas and other possible renewable energy sources.

The estimation of the consumption of **biofuels as an admixture** in the transport sector is based on the assumed development of (gross) consumption of energy in the

transport sector in scenario EFF (see Table 1) and on the development of the share of diesel and gasoline in consumption of energy in transport from the 'scenario with additional efficiency measures' taken from the study 'Policy Scenarios for Climate Protection V'[53], taking into account the blending quotas of biofuels to diesel and gasoline fuels and the overall energy ratio to be met by 2014, as defined in the Federal Immission Control Act (BImSchG 2009) . From 2015, petrol and diesel fuels placed on the market will also have to meet the minimum requirements of the Federal Immission Control Act regarding the reduction of greenhouse gas emissions in relation to a reference fuel.

In the transport sector, the estimate for the consumption of **pure fuel** (B100 and vegetable oil) and E85 which have been brought into the market through tax incentives, is in practice very difficult, because the quantities marketed largely depend on the price of fossil diesel fuel and the result of the annual overcompensation calculation to be carried out under European competition and energy tax legislation. The biofuels quota is, therefore, a much more reliable instrument for the promotion of biofuels. In addition, it should be noted that the tax incentives for biodiesel and vegetable oil fuel largely expire after the end of 2012, according to current legislation. Bearing this in mind, a conservative estimate was made for the years 2010 to 2012, based on the volumes of 2009 and the first months of 2010 of 300 000 tons of biodiesel and 100 000 tons of vegetable oil. Moreover, in view of the present situation, it can be assumed that a stable market can be achieved with the help of tax incentives for bio-ethanol fuel (E85). The estimate for 2010-2015 can therefore take constant sales volumes as a basis (approx. 9 000 t).

An estimate of the proportion of **biofuels** produced from residues, waste, cellulosic non-food materials and lignocellulosic material **in accordance with Article 21(2)** of Directive 2009/28/EC was made on the basis of existing studies[54] as well as own interviews with experts, including with companies that intend to produce such fuels. The sum of all biofuels to be considered twice, as under Article 21(2), was estimated to be between 155 to 654 ktoe[55] for the year 2020.

The share of imported biofuels by 2020 is based on estimates of the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) on domestic available agricultural land for production of biofuels and the resulting potential for domestic supply of biofuels.

Because of rising biofuel quotas until 2020, it can be assumed that the consumption of bioethanol/ETBE increases from 144 ktoe/a (2005) to 857 ktoe (2020) and the consumption of biodiesel (including hydrogenated vegetable oils) increases from 1 598 ktoe/a (2005) to ktoe 4 443 (2020). Basically, it is assumed that effective measures will be taken to avoid indirect land-use changes. This will determine to a large extent whether the use of higher volumes of biofuels will gain public acceptance.

The number of natural gas vehicles in 2020 is estimated at around 500 000, which in total will consume 863 ktoe of natural gas, including **biomethane**. It is further assumed that the gas industry will achieve its target in 2020 of 20 % admixed biomethane, which corresponds to a consumption of 173 ktoe. **Hydrogen** from

[53] Due to the normalisation rule for wind and lower full-load hours of facilities built over the course of a year, the average utilisation of wind turbines - offshore as onshore - in Table 10 seem to be slightly lower than the values listed above.

[54] UBA 2009

[55] DBFZ 2009, ECO 2009

renewable sources will make no significant contribution to energy supply in transport throughout the observation period of this scenario.

The **electricity** consumption in rail transport was calculated based on the (gross) final consumption of energy in the transport sector in scenario EFF and the proportion of rail transport in energy consumption from 'Policy Scenarios for climate protection V'[56]. The electricity consumption in road transport is based on the National Development Plan for Electric Mobility target of 1 million licensed electric vehicles in Germany in 2020. The share of electricity from renewable sources in the transport sector (roads and rail) in total amount of electricity consumed is based on the calculation methodology set down by Article 3(4)(c) of the Directive 2009/28/EC: The share of electricity from renewable energy sources in Germany calculated in the scenarios presented here was used from two years before the corresponding year. With this calculation method, the amount of electricity from renewable sources in transport increases from 169 ktoe (2005) to 667 ktoe in 2020. This increase is caused primarily by the increasing share of renewable electricity in rail transport. The amount of electricity from renewable sources in the road transport in 2020, however, is only 63 ktoe.[57]

The scenario developed for the National Renewable Energy Action Plan assumes that the consumption of renewable energy in transport will increase from 2 087 ktoe in the base year 2005 to 6 140-6 229 ktoe (257-261 PJ) in 2020 (see Table 12, without double counting biofuels, as stipulated in Article 21(2) of the above-mentioned Directive, and without a 2.5 factor for the consumption of electricity from renewable sources in road transport – the specified range results largely from uncertainties about the availability of BtL fuels). Taking into account the multiple counting of electricity from renewable sources in road transport and biofuels in accordance with Article 21(2), a consumption of energy from renewable sources of at least 6 390 ktoe (268 PJ) is reached in 2020, which can be added to the transport sector's binding target.

[56] The actual amount of fuel, under Article 21(2) of Directive 2009/28/EC, which will be placed in the market in Germany in 2020 will depend on precisely which fuels will be considered fuels from waste residues, cellulosic and lignocellulosic material, as defined in the currently discussed legislation.

[57] UBA 2009

Table 10a: Estimate of the total contribution (installed capacity, gross electricity consumption) anticipated in Germany of each technology using renewable energy sources with regard to the binding targets for 2020 and the indicative trajectories for the share of energy from renewable sources in the electricity sector in the period 2010-2014 [58]

	2005		2010		2011		2012		2013		2014	
	MW	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**
Hydropower:	4329	19687	4052	18000	4068	18000	4088	18000	4111	19000	4137	19000
<1MW	641	3157	507	2300	511	2300	515	2300	521	2450	527	2450
1 MW -10 MW	1073	3560	987	4050	991	4050	995	4050	1000	4250	1005	4250
> 10MW	2615	12971	2558	11650	2567	11650	2577	11650	2590	12300	2604	12300
from pumped storage power plant	4012	7786	6494	6989	6494	6989	6494	6989	6494	6989	6494	6989
Geothermal energy:	0.2	0.2	10	27	17	53	27	97	40	164	57	257
Solar energy:	1980	1282	15784	9499	20284	13967	23783	17397	27282	20293	30781	23218
photovoltaics	1980	1282	15784	9499	20284	13967	23783	17397	27282	20293	30781	23218
concentrated solar energy	0	0	0	0	0	0	0	0	0	0	0	0
Tides, waves, other ocean energy:	0	0	0	0	0	0	0	0	0	0	0	0
Wind energy:	18415	26658	27676	44668	29606	49420	31357	53055	32973	57314	34802	63657
land-based	18415	26658	27526	44397	29175	48461	30566	51152	31672	54064	32763	58420
offshore	0	0	150	271	432	959	792	1903	1302	3250	2040	5237
Biomass:	3174	14025	6312	32778	6620	34682	6934	36710	7214	38562	7475	40359
solid	2427	10044	3707	17498	3860	18298	4017	19294	4140	20114	4253	20901
biogas	693	3652	2368	13829	2523	14933	2680	15966	2837	16998	2985	18008
liquid biofuels (1)	54	329	237	1450	237	1450	237	1450	237	1450	237	1450
Overall:	27898	61653	53834	104972	60596	116122	66189	125258	71621	135333	77251	146490
from combined heat and power		-	1067	5328	1280	6453	1503	7681	1740	9002	1990	10424

(1) Only those are to be considered which meet the sustainability criteria of Article 5(1), last subparagraph, of Directive 2009/28/EC.

[58] It should be emphasized that the estimated percentage of renewable energy in road and rail transport determined by the calculation methodology of the EU Directive, does not reflect the actual proportion of renewables in this sector.

Table 10b: Estimate of the total contribution (installed capacity, gross electricity) anticipated in Germany of each technology for the use of renewable energy sources with regard to the binding targets for 2020 and the indicative trajectories for the share of energy from renewable sources in the electricity sector in the period 2015-2020 [59]

	2015		2016		2017		2018		2019		2020	
	MW	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**
Hydropower [60] **:**	4165	19000	4196	19000	4228	19000	4258	19000	4286	20000	4309	20000
<1MW	534	2450	539	2450	546	2450	552	2450	558	2550	564	2550
1 MW -10 MW	1012	4250	1019	4250	1026	4250	1032	4250	1038	4500	1043	4500
>10MW	2620	12300	2638	12300	2657	12300	2674	12300	2689	12950	2702	12950
from pumped-storage power plant[61]	6494	6989	6494	6989	6494	6989	7900	8395	7900	8395	7900	8395
Geothermal energy:	79	377	107	534	142	730	185	976	236	1281	298	1654
Solar Energy:	34279	26161	37777	29148	41274	32132	44768	35144	48262	38243	51753	41389
photovoltaics	34279	26161	37777	29148	41274	32132	44768	35144	48262	38243	51753	41389
concentrated solar energy	0	0	0	0	0	0	0	0	0	0	0	0
Tides, waves, other ocean energy:	0	0	0	0	0	0	0	0	0	0	0	0
Wind Energy [62] **:**	36647	69994	38470	76067	40154	82466	41909	89210	43751	96359	45750	104435
land-based	33647	61990	34371	64583	34815	66873	35188	68913	35479	70694	35750	72664
offshore	3000	8004	4100	11484	5340	15592	6722	20297	8272	25666	10000	31771
Biomass:	7721	42090	7976	43729	8211	45299	8440	46761	8648	48133	8825	49457
solid	4358	21695	4472	22396	4575	23050	4672	23633	4750	24139	4792	24569
biogas	3126	18946	3267	19884	3399	20798	3531	21678	3660	22543	3796	23438
liquid biofuels (1)	237	1450	237	1450	237	1450	237	1450	237	1450	237	1450
Overall[63]**:**	82891	157623	88526	168479	94009	179626	99561	191092	105183	204016	110934	216935
from combined heat and power	2250	11937	2530	13533	2823	15220	3129	16986	3444	18837	3765	20791

(1) Only those are taken into account which meet the sustainability criteria laid down in Article 5(1), last subparagraph, of Directive 2009/28/EC.

[59] The calculation of the annual electricity production takes into account that additional capacity is distributed over the course of the year.

[60] See footnote 57

[61] See footnote 58

[62] See footnote 59

[63] See footnote 60

Table 11: ***Estimate of the total contribution (final consumption of energy[64]) expected in Germany of each technology for using renewable energy sources, with regard to the binding targets for 2020 and the indicative trajectories for the share of energy from renewable sources, in the heating and cooling sectors in 2010-2020 [65] (1000 toe)***

	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Geothermal (except in low-temperature geothermal heat pump applications)	12	34	74	114	154	194	234	325	415	505	596	686
Solar Energy	238	440	500	560	621	681	741	842	943	1043	1144	1245
Biomass:	7260	9092	9350	9610	9869	10129	10388	10582	10776	10969	11162	11355
solid	6794	7516	7691	7865	8040	8214	8389	8501	8614	8726	8839	8952
biogas	154	912	992	1072	1152	1232	1312	1388	1464	1540	1616	1692
bioliquids (1)	313	664	668	673	677	682	688	693	697	702	707	711
Renewable energy through heat pumps:	196	465	532	599	666	733	800	869	938	1007	1075	1144
-aerothermal	39	165	196	229	264	301	338	378	418	460	503	547
- geothermal	130	258	289	319	347	374	400	426	451	475	498	521
- hydrothermal	27	42	46	51	54	58	62	65	68	71	74	77
Overall:	7706	10031	10457	10884	11309	11736	12163	12617	13071	13524	13978	14431
from district heating (2)		1370	1473	1576	1679	1782	1885	2020	2155	2290	2425	2560
from biomass in households (3)	4407	5538	5593	5648	5703	5758	5812	5845	5878	5910	5943	5975

(1) Only those are considered that meet the sustainability criteria set out in Article 5(1), last subparagraph, of Directive 2009/28/EC.
(2) District heating and/or cooling as part of the total consumption of renewable energy for heating and cooling.
(3) As part of the total consumption of renewable energy for heating and cooling.

[64] See footnote 61
[65] Immediate consumption and district heating in accordance with Article 5(5) of Directive 2009/28/EC.

Table 12: Estimate of the total contribution expected in Germany of each technology for the use renewable energy sources, with regard to the binding targets for 2020 and the indicative trajectories for the proportion of energy from renewable sources, in the transport sector in the period 2010-2020 (1000 toe)[66]

	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bioethanol/ETBE	144	639	1187	1145	1103	1060	996	950	978	936	896	857
of which pursuant to Article 21(2) (lower limit) - **(1)**	0	0	0	0	0	0	32	32	32	32	32	32
of which pursuant to Article 21(2) (upper limit) - **(1)**	0	0	0	32	41	60	107	167	239	307	374	442
of which imported - **(2)**	0	189	724	670	614	558	482	423	438	384	331	278
Biodiesel[67]	1598	2790	2300	2325	2086	2108	2074	2070	2987	2969	2949	4443
of which pursuant to Article 21(2) - **(1)**	0	98	98	98	98	98	98	98	98	98	98	98
of which imported - **(3)**	0	1459	942	941	675	671	610	579	1470	1426	1379	2846
Hydrogen from renewable energy sources	0	0	0	0	0	0	0	0	0	0	0	0
Electricity from renewable energy sources	169	219	245	272	307	338	374	416	463	513	576	667
of which in road transport	0	0	0	0	0	0	0	1	3	9	23	63
of which not in road transport	169	219	245	272	307	338	373	415	459	504	553	604
Other (biogas BtL, vegetable oils, lower limit)	177	102	105	108	18	26	35	49	67	91	124	173
Other (biogas, BtL, vegetable oils, ceiling)	177	102	105	108	18	26	35	49	67	121	184	261
of which pursuant to Article 21(2) (lower limit)	0	0	1	1	1	2	4	5	8	12	17	26
of which pursuant to Article 21(2) (upper limit)	0	0	1	1	1	2	4	5	8	41	77	115
Total (lower limit)	2087	3749	3837	3850	3513	3532	3479	3484	4495	4510	4546	6140
Total (upper limit)	2087	3749	3837	3850	3513	3532	3479	3484	4495	4540	4605	6229
of which pursuant to Article 21(2) (lower limit)	0	98	98	98	99	100	133	135	137	141	147	155
of which pursuant to Article 21(2) (lower limit)	0	98	98	130	140	160	209	270	344	446	549	654

(1) Biofuels that meet the provisions of Article 21(2) of Directive 2009/28/EC.
(2) Of the total amount of bioethanol/bio-ETBE. The import volume shown here is subject to great uncertainty because at present it is not possible to estimate how the international biofuels market - also in terms of compliance with sustainability standards - will develop until 2020.
(3) Of the total amount of biodiesel. The import volume shown here is subject to great uncertainty because at present it is not possible to estimate how the international biofuels market - also in terms of compliance with sustainability standards - will develop until 2020

[66] The (gross) amount of heat specified here is understood as heating/cooling values before possible conduction losses in local and district heating networks.
[67] Here, without application of multiplication factors for biofuels as under Article 21(2) of Directive 2009/28/EC and for consumption of electricity from renewable sources in road transport.

5.2. Total contribution expected from energy efficiency and energy saving measures to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in electricity, heating and cooling, and transport

The answer to this requirement should be included in Table 1 under chapter 2.

The comparison of gross final consumption of energy in scenarios EFF and REF reveals that the additional energy efficiency measures under the EFF scenario could lower the gross final consumption of energy in 2020 by 14 421 ktoe (604 PJ), which accounts for 7.3 % of the GFCE in 2020 in scenario EFF. Accordingly, the higher energy efficiency in the EFF scenario compared to the reference scenario contributes to an increase in the share of renewable energies in gross final consumption of energy by also 7.3 %; i.e. due to the higher energy efficiency in 2020 in the EFF scenario compared to the REF scenario, the share of renewable energies increases from 18.2 % in gross final consumption of energy in the REF scenario to 19.6 % in the EFF scenario. This means that alone through the development of renewable energies and without additional energy efficiency measures, Germany would achieve the binding target of at least 18 % renewable energy in gross final consumption of energy. In the sectors heating and cooling, electricity and transport, the additional energy efficiency measures under the EFF scenario compared to the REF scenario result in a lower energy consumption of 5 627 ktoe (heating and cooling), 4 310 ktoe (electricity) and 3 694 ktoe (transport)[68], which corresponds to 6.0 % (heating and cooling), 8.9 % (electricity) and 7.6 % (transport) in gross final consumption of energy in the respective sectors for 2020 in the EFF scenario. The share of renewable energies in the three sectors in 2020 in the reference scenario would fall accordingly (heating and cooling: 14.6 % instead of 15.5 %; electricity: 35.4 % instead of 38.6 %). The relative energy share of biofuels in the transport sector is implicitly defined within certain limits due to requirements for reduction of greenhouse gas emissions. As biofuels account for the majority of renewable energies used in transport, the share of renewable energies in the transport sector changes only slightly even with higher energy consumption in transport – as in the REF scenario.

5.3. Assessment of the impacts (optional)

The effects of the development of renewable energies are very difficult to predict. The development so far makes clear, however, that the promotion of renewable energies in Germany has achieved significant positive ecological and economic effects.

In 2009, through use of renewable energies, 31 647 ktoe (1 325 PJ) of primary energy from fossil sources could be saved in Germany[69], 59 % of these in the electricity sector and another 34 % in the sector heating and cooling. This enabled energy-related greenhouse gas emissions amounting to 108 million tonnes of CO_2 equivalents to be prevented (72 million tonnes of these in the electricity sector and 31 million tonnes in the sector heating/cooling). The use of renewable energy from

[68] The term biodiesel includes hydrogenated vegetable oils for use in diesel fuel.

[69] The sum of energy savings in each sector does not constitute the total savings in gross final consumption of energy partly because, due to computational requirements of the Directive 2009/28/EC, consumption in air transport is included in the overall gross final consumption of energy, but is not included in the consumption of the transport sector.

domestic sources allowed energy imports amounting to 5.7 billion euros[70] to be saved in 2009. New construction and development or upgrading of installations for the production of energy from renewable sources produced, in addition, a total turnover of 17.6 billion euros. Added to that is a further turnover of 15.7 billion euros deriving from other renewable energy plant operations[71], so that the total turnover from renewable energies amounts to 33.3 billion euros in 2009. For comparison: In 2005, a total of 10 billion euros in renewable energies was generated in Germany.

For the year 2009, 300 000 jobs can be attributed to the renewable energy industry, an increase of about 75 % since 2004. The growth in employment numbers by 20 000 in the period 2008-2009 shows that renewable energies have become, even in times of general economic crisis, a major economic factor in Germany.

The Federal Government expects that the positive developments and effects will continue in the future. About 400 000 people are expected to be employed in the field of renewable energies[72] by the year 2020. Simultaneously, approximately 215 million tonnes of CO_2 emissions can be prevented[73] through the development of renewable energies anticipated in the National Action Plan,

5.4. Preparation of the National Renewable Energy Action Plan and the follow-up of its implementation

(a) How were regional and/or local authorities and/or cities involved in the preparation of this Action Plan? Were other stakeholders involved?

On 26 November 2009, the BMU conducted an information meeting of the federal states to the National Renewable Energy Action Plan. At this event, representatives of the states as well as from the German Federation of Municipal Authorities (*Deutsche Städte- und Gemeindebund*) and the German Association of Cities and Towns (*Deutsche Städtetag*) were invited to participate in the preparation of the National Action Plan. The representatives were handed out a questionnaire that included specific questions to regional details from the Commission's template. Many of the proposals submitted for inclusion to the BMU until March 2010 have been incorporated into the National Action Plan. The draft of the National Action Plan, including the regional and local contributions, was handed over to the stakeholders for comment end of June 2010.

(b) Are there plans to develop regional/local renewable energy strategies? If so, could you please explain? In case relevant competences are delegated to regional/local levels, what mechanism will ensure national target compliance?

In Germany, responsibility for regional and local development of renewable energies resides basically with the federal states or the municipalities. Ambitious projects at regional and local level are supported by the Federal Government, for example as part of the project ‘Development prospects for sustainable 100% renewable-

[70] BMU 2010c
[71] BMU 2010c
[72] BMU 2009b
[73] BMU 2007, DLR 2008, DLR 2009

energy regions in Germany‘ (*Entwicklungsperspektiven für nachhaltige 100%-Erneuerbare-Energie-Regionen in Deutschland*), conducted jointly by the deENet and the University of Kassel. In this example, communities and regions that wish to meet their energy needs in the medium to long term through 100 % renewable energy, have access to scientific research and support. The project will analyse and offer nationwide field support to the regional activities aiming at full supply through renewable energies. A fundamental component of the project is the ongoing, nationwide survey of 100 %-renewable-energy regions. In June 2010, 82 regions/projects were known (see table in Annex under 7.3.9). The project website: http://www.100-ee.de offers a recent overview and an interactive map, (http://www.100-ee.de/index.php?id=182).

Another project supported by the Federal Government,’Model Regions Bioenergy‘ (*Modellregionen Bioenergie*), promotes the development of network structures between agriculture, industry, science and population. More information on the project is available at http://www.bioenergie-regionen.de. In Annex 7.3.9 a list of bioenergy-regions is provided.

(c) Please explain the public consultation carried out for the preparation of this Action Plan.

In late June/early July 2010, the Federal Government consulted associations and NGOs from the fields of renewable energy and environment on the draft of the National Action Plan. In a consultation meeting on 9 July 2010 in the Federal Environment Ministry, the associations presented their remarks and comments. The Federal Government has included some of these suggestions and comments in the present National Action Plan. In addition, local and regional stakeholders were involved in the consultation process (see 5.4 a).

(d) Please indicate your national contact point/the national authority or body responsible for the follow-up of the Renewable Energy Action Plan?

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)

Division for education and fundamental aspects of renewable energy (KI III 1)

(e) Do you have a monitoring system, including indicators for individual measures and instruments, to follow-up the implementation of the Renewable Energy Action Plan? If so, could you please give more details on it?

The continuous evaluation at federal level of the renewable energy schemes and instruments described in the National Action Plan is stipulated in various acts and regulations.

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7. ANNEX

7.0. Abbreviations and tables

7.1.1. Abbreviations

AFP	Agrarinvestitionsförderungsprogramm (Agricultural Investment Support Program)
AGEB	Arbeitsgemeinschaft Energiebilanzen (Working Group Energy Balances)
ARegV	Anreizregulierungsverordnung (Incentive Regulation Ordinance)
AusglMechV	Ausgleichsmechanismusverordnung (Equalisation Scheme Ordinance)
BauGB	Baugesetzbuch (Building Code)
BauNVO	Baunutzungsverordnung (Land Use Ordinance)
BBergG	Bundesberggesetz (Federal Mining Act)
BbgBO	Brandenburgische Bauordnung (Brandenburg Building Code)
BBSR	Bundesinstitut für Bau-, Stadt- und Raumforschung (Federal Institute for Construction, Urban and Spatial Research)
GFCE	Gross Final Consumption of Energy
BfN	Bundesamt für Naturschutz (Federal Agency for Nature Conservation)
BImSchG	Bundes-Immissionsschutzgesetz (Federal Immissions Control Act)
BImSchV	Verordnung zur Durchführung des Bundes-Immissionsschutzgesetz (Ordinance Implementing the Federal Immission Control Act)
Biokraft-NachV	Biokraftstoff-Nachhaltigkeitsverordnung (Biofuels Sustainability Ordinance)
BioKraftQuG	Gesetz zur Änderung der Förderung von Biokraftstoffen (Biofuels Quota Act)
BioSt-NachV	Biomassestrom-Nachhaltigkeitsverordnung

	(Biomass Stream Sustainability Ordinance)
BLE	Bundesanstalt für Landwirtschaft und Ernährung
	(Federal Institute for Agriculture and Nutrition)
BMBF	Bundesministerium für Bildung und Forschung
	(Federal Ministry of Education and Research)
BMELV	Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz
	(Federal Ministry of Nutrition, Agriculture and Consumer Protection)
BMU	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit
	(Federal Ministry for the Environment, Nature Conservation and Nuclear Safety)
BMVBS	Bundesministerium für Verkehr, Bau und Stadtentwicklung
	(Federal Ministry of Transport, Building and Urban Affairs)
BMWi	Bundesministerium für Wirtschaft und Technologie
	(Federal Ministry of Economics and Technology)
BNatSchG	Bundesnaturschutzgesetz
	(Federal Nature Conservation Act)
BNetzA	Bundesnetzagentur
	(Federal Network Agency)
BSH	Bundesamt für Seeschifffahrt und Hydrographie
	(Federal Maritime and Hydrographic Agency)
BtL	Biomass-to-Liquid
CHP	Cogeneration of Heat and Power
dena	Deutsche Energie-Agentur GmbH
	(German Energy Agency GmbH)
DVGW	Deutsche Vereinigung des Gas- und Wasserfaches e.V.
	(German Association of Gas and Water Experts
EAG EE	Europarechtsanpassungsgesetz Erneuerbare Energien
	(European Law Adaptation Act for Renewable Energy)
EE-Anlagen	Erneuerbare-Energien-Anlagen
	(Renewable Energy Installations)
EEAP	Energieeffizienz-Aktionsplan
	(Energy Efficiency Action Plan)
EEG	Erneuerbare-Energien-Gesetz
	(Renewable Energy Act)
EEWärmeG	Erneuerbare-Energien-Wärmegesetz
	(Renewable Energies Heat Act)

EEZ	Exclusive Economic Zone
EFF	Szenario mit zusätzlichen Energieeffizienzmaßnahmen (Scenario with additional efficiency measures)
EnEV	Energieeinsparverordnung (Energy Saving Ordinance)
EIA	Environmental Impact Assessment
EnLAG	Energieleitungsausbaugesetz (Power Grid Expansion Act)
ENTSO-E	European Network of Transmission System Operators for Electricity
EnWG	Energiewirtschaftsgesetz (Energy Industry Act)
EnergieStG	Energiesteuergesetz (Energy Tax Act)
ETBE	ethyl-tert-butylether
EU	European Union
EWärmeG	Erneuerbare-Wärme-Gesetz (Renewable Heat Act)
EEA	European Economic Area
FCE	Final Consumption of Energy
FNR	Fachagentur Nachwachsende Rohstoffe (Agency for Renewable Raw Materials)
GAK	Gemeinschaftsaufgabe ‘Verbesserung der Agrarstruktur und des Küstenschutzes’ (Joint Task ‘Improvement of Agricultural Structures and Coastal Protection’)
GasNEV	Gasnetzentgeltverordnung (Gas Grid Payment Ordinance)
GasNZV	Gasnetzzugangsverordnung (Gas Grid Access Ordinance)
GFCE	Gross Final Consumption of Energy
GJ	gigajoule
GNP	Gross National Product
grain WCS	grain whole crop silage
HBauO	Hamburgische Bauordnung (Building Code Hamburg)
HwO	Handwerksordnung (Crafts and Trades Regulation Code)
IEE	Intelligent Energy Europe

IPBG	Infrastrukturplanungsbeschleunigungsgesetz (Infrastructure Planning Acceleration Act)
ILE	Integrierte ländliche Entwicklung (Integrated Rural Development)
KfW	KfW-Bankengruppe (KfW Banking Group [formerly Reconstruction Loan Coorporation])
KraftNAV	Kraftwerks-Netzanschlussverordnung (Power Plant Grid Connection Ordinance)
KrW-/AbfG	Kreislaufwirtschaft- und Abfallgesetz (Closed Substance Cycle and Waste Management Act)
ktoe	kilo tons of oil equivalents
kw	kilowatt
KWKG	Kraft-Wärme-Kopplung-Gesetz (Cogeneration of Heat and Power Act)
LEP	Landesentwicklungsplan (State Development Plan)
MAP	Marktanreizprogramm (Market Incentive Program)
MW	megawatt
NAV	Niederspannungsanschlussverordnung (Low Voltage Connection Ordinance)
neg.	negligible
NRW	Nordrhein-Westfalen (North Rhine-Westphalia)
NREAP	National Renewable Energy Action Plan
n.s.	not specified
PCE	Primary Consumption of Energy
PJ	petajoule
PV	photovoltaic
REF	Reference Scenario
ROG	Raumordnungsgesetz (Federal Regional Planning Act)
oe	oil equivalent
SächsBO	Sächsische Bauordnung (Saxony Building Code)
SeeAnlV	Seeanlagenverordnung (Offshore Installations Ordinance)

SRP	Short Rotation Plantation
StromNEV	Stromnetzentgeltverordnung (Electricity Grid Payment Ordinance)
StromNZV	Stromnetzzugangsverordnung (Electricity Grid Access Ordinance)
TEN-E	Leitlinien für die transeuropäischen Energienetze (Guidelines for Trans-European Energy Networks)
UBA	Umweltbundesamt (Federal Environment Agency)
UCTE	Union for the Coordination of the Transmission of Electricity
UIG	Umweltinformationsgesetz (Environmental Information Act)
UVPG	Gesetze über die Umweltverträglichkeitsprüfung Environmental Impact Assessment Acts
VdEW	Verband der Ernährungswirtschaft (Food Industry Association)
VDN	Verband deutscher Naturparke e.V. (Association of German Nature Parks)
VO	Verordnung (Ordinance)
VwVfG	Verwaltungsverfahrensgesetz (Administration Procedure Act)
WHG	Wasserhaushaltsgesetz (*Water Resources Act)*

7.1.2. List of tables

Tables 1-12 from templates of the European Commission.

Tables a-z additional tables.

of renewable energy sources with regard to the binding targets for 2020 and the indicative trajectories for the share of energy from renewable sources in the electricity sector in the period 2010-2014

Table 10b: Estimated total contribution (installed capacity, gross electricity) that is expected in Germany of each technology for the use of renewable energy sources with regard to the binding targets for 2020 and the indicative trajectories for the share of energy from renewable sources in the electricity sector in the period 2015-2020

Table 11: Estimated total contribution (energy consumption) that is expected in Germany of each technology for the use of renewable energy sources with regard to the binding targets for 2020 and the indicative trajectories for the share of energy from renewable sources in the heating and cooling sector in 2010-2020

Table 12: Estimated total contribution that is expected in Germany from each technology for the use of renewable energy sources with regard to the binding targets for 2020 and the indicative trajectories for the share of energy from renewable sources in transport in 2010-2020

Table n: Development of gross domestic product, primary consumption of energy and final consumption of energy for 2010-2020 for the scenarios EFF and REF of the National Renewable Energy Action Plan

Table o: Determination of the empirical ratio of gross final consumption of energy to final consumption of energy, from the energy balances of Germany 2000-2007

P table: Overview of energy and climate policies of the federal states (as of February and July 2010)

Table q: Sample list of existing regional legislation for authorisation, certification and licensing procedures, and the planning legislation applied to installations and associated infrastructure of transmission and distribution grids (as of February and July 2010)

Table r: Quality regulations in force in Germany with the related acts and regulations

Table s: Examples of existing and planned information, awareness and training programs that inform citizens about the benefits of the development and use of energy from renewable sources and relevant practical aspects

Table t: Increase in interconnection capacity with neighbouring countries

Table l: Availability of biomass in 2007, stated as biogenic fuels in energy units

Table v: Estimated availability of domestic biomass in 2015 and 2020

Table W: Biomass conversion table

Table x: List of so far identified 100% Renewable Energy Regions (as of June 2010)

Table y: List of Bioenergy Regions (as of June 2010)

Table z: Assumptions on the annual electricity production in wind turbines with and without application of the normalisation rule set out in Annex II of Directive 2009/28/EC

7.2. Additions to Chapter 2

7.2.1. Calculation of gross energy consumption for electricity, heating and cooling and transport

a) Basic assumptions for the determination of the (gross) final consumption of energy in both scenarios of the National Renewable Energy Action Plan

The driving factor for the estimation of the gross final consumption of energy in the two scenarios to be defined for the National Renewable Energy Action Plan is the development of gross domestic product (GDP), as is listed in the following table for the years 2008-2020

Table n: Development of gross domestic product (GDP in billion Euros$_{2000}$), primary consumption of energy (PCE, in Mtoe[74]) And final consumption of energy (FCE, in Mtoe) for 2010-2020 for scenarios EFF and REF of the National Renewable Energy Action Plan.

	Scenario	Unit	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
GDP	**REF & EFF**	**billion euro$_{2000}$**	2 274	2 160	2 187	2 215	2 243	2 271	2 299	2 327	2 349	2 371	2 393	2 415	2 437
PCE	**REF**	**Mtoe**	339.2	317.2	323.7	322.7	321.3	319.3	317.5	315.5	312.5	308.5	304.5	300.7	296.9
	EFF	**Mtoe**	339.2	317.2	323.4	321.5	318.4	315.0	311.3	307.1	301.2	295.1	289.0	282.8	276.7
FCE	**REF**	**Mtoe**	218.0	203.6	215.8	215.3	214.5	213.3	212.3	211.1	210.2	208.6	207.1	205.5	204.0
	EFF	**Mtoe**	218.0	203.6	215.6	214.5	212.6	210.4	208.2	205.5	202.6	199.6	196.5	193.3	190.1
GFCE	**REF**	**Mtoe**	226.0	210.1	223.8	223.2	222.5	221.2	220.1	218.9	218.0	216.3	214.7	213.1	211.6
	EFF	**Mtoe**	226.0	210.1	223.6	222.5	220.5	218.2	215.9	213.1	210.1	207.0	203.8	200.5	197.2
PCE/FCE	**REF & EFF**	**-**			1.500	1.499	1.498	1.497	1.496	1.494	1.487	1.479	1.471	1.463	1.455
GFCE/FCE	**REF & EFF**	**-**			1.037	1.037	1.037	1.037	1.037	1.037	1.037	1.037	1.037	1.037	1.037

Figures for 2008: BMWi energy data[75]. Figures for 2009: own preliminary assessment of BMWi energy data[76]

The GDP trend takes into account the slump in the GDP due to the economic and financial crisis in Germany 2008-2009[77] and therefore follows overall a more conservative path than energy scenarios for the Energy Summit of the Federal Government in 2007[78] or the policy scenarios for climate protection of the Federal Ministry for the Environment[79], but corresponds roughly to the GDP trend of more recent studies such as the Prognos AG for the WWF[80] .

Based on the present GPD trend, primary consumption of energy (PCE) can be determined through energy productivity, the ratio of GDP to PCE. The starting point was a GDP of 2 276 billion Euros$_{2000,}$ a PCE of 339.2 Mtoe (14 200 PJ) in 2008[81] and

[74] Estimates based on the CO_2 avoidance factors from BMU 2009b;
[75] 1 Mtoe = 1,000 ktoe = 1 000 000 tonnes of oil equivalent = 41 868 PJ
[76] BMWi 2010
[77] BMWi 2010
[78] BMWi 2010
[79] EWI/Prognos 2007
[80] UBA 2009.
[81] WWF 2009

the resulting energy productivity of 6.7 million $Euros_{2000}$/ktoe (0.16 billion $Euros_{2000}$/PJ). The year 2008 was chosen as the base year because it is the year of the most recent energy balance available[82] for the Federal Republic of Germany. For the reference scenario (REF) of the National Renewable Energy Action Plan, an *average* slope of energy productivity of 1.7 % per year was assumed for the period 2009-2020; for the scenario with additional energy efficiency measures, the mean increase in energy productivity was 2.3 %. The value of 1.7 % per year of the scenario REF corresponds approximately to the average energy productivity growth in Germany in the period 1990-2008[83]. The value of 2.3 % for the EFF scenario reflects a current assessment of the impact of feasible new energy efficiency measures and takes account of the effects of the economic and financial crisis in 2008/2009; it ranges at lower levels of comparable efficiency scenarios of current studies[84].

The aforementioned values for the increase in energy productivity are *averages* for the period 2008-2020; that is, they primarily define the primary consumption of energy (at given GDP) for 2020, starting from base year 2008. For the period 2009-2019, plausible adjustments were made in primary consumption of energy in order to take into consideration the effect of the economic crisis 2008/2009 in the scenarios EFF and REF. In 2009, therefore, a PCE was set of 317.2 Mtoe (13 281) (with a GDP of 2 160 billion $Euros_{2000)}$[85] which represents a slump of more than 6 % compared to 2008. For 2010, both scenarios assume that the primary consumption of energy will slightly recover, without reaching the 2008 level. In combination with a GDP drop of 5 % in the period 2008-2009 and subsequent recovery in economic performance in 2010, energy productivity in the period 2008-2010 lies well below the specified average of 1.7 %/a (REF) and 2.3 %/a (EFF). Therefore, the energy productivity – starting in 2011 – must gain momentum in both scenarios: The increase in energy productivity is then at the end of the decade (2019-2020) at 2.0 %/a in the REF scenario and at 2.9 %/a in the EFF scenario.

The calculation of final consumption of energy (FCE) from the PCE determined by these criteria was based on the corresponding FCE/PCE ratio of the'Policy scenarios for climate protection V'[86] from the Federal Environmental Agency. For the distribution of final consumption of energy in the sectors transport, electricity and heating/cooling in scenario EFF of the National Action Plan, it was considered that in the sector heating/cooling larger potentials for energy savings could be tapped into than in the transport and electricity sector, where increasing efficiency of vehicles and devices is offset by higher performances and a growing use of electricity-driven technologies.

b) Determination of the gross final consumption of energy from the final consumption of energy

According to the definition of gross final consumption of energy (GFCE) of Directive 2009/28/EC (Article 2 (f), the gross final consumption of energy can be determined, in accordance with the classification criteria of the energy statistics of the Working Group on Energy Balances (AGEB)[87]as follows:

[82] BMWi 2010
[83] BMWi 2010, 2009b AGEB
[84] BMWi 2010
[85] UBA, 2009, WWF 2009, EWI/Prognos 2007
[86] BMWi 2010
[87] UBA 2009

Gross Final Consumption of Energy (GFCE) =

Final consumption of energy (FCE) + (line 45 AGEB)

Flaring and transmission losses electricity + (line 41 AGEB)

Flaring and transmission losses heating + (line 41 AGEB)

Own use of electricity in power and heating plants + (line 47 AGEB)

Own use of heat in power and heating plants (line 47 AGEB)

The corresponding data of the AGEB[88] is summarized inTable o.

Table o: Determination of the empirical relationship between gross final consumption of energy to final consumption of energy from the energy balances of Germany 2000-2007

		2000	2001	2002	2003	2004	2005	2006	2007	Average 2000-2007
Final consumption of energy (FCE)	**PJ/a**	9235	9455	9226	9356	9295	9242	9296	8815	
Flaring and transmission losses electricity	**PJ/a**	85	118	93	100	103	106	104	106	
Flaring and transmission losses heating	**PJ/a**	41	40	39	33	38	39	39	36	
Production-related (own) consumption electricity - power and heating plants	**PJ/a**	195	195	188	195	194	200	200	193	
Production-related (own) consumption heat - power and heating plants	**PJ/a**	8	8	7	5	5	5	5	5	
Gross final consumption of energy (GFCE)	**PJ/a**	9563	9816	9553	9689	9635	9592	9644	9155	
GFCE/FCE	**-**	1.036	1.038	1.035	1.036	1.037	1.038	1.037	1.039	**1.037**

Source: AGEB 2009 a, b, Figures GFCE and GFCE/FCE: own calculations

[88] AGEB 2009a, b

The gross final consumption of energy can be determined approximately from the final consumption of energy of the scenarios EFF and REF as follows: The statistics of the AGEB show that the relationship between gross final consumption of energy and final consumption of energy (f = GFCE/FCE) in the period 2000-2007 was subject to only minor fluctuations. Average value and standard deviation of f was at f = 1.037±0.001. Under the assumption that f is constant in time until 2020, the gross final consumption of energy (GFCE) until 2020 can be calculated from the final consumption of energy of the scenarios REF and EFF, multiplied by the factor f: GFCE = f * FCE

c) Calculation of the gross final consumption of energy for the electricity sector

The gross final consumption of energy for the electricity sector (= gross consumption of electricity) can be determined as follows:

gross consumption of electricity =

gross consumption of electricity +

import balance -

pumping in pumped-storage plants

In both the scenarios EFF and REF of the National Renewable Energy Action Plan, it is assumed that electricity consumption in Germany will be fully covered by domestic power generation, but also that no electricity is exported to neighbouring countries. The import balance is therefore in both scenarios a constant 0. In the progress reports to the National Action Plan from 2011, the actual electricity import and export quantities will be reported.

d) Calculation of gross final consumption of energy for the transport sector

For the transport sector, the gross final consumption of energy is identical to the final consumption of energy. For the National Action Plan, however, specific calculation rules must be observed. In particular:

- For the gross final consumption of energy in transport in Table 1 (row 3) only petrol, diesel fuel, biofuels used in road and rail transport and electricity were taken into account. In addition, the electricity from renewable sources used in road transport was weighted by a factor of 2.5.
- For the share of gross final consumption of energy in transport which is included in the overall gross final consumption of energy in Table 1 (row 4), the use of natural gas/biomethane and kerosene were considered, in accordance with the definition of gross final consumption of energy (and in contrast to row 3 in Table 1).

e) Calculation of gross final consumption of energy for the heating and cooling sector

The gross final consumption of energy (GFCE) in the sector heating/cooling is calculated as follows:

GFCE (heating & cooling) =	(row 1 in Table 1)
Total GFCE	(row 4 in Table 1)
- GFCE electricity	(row 2 in Table 1)
- GFCE transport	(row 3 in Table 1)
- FCE kerosene, gas and electricity in transport	
- 1.5 times the value of renewable electricity consumption in road transport	

This takes into account that the use of kerosene and natural gas/biomethane is part of the total GFCE, but is not included in the GFCE transport. In addition, multiple counting of electricity consumption in transport (in particular electricity from renewable sources in road transport) is avoided.

f) Conversion factor between PJ and 1 000 tonnes of oil equivalent (ktoe):

1 PJ = 23 885 tonnes of oil equivalent = 23.885 · 1000 toe = 23.885 ktoe

1 ktoe = 1000 tonnes of oil equivalent = 41.868 TJ = 0.041868 PJ

7.2.2. Energy efficiency improvements and energy savings in the EFF scenario of the National Renewable Energy Action Plan compared to requirements for the reduction of final consumption of energy in accordance with Directive 2006/32/EC and the National Energy Efficiency Action Plan

The EU Directive 2006/32/EC on Energy Efficiency and Energy Services sets down that Germany's final consumption of energy in the period 2008 to 2016 should fall by 9 % of the average final consumption of energy in the period 2001-2005. According to the Working Group on Energy Balances[89], the average final consumption of energy 2001-2005 was 222 489 ktoe (9 315 PJ), 9 % of which amount to 20 024 ktoe (838 PJ). 8 957 ktoe (375 PJ) can also be credited, as so-called 'Early Actions', to the reduction of final consumption of energy in the period 2008-2016. Interim target for 2010 is therefore a reduction of final consumption of energy by 16 % of the target value 2016, i.e. 3 204 ktoe (134 PJ)[90].

According to the AGEB[91], the final consumption of energy in Germany in 2008 was 217 998 ktoe. The final consumption of energy in 2016 in the scenario'with additional energy efficiency measures (EFF)' is ktoe 202 616, a difference of 15 382 ktoe. If 'Early Actions' are taken into account, the reduction of final consumption of energy 2008-2016 which is to be considered in the EFF scenario amounts to 24 339 ktoe. In 2010, the final consumption of energy in the EFF scenario is by 2 365 ktoe lower than in 2008, and lies, taking into account the 'Early Actions', at 11 321 ktoe. The scenario EFF of the NREAP surpasses thus, both for 2016 and for the interim target 2010 –

[89] AGEB 2009a, b

[90] AGEB 2009a, b

[91] It should be noted that the EU Directive on 'Energy Efficiency and Energy Services' (2006/32/EC) refers to *final* energy consumption, while the data on energy consumption in the Renewable Energy Directive (2009/28/EC) refer to *gross final* consumption of energy. To determine the gross final consumption of energy from the final energy consumption, see Chapter 7.1.1b.

taking into account the ‘Early Actions’ – requirements for the reduction of energy consumption under Directive 2006/32/EC[92].

The information contained in the National Energy Efficiency Action Plan (EEAP)[93](in accordance with Directive 2006/32/EC) on energy savings in individual sectors are not binding targets for the National Renewable Energy Action Plan, but only a rough estimate of possible reductions in energy consumption, as can be effected by certain instruments or individual measures. The following comparison of energy savings of each sector in EEAP and in NREAP therefore only illustrate the extent to which estimates of both plans are at a similar level.

In the transport sector, the EEAP sees the possibility for reduction of final consumption of energy 2008-2016 ranging between 3 798-5 517 ktoe. In the scenario EEF of NREAP, a reduction of 1 818 ktoe of final consumption of energy in transport is reached in the period 2008-2016, a figure which lies below the EEAP scenario. ‘Early Actions’ are not planned for the transport sector. In the electricity sector, the EEAP estimates potential energy savings of 2 209-3 709 ktoe in the period 2008-2016. Of this, 1 767 ktoe can be counted as ’Early Actions‘ (with a weighting factor for electricity of 1.0). In the scenario EFF of the NREAP, the reduction of electricity consumption 2008-2016 lies at 1 804 ktoe without ’Early Actions’ and 3 571 ktoe including ‘Early Actions’. The reduction of electricity consumption in the scenario EFF of the NREAP thus lies within the range of the EEAP. In the sector ‘heating and cooling’, the EEAP expects energy savings of 5 990-8 579 ktoe in the period 2008-2016. In the scenario EFF of the NREAP, however, the reduction of final consumption of energy in this sector is ktoe 12 197.

[92] AGEB 2009a, b

[93] Directive 2006/32/EC allows weighting the reduction of electricity consumption by a factor 1.0 to 2.5. In the above calculation a factor of 1.0 was used.

7.3. Additions to Chapter 3

Table p: Overview of energy and climate policies of the federal states (as of February and July 2010)

Land	Strategy	Objective/Content
Baden-Wurttemberg	*Klimaschutz 2010* (Climate Protection Concept 'Climate 2010') Energy plan 2020	Saving of 2 m to 4 m tonnes CO_2 per year on average in the years 2008 to 2012 through state-specific measures, doubling the share of renewable energies in primary consumption of energy and electricity production (target was reached in 2007). The Climate Protection Concept 2010 is currently being updated. Increasing energy efficiency by 2 % per year and reduction of primary consumption of energy, expanding renewable energies to at least 20 % in electricity production, 16 % in heat supply and 12 % in primary consumption of energy, development of cogeneration to 20 % of net electricity production.
Bavaria	*Klimaprogramm Bayern 2020* Climate Program Bavaria 2020	Reduction in annual energy-related CO_2 emissions to well below 6 tonnes per capita (prerequisite: further use of nuclear energy) by, inter alia, doubling the share of renewable energies in final consumption of energy to 20 %, increasing energy productivity by 30 %, increasing the share of renewable energies in electricity production to 30 %, increasing the contribution of geothermal energy on each electricity and heat supply to 1-2 %, increasing the share of biomass in primary consumption of energy to 8 %
Berlin	*Landesenergieprogramm 2006-2010* (State Energy Program 2006-2010)	Doubling the share until 2020, to then 20 % in final consumption of energy.
Brandenburg	*Energiestrategie 2020* (Energy Strategy 2020)	Increasing the share of renewable energies from the present 6.2 % to 20% in primary consumption of energy by 2020. To achieve this, especially solar energy and biomass for building engineering systems will be developed.
Bremen	*Klimaschutz- und Energieprogramm* (KEP) 2020 Climate Change and Energy Programme	Basis of the program is the binding target of reducing Bremen CO_2 emissions by 2020 by at least 40 % compared to 1990. The reduction target refers to the federal state Bremen (without steel industry). The CO_2 emissions in the steel industry will be considered in a supplementary examination.
Hamburg	*Klimaschutzkonzept 2007-2012* (Climate Protection Concept 2007-2012)	The Climate Protection Concept is aimed at CO_2 reduction and includes, beside programs for financial support of renewable energies uses, also some exemplary individual projects in which renewable energies are deployed.

Hesse	*Klimaschutzkonzept Hessen 2012* (Climate protection concept Hesse 2012)	Increasing the share of renewable energies in final consumption of energy (excluding transport) by 2020 to 20 %.
	Hessian energy plan for energy efficiency and renewable energies	Report of the Energy Forum Hesse 2020: Objectives and key points of the Hessian energy plan for the areas of energy efficiency and renewable energies, January 2010
	Status and prospects of biomass use for energy in Hesse	Biomass potential study Hesse: Status and prospects of biomass for energy in Hesse in June 2010
	Integrierte Klimaschutzprogramm Hessen 2012 (Integrated Climate Protection Programme Hesse 2012 - INKLIM 2012)	The Integrated Climate Protection Programme Hesse 2012 (INKLIM 2012) was launched in spring 2004. It provides the technical and scientific basis for the Hessian climate protection concept 2012 from the year 2007 and the Action Plan for Climate Protection from 2007. It particularly looks at the sectors of energy supply, industry, industry, household and transport. Building on the model structure of the project InKlim 2012, in the following period a scenario update was conductd and completed in 2009 (INKLIM - Scenario Update).
Mecklenburg-Vorpommern	*Aktionsplan Klimaschutz Mecklenburg-Vorpommern 2010* (Climate Protection Action Plan Mecklenburg-Vorpommern 2010)	The Climate Protection Action Plan shows the strategic and specific oportunities and options in the four key action areas: Energy conservation, energy efficiency, renewable energy and biogenic CO_2 storage and greenhouse gas abatement Depending on the given conditions, the federal state government aspires to a CO_2 reduction of '40PLUS' by 2020 from 1990. Regarding renewable energies, in the electricity sector a 5.6 times and in the heating sector 4.8 times increase from 2005 is possible.
Lower Saxony	Coalition agreement (2008-2013)	Increasing the share of renewable energies to 25 % in 2020.

North Rhine-Westphalia	*NRW Konzept Erneuerbare Energien* (NRW Plan Renewable Energies) Energy and climate protection strategy of North Rhine-Westphalia,	The aim is to achieve strong sustainable economic growth while reducing CO_2 emissions. • reduce energy consumption • increase efficiently the share of renewable energies in energy supply • increase efficiency, mainly in power generation through fossil fuels • research, develop and introduce into the market the necessary technologies for this • accelerate international energy technology transfer. With these measures a reduction in CO_2 emissions until 2020 of 81 m tonnes annually from 2005 is aimed at. The energy and climate protection strategy of North Rhine-Westphalia provides for: • an increase in electricity production from renewable energies from 8.7 TWh (2005) to 20 TWh (2020) • an increase in heat production from renewable energies from 5 TWh (2005) to 20 TWh (2020) • a reduction of final consumption of energy in the period from 2006-2020 by 20 % against the trend.
Rheinland-Pfalz	Government agreement of 28.06.2007, '*Ein Land voller Energien – für Klima, Wachstum und sichere Versorgung*' ('A land full of energy - for climate, growth and security of supply')	The energy policy objectives of the federal state government are: climate protection, securing energy, reducing energy bills and creating jobs. Rheinland-Pfalz is focusing on energy conservation, energy efficiency, increased use of renewable energies and the development of energy generation in the state itself. The aim of the federal state government is expanding the share of renewable energy in electricity consumption to at least 30% by 2020. Their share in the heat market should increase by at least 16% in 2020 as against 2005.
Saarland	*Saarländisches Klimaschutzkonzept 2008-2013* *(*Climate Protection Plan Saarland 2008-2013)	Goals for 2020 include the expansion of wind power installed capacity to 200 MW; photovoltaic to 100 MW; and for biogas a share of 10 % on gas consumption.
Saxony	*Aktionsplan Klima und Energie* (Climate and Energy Action Plan)	§ Reduction of annual energy-related CO_2 emissions of the non-emissions trading sector in 2020 compared to 2006 by least 6.5 m tonnes § Increase of the share of renewable energies in gross consumption of electricity by 2020 to at least 24% § Reduction in fossil heating energy needs in 2020 by 20 % The action plan focuses on short and medium term operational measures for climate protection and sustainable energy use as well as measures to adapt to climate change.
Saxony-Anhalt	The *Klimaschutzprogramm 2020* (Climate Protection Program 2020) is based on data and information from the *Klimaschutzkonzept* 2008 (Climate Protection Plan 2008)	The GHG reduction potential in the period 2005-2020 amounts to 18.3 to 24.8 %. In its Climate Protection Program 2020, Saxony-Anhalt wants to significantly exceed the 40 % goal of the Federal Government. Also envisaged is a GHG reduction 1990-2020 by 47.6 %. The federal state government aims to increase the share of renewable energies in final energy demand to 20 % by 2020. The Climate Protection Program 2020 contains 110 climate protection measures
Schleswig-Holstein	*Klimaschutzbericht/ -programm 2009* (Climate Report/Program 2009)	Information on measures of the current legislative term, future priorities for action. The aim of the federal state government of Schleswig-Holstein is to achieve in 2020 a share of well over 100 % in domestic electricity consumption equivalents from renewable energies.

	Energiekonzept 2010 (Energy Plan 2010)	Energy policy objectives of the federal state government for the next ten years with regard to the requirements of climate protection policy at EU and national level. Objectives are: Development of renewable energy, energy conservation and energy efficiency, promotion of a balanced energy mix, support for grid development, promotion of competition in energy markets, reliable energy regulator to secure energy supply, innovation in the energy sector.
	In preparation: Scenarios for electricity and heat supply in 2020	In 2010, the federal state government will present a scenario 2020 for electricity and heat supply in Schleswig-Holstein, taking into consideration energy scenarios and frameworks commissiones at federal level. According to initial estimates, a share of renewable energies in final consumption of energy of over 50 % can be achieved by 2020. The long-term aim is to ensure energy supply exclusively from renewable sources. In the scenarios envisaged in the course of the year, forecast or target values will be specified in more detail.
	Scheduled: *Integriertes Klimaschutz- und Energieprogramm* (Integrated Climate and Energy Program – IKEP) Schleswig-Holstein	Planned for this legislative period (2012 or 2013): *Integriertes Klimaschutz- und Energieprogramm Schleswig-Holstein* (Integrated climate and energy program Schleswig-Holstein)
Thuringia	*Energie- und Klimastrategie Thüringen 2015* *(*Energy and Climate Strategy Thuringia 2015)	The goal is a percentage of renewable energy in total final consumption of energy of 22 % by 2015.

7.4. Additions to Chapter 4

7.4.1. Chapter 4.2.1 point (a)

Table q: Sample list of existing regional legislation for authorisation, certification and licensing procedures and the spatial planning that will be used on plants and the associated transmission and distribution network infrastructure. (As of February and July 2010)[94]

Federal state	Legislation	Federal state authority and responsibilities	Amendment planned [95]
Baden-Württemberg	§ 11(3)(2)(11) and (7)(1) *Landesplanungsgesetz* Baden-Württemberg in conjunction with § 8(5)(1)(3) *Raumordnungsgesetz*	Regional planning body; regional planning control of wind energy use	
Bavaria	Articles 1, 2 BayImSchG	**Article 1** **Installations requiring approval** (1) Responsible authority under § § 4-21 of the Federal Immissions Control Act (BImSchG) (approving authority) is: a) - for installations of public utilities to produce electricity, steam, hot water, process heat or heated waste gas through use of fuel in a combustion system, excluding facilities for the use of biogas and natural wood with a thermal capacity of less than 10 MW; and for public electricity transformer stations with a high voltage of 220 kilovolts or more, including control panels; - for the public waste disposal facilities for thermal treatment of waste for disposal and facilities of public waste storage or treatment of hazardous waste for disposal and - for plants collection centers for utilization of animal carcases, the government; b) for facilities under the oversight of the mining authority, the *Bergamt;* c) for remaining plants, the local authority. (2) The approval authority is responsible for other official acts which are provided in the Federal Immissions Control Act and regulations based on this Act, especially for the ordering of investigations and trials, the order of operating agent, the receipt of complaints and the admission of exceptions. It is also responsible for operation bans due to lack of financial security under the law on environmental liability. (...) **Article 2**	Amendment 2010

[94] BMWi 2007

[95] The table provides an exemplary overview of the laws of individual states. It does not provide a complete overview of all regional legislation.

Bavaria		**Installations not subject to licensing** (1) The local government shall take the orders under § § 24, 25 BImSchG and the competent authority for other services within the meaning of Article 1(2) (2) By way of derogation of paragraph 1, installations that are subject to the supervision of the mining authority, the *Bergamt*. (...)'	
	§§ 4, 5 BergBehördV	Responsibilities of the StMWIVT and the mining authorities for the exploration and extraction of geothermal energy.	Amendment 2010
	Art. 53, 54, Art. 57(1)(2) Art. 57(1)(3)(a) Art. 57(2)(9) Art. 57 (1)(3)(b), Art. 59 BayBO	Systems of technical building equipment with the exception of free-standing chimneys over 10m height are not subject to licensing. Also not subject to licensing are solar energy and solar panels with the exception of installations that are not more than one third of each roof or exterior wall surface; not built in parallel or flush or unattached from a building; have a height of more than 3m and a total length of more than 9m. Solar power plants and solar panels are - independent of size - not subject to licensing procedures, provided they comply with local building regulations or urban statutes, which contain rules on admissibility, location and size of installation. Small wind turbines with a height up to 10m are not subject to licensing procedures. Unless the project is not subject to approval or licensing procedures, the approval takes place - with the exception of special structures under Article 2(4) BayBO - through a simplified building permit procedure under Article 59 BayBO. Lower supervision authorities are the local government, higher supervision authorities are the government, supreme supervision authority is the Ministry of the Interior.	Already amended and changes are not planned

Bavaria	Article 63 BayWG	Implementation of the WHG and the BayWG lies in the responsibility of local government authorities. These are responsibly mainly for issuing water rights permits.	
	Article 5 BayLplG, Article 11 et seq BayLplG	Planning authorities are StMWIVT as the supreme state planning authority, the governments as higher regional planning authorities and the local government offices as lower state planning authorities. The StMWIVT is responsible for drafting the state's development program (LEP).	Is to be amended.
	Article 2(9a) and (11), (13) BayLplG	Principles of spatial planning: Objectives of regional planning in the LEP to be developed from these principles.	Is to be amended
	LEP B VI 1.1 Z	Sprawl ban: this aim and subsequent objectives and principles of the LEP are to be considered by the regional planning associations in the preparation of regional plans and by the municipalities in the preparation of land use plans and development plans.	The entire LEP is currently being reviewed
	LEP B VI 1.5 Z	Particularly sensitive landscape elements shall be kept free from development.	"
	LEP B VI 1.5 G	Residential areas and other projects are to be integrated into the landscape as carefully as possible.	"
	LEP BV 3.6 g	Increased use and exploitation of renewable energy sources is desirable	"

	LEP B IV 2.1 Z	Area-wide, diverse, sustainable agriculture should be preserved.	“
	LEP BV 3.2.3 G	Electricity from renewable energy sources should be consolidated and further expanded and the capabilities of profitable and energy-efficient combined heat and power should be exploited.	“
	Article 6 DSchG	Whosoever intends to remove, change or relocate monuments or remove, change, or relocate protected pieces of decorative furnishings, or detach them from a monument, is subject to permission (Article 6 DSchG). This also applies to the installation of photovoltaic systems on roofs or facades. Responsible for issuing licenses is the local government offices as lower monument authorities (Article 11 DSchG). Higher conservation authorities are the governments; supreme monument protection authority is the *Staatsministerium für Wissenschaft, Forschung und Kunst (*Ministry of State for Science, Research and Art) . Support for enforcement authorities will be provided by the *Landesamt für Denkmalpflege (*State Office for the Preservation of Monuments) (Art. 12 DSchG). The *Landesamt für Denkmalpflege* is responsible for all issues of preservation and conservation. In the vast majority of cases, permits under Article 6 DSchG are issued in less than four weeks after receipt of entire application documents.	Already amended: Changes are not planned. In the field of monument preservation, it is important to note that changes may be associated with a non-reversible loss of constitutionally protected cultural property for which no equivalent can be created. The rules of preservation are therefore reasonable within the meaning of Article 13(1) Directive 2009/28/EC

Bavaria	ZVEnEV	The local building supervision authorities are responsible for the implementation of EnEV	Currently being amended
	ZustWiG	Article law on the responsibilities for enforcement of business legislation. The ZustWiG includes the regulatory power for the ZVEnEV, and for the ZustWiV.	Currently being amended
	ZustWiV	The regulation contains following relevant rules of jurisdiction: § 1 ZustWiV: Responsibility of governments for the enforcement of § § 54 (2), No. 1-3, No. 8 EnWG § 3 ZustWiV: Responsibility of governments for the execution of the concession fee regulation § § 7, 8 ZustWiV: The inspectorates are responsible for the implementation of energy labeling and energy levels regulation.	Is currently being amended
Brandenburg	Administrative Procedure Law of the Land Brandenburg of 07 July 2009 VwVfGBbg (§ 10)	State Office of Construction and Transportation (*Landesamt für Bauen und Verkehr*) carries out planning approval procedures and grants planning approvals (Concentration effect)	Not applicable
	Act on the introduction of regional planning as well as brown coal and remediation planning of 18 May 1993 RegBkPlG	Five regional planning committees provide each a regional plan (spatial control of wind use in suitable areas designated in the plan section 'Wind' in the respective regional plans)	Revision of the five 'plan sections Wind' for the Energy Strategy 2020
	Several decrees, among others: - Wind power Decree of 16 June 2009 - update of the Decree on 24 May 1996 (designation of suitable areas by the regional planning to reduce potential conflicts), - Fauna-based ecological distance criteria for the creation of wind farms in Brandenburg from June 1 2003 (consideration of the avifauna in planning and approval of sites for wind energy), - WEA-shadow-guideline of 24 March 2003 (identification and evaluation of optical emissions in the approval process), - WEA Noise Emission Decree of 31 July 2003 (Requirements for noise emission prognosis and measurement for wind turbines). - Plants subject to approval under building legislation (such as wind turbines under 50 meter total height, open space photovoltaic systems, biomass plants with a thermal capacity below 1 MW (biogas, sewage gas and landfill gas, wood use)		
	Brandenburg Building Code - 17 September 2008, last amended by Article 6 of the Act of 13 April 2010 BbgBO	Lower supervision authorities grant planning permission (approval concentration)	Not relevant

Brandenburg	Note:

	in accordance with § 55 BbgBO, following projects are not subject to building licensing: - Combustion plants with less than 300 kW nominal thermal output (i.e. small biomass heating, such as pellets plants), - Solar collectors, solar energy and photovoltaic installations mounted with a distance of less than 0.20 m to the roof or exterior wall surfaces or mounted on flat roofs with a total of less than 10 m² total surface and a height of not more than 0.60 m - Heat pumps - Stationary combustion motors for cogeneration of electricity and heat in buildings (*Blockheizkraftanlagen*). - Biogas plants		
	Act implementing the Animal by-disposal law of 30 July 1999, as last amended by Article 1 of Law of 16.12.2004 AGTierNebG	Brandenburg *Landesumwelt* (Federal State Environment) is responsible for approving and monitoring installations requiring a permit under the BImSchG. Veterinary and food inspection offices of the rural and urban districts are responsible for monitoring the facilities not subject to licensing.	Not relevant
	Recycling and Waste Law (*Kreislaufwirtschafts- und Abfallgesetz*) of 27 September 1994, modified by Article 3 of the Act of 11 August 2009 KrW-/AbfG	*Landesumwelt* Brandenburg handles waste legislation planning approval procedures in accordance with § 31(3) KrW-/AbfG (concentrating authorization - BImSchG approval is part of the waste permit).	Not relevant
	Installations for the incineration of special gases (landfill gas) - If there are gas engines, CHP or MBT plants on the premises of landfill sites, they are also part of the landfill facilities. - Are gas engines, CHP or MBT plants not part of a landfill site, they will be licensed with an approval procedure under BImSchG law. In this case, the Brandenburg *Landesumwelt* would also responsible for the BImSchG-license (concentrating approval).		
Hamburg	§ 61 HBauO	BSU, districts, Hamburg Port Authority (HPA). Implementation of the authorization for wind turbines as associated ancillary plants to those projects listed in § 61 (1) HBauO.	Summer 2010
	§ 62 HBauO	BSU, districts, HPA. Implementation of the approval procedure for wind turbines up to a total height of 50 m above the established ground surface.	Summer 2010
	§ 4 HmbKliSchG	BSU, connection and use obligation for renewable energy and cogeneration	2010

Lower Saxony	Land Use Planning Act (*Raumordnungsgesetz* – ROG) of 22.12.2008 (Federal Law Gazette I., p. 2986), as last amended by Article 9 of the Law of 31.07.2009 (BGBl. I, p. 2585)	The Federal Regional Planning Act (*Raumordnungsgesetz* - ROG) is subject to concurrent legislation. Federal Law (the ROG) is therefore to be considered by the federal states as directly applicable law.	
	Niedersächsisches Gesetz über Raumordnung und Landesplanung (Lower Saxony Spatial Planning and Regional Planning Act – NROG) in the version of 7 June 2007 (Nds. GVBl. p. 223)	Lower Saxony Ministry of Food, Agriculture, Consumer Protection and Regional Development (*Niedersächsische Ministerium für Ernährung, Landwirtschaft, Verbraucherschutz und Landesentwicklung*) is responsible for spatial planning and regional development at federal state level.	
	Regulations relating to NROG (VV-NROG) - Rd.Erl. the ML of 29.05.2008 (Nds. MBl. p. 592)	Lower Saxony Ministry of Food, Agriculture, Consumer Protection and Regional Development	
	Regulation on the regional spatial program (LROP), as amended on 08.05.2008 (Nds. GVBl. no. 10 of 22.05.2008, p.132)	Lower Saxony Ministry of Food, Agriculture, Consumer Protection and Regional Development	Is running
Saarland	*Wasserrahmenrichtlinie* (Water Framework Directive)	(Ministry of Environment, Energy and Transport *(Ministerium für Umwelt, Energie und Verkehr)* (MUEV) or *Landesamt für Umwelt und Arbeitsschutz* (State Office for Environment and Occupational Safety)	None
	Landesbauordnung (State Building Code)	MUEV or rural districts	In discussion
	Landesdenkmalschutzgesetz (Federal State Conservation Law)	MUEV	2010
	Landesentwicklungsplan (Federal State Development Plan)	MUEV	2010
Saxony	Saxon Building Code (SächsBO)	State authority: Saxon State Ministry of the Interior Building regulations control authorities responsible, see § 57 SächsBO	The SächsBO is being reviewed for implementation requirements.
	Sächsisches Wassergesetz (Saxon Water Act – SächsWG) §§ 13 (permit) or 14 (approval) in conjunction with § 42a SächsWG (minimum water drainage) and § 91 (water use permit) in conjunction with §§ 91a (requirements for hydropower plants), 91b SächsWG (consistency)	Basically, district offices and urban districts as the local water authorities; if permit or planning approval necessary: regional offices as higher water authorities.	The regulations of the Saxon Water Law are being adapted to the Water Act as applicable from 1.3.2010.

Schleswig-Holstein	Plants not requiring a permit - approval requirement according to regional building regulations for the federal state Schleswig-Holstein from 01.22.2009 (GVOBl. SH, 2009, p. 6)	In accordance with LBO Schleswig-Holstein	-
	Installations requiring a permit- approval requirement as under § 4(1) in conjunction with § 13 BImSchG and 4 BImSchV,	In accordance with state regulation on competent authorities for pollution control regulations and cross-media reporting obligations of 20.10.2008 (GVOBl. SH 2008, p. 540, 544)	-
	Regional Development Plan	Interior Ministry	In progress
	Principles for the Planning of Wind Power Stations (*Grundsätze zur Planung von Windkraftanlagen*)- Circular	Interior Ministry	In progress

Details on Federal (Urban) Planning Legislation

Renewable energy installations are structures that fall under the provisions of the Building Code Regulations (BauGB) and the Land Use Ordinance (BauNVO). These regulations provide several options for the approval of renewable energy plants:

a) The municipality may establish a land use plan. Land use plans are zoning maps (preparatory land use plan) and development plans (binding land use plan). Being within the jurisdiction of a development plan, a project is permitted if it does not contradict the stipulations of the development plan.

   The use of renewable energy and the economic and efficient use of energy is to be taken into account (§ 1(6)(7)(f) BauGB) when preparing a development plan. For urban planning reasons, the development plan can also establish areas in which certain constructional measures for renewable energies, like solar energy installations, must be implemented when erecting buildings(§ 9(1)(23)(b) BauGB).

   The designs and specifications made in the land use plans are substantiated by the provisions of the Land Use Ordinance according to type (building sites or construction areas) and size (e.g. floor space index) and according to structure. This also applies to areas that are used by plants producing renewable energy. For example, areas in which facilities are located for research, development or use of renewable energies, such as wind and solar energy, can be defined as special areas (§ 11(2) BauNVO).

b) The municipality may, alternatively, collaborate with private individuals in the form of urban development contracts. Subject of an urban development contract may also be – depending on the aims and objectives pursued by the urban planning – the use of networks and systems of combined heat and power and solar systems for heating, cooling and electricity.

c) If the municipality has no development plan drawn up to assess the project, its permissibility is evaluated in accordance with the Building Code. Outside the scope of a development plan, a project is permissible mainly if the requirements

of either the Building Code § 34 (unplanned interior) or § 35 (unplanned exterior) are met.

A project within a compact district (interior) is in particular permissible if it fits in with the characteristics of the surroundings; this must be verified for renewable energy installations according to the same criteria as is applied to other projects.

In general, no construction should take place outside the building context, i.e. in the exterior. Exceptions may apply to projects which, due to their function, must be realised in the exterior. Such an exception is a so-called privilege. For example a project is privileged that supplies the public with electricity, gas, (...) heat and water, (...) or enables a location-dependent commercial operation (§ 35(1)(3) BauGB). Also privileged in the 'exterior' is a project for research, development or exploitation of wind or water energy (§ 35(1)(5) BauGB). Finally, the energy use of biomass can, under certain conditions, be privileged and permitted in the 'exterior' (§ 35 (1) (6) BauGB).

d) The introduction of time-limit provisions and assumptions of approval (in § 109 BauGB [expropriation law] and § 171d BauGB [Urban Redevelopment Law], in conjunction with § 173 BauGB [conservation law]) for urban planning approval procedures in specific, geographically and temporally limited action areas should implement the requirements under Article 13(1)(2)(a) of the Directive to define transparent timetables and, under Article 13(1)(2)(c) of the Directive, to streamline and expedite administrative procedures.

7.4.2. Chapter 4.2.2 point (a)

Table r: Quality regulations in force in Germany with their related laws and regulations

Energy form	Act/Reg		Provision
All	EnWG	§ 19(1) Legally non-binding guidelines as a basis for minimum requirements on network operators	• *Verband der Netzbetreiber e.V.* (Association of Grid Operators - VDN) at the VDEW: TransmissionCode 2007 *Netz- und Systemregeln der deutschen Übertragungsnetzbetreiber (* Network and System Rules of the German transmission grid operators 2007) • Association of Grid Operators - VDN - e.V. at the VDEW: *EEG Erzeugungsanlagen am Hoch- und Höchstspannungsnetz, 2004* (EEG Production Plants in the High and Very High Voltage Grid) • *BDEW Bundesverband der Energie- und Wasserwirtschaft e. V* (BDEW Federation of Energy and Water Management): *Technische Richtlinie Erzeugungsanlagen am Mittelspannungsnetz* (Technical Guideline for Generating Plants at the Medium Voltage Network), *Richtlinie für Anschluss und Parallelbetrieb von Erzeugungsanlagen am Mittelspannungsnetz, 2008* (Guidelines for Connection and Parallel Operation of Generating Plants in the Medium Voltage Grid, 2008) • *BDEW Bundesverband der Energie- und Wasserwirtschaft e. V*. (BDEW Federation of Energy and Water Management): *Technische Anschlussbedingungen für den Anschluss an das Mittelspannungsnetz - TAB Mittelspannung 2008* (Technical Conditions for Connection to the Medium Voltage Grid – TAB Medium Voltage 2008). *BDEW Bundesverband der Energie- und Wasserwirtschaft e. V*. (BDEW Federation of Energy and Water Management) *Technische Anschlussbedingungen - TAB 2007 - für den Anschluss an das Niederspannungsnetz* (Technical Conditions for the Connection to the Low Voltage Grid – TAB Medium Voltage 2007). (*Bundesmusterwortlaut*), 2007.
Biomethane	EEG		Minimum standards for processing (energy, methane slip, regenerative heat source)
Biomethane	DVGW regulations		Determines in great detail the quality of biomethane at feed-in
Biomethane	EnWG	§ 19	Provision for the definition of minimum standards for the conditions for grid compatible gas quality, including gas from biomass
Biomethane	*Gasnetzzugangs-verordnung* (Gas Grid Access Ordinance)	§ 35, 41d	§ 41d Priority access for transport customers of biogas § 35 gas quality
Biomethane	EEWärmeG	Annex, number II.1	Fulfilment of obligation to use only if methane emissions and power consumption is reduced at feed-in with best available technology. Refers to § 41f (1) of Gas Grid Access Ordinance

Biomass (gas)	EEWärmeG	Annex, number II.1	Use conditions for high-efficiency CHP as defined by CHP Directive 2004/8/EC
Biomass (solid)	EEWärmeG	Annex, number II.3	Specification of minimum boiler efficiency
Biomass (liquid)	EEWärmeG	Annex, number II.2	'Best Available Technology ', compliance with sustainability requirements of Articles 17-19 of Directive 2009/28/EC
CHP (efficiency)	CHP-G	§ 6	Requirements for efficiency of CHP plants, reference to F-308
CHP (efficiency)	FW308 AGFW, worksheet to determine efficiency		Certification of CHP plants - determination of electricity from CHP.
CHP (efficiency)	EEWärmeG	Annex, number V	Highly efficient in the sense of the CHP-Directive
CHP (efficiency)	CHP Directive	Article 4,5	Provision to the efficiency of CHP plants
Solar heat	EEWärmeG	Annex, number I	Proof of the efficiency of the solar thermal energy plant by the Solar Keymark seal
Solar heat	Solar Keymark seal		Basis of the Solar Keymark are the EU-standards DIN EN 12975-1 'Thermal solar systems and components - Solar collectors - Part 1: General Requirements' DIN EN 12975-2 'Thermal solar systems and components - Solar collectors - Part 2: Test methods' DIN EN 12976-1 'Thermal solar systems and components - Prefabricated systems - Part 1: General Requirements' DIN EN 12976-2 'Thermal solar systems and components - Prefabricated systems - Part 2: Test methods'
Solar heat	German/European standards		DIN 4757-2: 1980-11 Solar heating systems with organic heat transfer medium; requirements for safety performance DIN EN 12975-1: 2006-06 Thermal solar systems and components - Solar collectors - Part 1: General requirements; German version EN 12975-1:2006 DIN EN 12975-2: 2006-06 Thermal solar systems and components - Solar collectors - Part 2: Test methods; German version EN 12975-2:2006 DIN EN 12976-1: 2006-04 Thermal solar systems and components - Prefabricated systems - Part 1: General requirements; German version EN 12976-1:2006 DIN EN 12976-2: 2006-04 Thermal solar systems and components - Prefabricated systems - Part 2: Test

			methods; German version EN 12976-2:2006 CEN / TS 12977-1:2009 Custom built systems - Part 1 - General Requirements CEN / TS 12977-2:2008 Custom built systems - Part 2 - Test methods EN 12977-3:2008 Custom built systems - Part 3 - Performance of hot water storage for solar systems. CEN / TS 12977-4:2009 Custom built systems - Part 4 - Performance of storages for solar combi-systems CEN / TS 12977-5:2009 Custom built systems - Part 5 - Test methods for control equipment
Photovoltaics	German standards		DIN EN 50 461, VDE 0126-17-1: 2007-03 solar cells - Data sheet and product data for crystalline silicon solar cells; German version EN 50461:2006 DIN VDE 0126-21, Publication date: 2007-07 draft standard photovoltaics in building DIN EN 60904-1: 1995-04 Photovoltaic devices - Part 1: Measurement of photovoltaic current-voltage characteristics (IEC 60904-1:1987) German version EN 60904-1:1993 DIN EN 60904-2: 1995-04 Photovoltaic devices - Part 2: Requirements for reference solar cells (IEC 60904-2:1989) German version EN 60904-2:1993 DIN EN 60904-2/A1: 1998-11 Photovoltaic devices - Part 2: Requirements for reference solar cells; Amendment 1 (IEC 60904-2:1989 / A1: 1998), German version EN 60904-2:1993 / A1: 1998 DIN EN 60904-3: 1995-04 Photovoltaic devices - Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral power distribution (IEC 60904-3:1989) German version EN 60904-3:1993 DIN EN 60904-5: 1996-12 Photovoltaic devices - Part 5: Determination of the equivalent cell temperature of photovoltaic (PV) equipment after the open circuit voltage method (IEC 60904-5:1993) German version EN 60904-5:1995 DIN EN 60904-6: 1996-02 Photovoltaic devices - Part 6: Requirements for reference solar modules (IEC 60904-6:1994) German version EN 60904-6:1994 DIN EN 60904-6/A1: 1998-11 Photovoltaic devices - Part 6: Requirements for reference solar modules, Amendment 1 (IEC 60904-6:1994 / A1: 1998), German version EN 60904-6:1994 / A1: 1998 DIN EN 60904-7: 2007-05 Photovoltaic devices - Part 7: Calculation of the spectral mismatch correction for measurements of photovoltaic devices (IEC 82/458/CDV: 2006), German version EN 60904-7:2007 DIN EN 60904-8: 1998-11 Photovoltaic devices - Part 8: Measurement of the spectral response of a photovoltaic (PV) device (IEC 60904-8:1998) German version EN 60904-8:1998 DIN EN 60904-10: 1998-11Photovoltaische - Part 10: Methods of measurement of the linearity (IEC 60904-10:1998); German version EN 60904-10:1998 DIN EN 61 194: 1996-12 characteristic parameters of photovoltaic (PV) island systems (IEC 61194:1992, modified), German version EN 61194:1995

			DIN EN 61215, VDE 0126-31: 2006-02 Terrestrial crystalline silicon photovoltaic (PV) modules - Design qualification and type approval (IEC 61215:2005); German version EN 61215:2005 DIN EN 61 277: 1999-02 Terrestrial photovoltaic (PV) power generation systems - General and guidelines (IEC 61277:1995); German version EN 61277:1998 DIN EN 61300-2-30: 1998-09 Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-30: Tests; solar radiation (IEC 61300-2-30:1995); German version 61300-2-30:1997 DIN EN 61 345: 1998-11 Testing of photovoltaic (PV modules) with ultraviolet (UV) radiation (IEC 61345:1998); German version EN 61345:1998 DIN EN 61646: 1998-03 Thin-film terrestrial photovoltaic (PV) modules - Type aptitude and type approval (IEC 61646:1996); German version EN 61646:1997 DIN EN 61 724: 1999-04 Monitoring of the operational performance of photovoltaic systems - Guidelines for measurement, data exchange and analysis (IEC 61724:1998); German version EN 61724:1998 DIN EN 61725 1998-03 Analytical description for solar radiation profiles (IEC 61725:1997); German version EN 61725:1997 DIN EN 61 727: 1996-12 Photovoltaic (PV) systems - Characteristics of network interface (IEC 61727:1995); German version EN 61727:1995 DIN EN 61 829: 1999-02 Photovoltaic (PV) module groups of crystalline silicon- On-site measurement of the current-voltage characteristics (IEC 61829:1995); German version EN 61829:1998 DIN EN 62 124, VDE 0126-20-1: 2005-10 Photovoltaic (PV) stand-alone systems - Design qualification and type testing (IEC 62124:2004); German version EN 62124:2005 DIN EN 62 093, VDE 0126-20: 2005-12 BOS components for photovoltaic systems - Design qualification natural environments (IEC 62093:2005); German version EN 62093:2005 DIN EN 62 108: 2007-05 concentrator photovoltaic (CPV) modules and arrays - Design qualification and type approval (IEC 82/429/CDV: 2006); German 62108:2
Photovoltaics	German construction standards that apply to installation of PV		DIN 1249 Flat Glass in Construction DIN 181 516 Part 4 of single-pane safety glass requirements, measurement, testing
Photovoltaics	Standards for connection and control		VDE 0100 ‘Erection of power installations with nominal voltages up to 1000 volts’ all relevant components VDE 0105 Part 100 ‘Operation of electrical installations’ VDE 0185 ‘Lightning protection’ of all relevant parts VDE 0298 Part 4 ‘Rubber insulated cables of rated voltages up to 450/750V’ VDE 100 part 712 Photovoltaic supply

Geothermal energy/environment heat	EEWärmeG	Annex, number III	Requirement of minimum annual coefficient according to VDI guideline 4650, Part 1; installation of counting devices for heat and electricity
Waste heat	EEWärmeG	Annex, number IV	With use by air ventilation systems, minimum degree of heat recovery target and minimum output value, when used with heat pumps see geothermal energy/heat environment
Wind	SDL WindV		Requirement for grid integration
Wind	DIN standards		VDE 0127 Part 12 1999-07 DIN EN 61400-12 Wind turbines - Part 12: Method of determining the performance behaviour of wind turbines (IEC 61400-12: 1998) German version EN 61400-12: 1998 VDE 0127 Part 21 2002-11 DIN EN 61400-21 Wind turbines - Part 21: Measurement and assessment of power quality of grid connected wind turbines (IEC 61400-21: 2001) German version EN 61400-21: 2002
Wind	FGW Technical Guidelines	TR 3,4,8	Part 3 Determination of the electrical characteristics of generation units at the middle, high and extra high voltage grids, Revision 20, 01/10/2009 Part 4 Requirements for modeling and validation of simulation models of the electrical characteristics of power generating units and systems, Revision 4 dated 01.10.2009 Part 8: Certification of the electrical characteristics of generation units and plants on the medium-high and high voltage grids, Revision 2, 12/18/2009

7.4.3. Chapter 4.2.3 point (e)

In the following, measures at federal state government level are described:

Baden-Wurttemberg

With adoption by the Landtag on 7 November 2007 of the 'Renewable Heat Act', (EWärmeG), Baden-Württemberg has become the first state to adopt a heat act[96]. It will enable heating and warm water from renewable energy to become the standard in residential buildings. From 1 January 2010, when replacing an existing heating system in a residential building, 10 % of heat demand must be covered by renewable energies. Alternatively, by improving insulation in building façades or roofs, energy can be saved and CO_2-emissions therefore reduced. With these state regulations, Baden-Württemberg is an ambitious pioneer in the promotion of heating based on wood, solar and geothermal power. With its regulations, the Act goes well beyond federal statutory provisions (EEWärmeG) and has prompted other states to also plan to introduce similar legislation.

Bavaria

On 24 April 2007, the Bavarian Council of Ministers resolved to revise and expand the Bavarian climate protection program from the year 2000 (amended in 2003) to a '*Klimaprogramm Bayern 2020* '(Climate Program Bavaria 2020). As target for renewable energies, the program formulates a doubling of the share until 2020, to 20 % of final consumption of energy, by promoting in the building sector the biogenic heat production through biomass heating systems (eg, pellets, wood chips, biogas) and the development of geothermal heating networks.

An essential part of the Climate Program Bavaria 2020 is a special program for the renovation of public property (term 2008-2011), with a volume of 150 million euros. The renovation measures include the use of building shells and installation engineering with increased use of renewable energies.

Explicit structural engineering rules for using renewable energies do not exist at state level at present.

The Bavarian Landtag, however, has taken in recent years a number of fundamental decisions that are guiding principles for state building construction in the use of renewable energy:

- Decision *Drs. 13/2835 – Einsatz erneuerbarer Energien* (Use of renewable energies – Oct. 1995)
- Decision *Drs. 13/11924 – Strom aus regenerativen Energien* (Electricity from renewable energy sources – July 1998)
- Decision *Drs. 15/1222 – Fotovoltaikanlagen auf staatlichen Liegenschaften* (Photovoltaic systems on public property – June 2004)
- Decision *Drs. 15/3097 – Biomasse zur Wärmeversorgung staatlicher Liegenschaften* (Biomass for heat supply of state property – Apr. 2005)
- Decision *Drs. 15/4040 – Wettbewerb im Energiesektor zum Ausbau der CO_2-neutralen und CO_2-freien Energieerzeugung* (Competition in the energy sector for the development of $CO_{2\text{-neutral and}}$ CO_2-free power – Sep. 2005)

[96] With a view to taking appropriate measures under Article 13(1) of Directive 2009/28/EC.

- Decision *Drs. 15/9405 – Erleichterungen bei der Nutzung von Fotovoltaikanlagen auf staatlichen Liegenschaften* (Facilitation of the use of photovoltaic panels on public property – Nov. 2007)
- Decision *Drs. 15/9958 – Wärmenetze im Bereich erneuerbarer Energien* (Heat networks in the field of renewable energies – Feb. 2008)

Particularly notable is the decision Drs. 13/2835, of October 1995, which states inter alia: '[...] the federal state government is therefore requested [...] to forcefully pursue the following measures or to reconsider them [...] 2. Consistent application of measures for thermal protection and renewable energies, including those that are not yet fully competitive, as a showcase function and exemplary role for renovation and construction projects in the public sector. [...]'

Berlin

The energy strategy of the federal state Berlin is formulated in the 'State Energy Program 2006-2010'. Targets and measures for saving energy, for environmental protection and sustainable development of energy sources are summarized here. According to this program, renewable energies will take a key position. The program includes an extensive list of measures, particularly for the development of solar energy use (heating and warm water) and the establishment of solar companies. Additional state laws that supplement federal legislation do not exist.

Among the key project ideas in Berlin is the *Solaranlagenkataster* (solar installations register), a database on the status and ongoing registration of solar installations in Berlin, as well as the *Solardachbörse* (Solar Roof Exchange).

Brandenburg

In Brandenburg, renewable energies will be developed into a mainstay of energy supply. The *Energiestrategie 2020* (Energy Strategy 2020) adopted in May 2008, provides for an increase in the share of renewable energy from the current 6.2 % to 20 % in primary consumption of energy by 2020, by expanding, in particular, the use of solar energy and biomass in building facilities. To achieve the energy program's objectives, the federal state government has formulated a far-reaching package of measures.

Bremen

In Bremen, the Bremen Energy Act (*Bremische Energiegesetz* – BremEG) is in place, which regulates the promotion of economical and environmentally sound energy supply and energy use in the federal state Bremen. In addition, in November 2008 the Bremen Senate adopted the Climate Action Program 2010 (*Aktionsprogramm Klimaschutz 2010*), which was followed on 12.15.2009 by the Climate and Energy Program 2020 (*Klimaschutz- und Energieprogramm 2020)*. Both programs provide schemes to promote renewable energy.

Hamburg

The Senate is planning a series of measures to facilitate the use of renewable energies in the electricity and heating sector, in accordance with the Hamburg Climate Protection Plan 2007-2012 (*Klimaschutzkonzepts 2007-2012)*. It will introduce, following the example of Baden-Württemberg, an obligation to use renewable energy.

To expand climate protection activities, an energy agency is being planned, which has been in construction since September 2009. The energy agency is to develop and

expand information on uses, energy reports and programs to promote renewable energy, and improve investor acquisition strategies.

Hesse

Under the slogan 'Sustainable Hesse – learning and acting for our future' (*Hessen nachhaltig – Lernen und Handeln für unsere Zukunft),* the federal state government began in April 2008 to develop a sustainability strategy. It has committed itself to increase the share of renewable energies in final consumption of energy (excluding transport) by the year 2020 to 20 % and to develop an energy plan 2020, which should indicate possible ways of realising this target. In parallel, a 'Sustainability Conference' arranged for an Energy Forum 2020 to be set up, where renowned experts and representatives of energy efficiency and renewable energy were invited.

The report of the Energy Forum Hesse 2020, 'Objectives and key points of the Hessian energy plan for the areas of energy efficiency and renewable energy' (*Ziele und Eckpunkte des Hessischen Energiekonzepts für die Bereiche Energieeffizienz und Erneuerbare Energien*) was completed in January 2010 and is now being implemented.

Mecklenburg-Vorpommern

The Climate Protection Action Plan Mecklenburg-Vorpommern 2010 sums up the federal state's priorities for the use of renewable energies, also concerning building stock. Until the year 2020, an increase by a factor of 4.6 in the use of renewable energies for heat generation is targeted. To this end, technical potentials, current use within the federal state and the economically exploitable potential in 2020 were identified. The use of biogas and biomass, deep geothermal energy, near-surface geothermal energy and solar thermal energy, play a significant role in the increase of RE shares.

The following concrete actions have been proposed in this context:

- Coaching of bioenergy villages (Action 13)
- Bioenergy regions support (Action 14)
- Energy and balneology use of geothermal energy (Action 18)
- Development of local heating networks (Action 22)
- Plan 'Distributed Energy Supply Mecklenburg-Vorpommern' (*Dezentrale Energieversorgung Mecklenburg-Vorpommern*) (Action 23)
- Creation of environment-friendly campsites (Action 32)
- Research on renewable energies (Action 50)
- Information campaign to promote the use of renewable energies (Action 51)
- Construction of a national information and demonstration centre for renewable energy (Leea)

Lower Saxony

Through its Coalition Agreement 2008-2013, Lower Saxony is committed to expanding renewable energies and has set itself the target of increasing the share of renewable energy in total energy consumption to 25 % by 2020.

Under the Energy Efficiency Guidelines (*Energieeffizienzrichtlinie*) which entered into force on 1 April 2009, Lower Saxony's Ministry of Environment and Climate Protection is funding exemplary projects which display a combination of innovative and unique features. The overall design of the project must have a role model character for future energy efficiency. It is primarily intended to fund projects for which the required heating energy is provided by renewable energy sources. Municipal buildings with high energy needs are targeted, such as hospitals and educational centres which are connected to other large heat consumers – if energy needs are reduced to a minimum through exploitation of energy efficiency potentials.

North Rhine-Westphalia

Use and technological change in the field of renewable energies is formulated in the 'Energy and Climate Protection Strategy North Rhine-Westphalia' (*Energie- und Klimaschutzstrategie Nordrhein-Westfalen*) and the 'NRW concept Renewable Energies' (NRW Konzept Erneuerbare Energien). The aim of these strategies is to increase the share of renewable energies in energy supply, with biomass being a main focus point of the government: Electricity and heat production from biomass are to be doubled to almost 18 billion kWh by 2020. This would cover 20 % of electricity and 10 % of the heating needs of all households in North Rhine-Westphalia. About 60 % of the potential for development is to be achieved through use of residues and waste materials or by improving efficiencies. Development targets for biogenic fuels are currently not planned.

The development of the other renewable energies is supported by the government of North Rhine-Westphalia. A main focus is the NRW Energy Agency's comprehensive information, advice and promotional campaigns to stimulate awareness for the need of renewable energy in enterprises, municipalities and private households, and reduce possible barriers.

Another important objective of NRW is to establish a minimum 20 % share of renewable energy in buildings (new buildings and renovations) by 2020. This requirement applies equally to public and municipal bodies, as well as to private buildings.

Legislation regarding an increase in the share of energy from renewable sources in the building sector does not exist at present.

Since 2002, the 'Solar-Check NRW', co-ordinated by the Energy Agency NRW, offers building owners in North Rhine-Westphalia a state-sponsored counselling by skilled craftsmen for use of solar energy in buildings. Since the start of the campaign over 16 000 consultations were carried out. The scheme will initially run until end of 2011. A continuation is planned.

The project *Mit der Sonne bauen – 50 Solarsiedlungen in NRW*, (Build with the Sun - 50 Solar Housing Estates in NRW) called on local authorities to use the possibilities of solar energy for heating and power supply in housing estates and to give a further boost to solar building. Meanwhile, 29 settlements with about 2 800 residential units

have been built in NRW. 18 are still in construction and another six are being planned. With 53 projects, NRW is currently Europe-wide front runner in solar residential areas.

The project ’100 Climate Protection Settlements in North Rhine-Westphalia’ (*100 Klimaschutzsiedlungen in Nordrhein-Westfalen)*, as a continuation of the 50 solar housing estates in NRW municipalities, is calling to architects, engineers, the housing industry and investors to build in the coming years more lower-energy passive buildings and refurbish existing ones by making use of renewable energy technologies. The scheme will initially run until end of 2011; a continuation is planned.

The Ministry of Construction and Transport NRW promotes passive buildings within the framework of social housing in North Rhine-Westphalia, according to housing eligibility rules (*Wohnraumförderbestimmungen* – WFB): ‘*Förderung von baulichen Maßnahmen zum Einbau von solarthermischen Anlagen im Rahmen der Bestandsförderung des Landes NRW für Sozialwohnungen’* (Promotion of building measures to install solar thermal systems within the framework of support for existing social housing in NRW) (Nr. 5 of the RL BestandsInvest).

Rhineland-Palatinate

Rhineland-Palatinate supports the nationwide development targets and has set itself the goal of increasing the share of renewable energy in electricity consumption to at least 30 % by 2020. In the heating market, the share of renewables is to be tripled compared to 2005, with at least 16 % by 2020. Rhineland-Palatinate is focusing on a mix of renewable energy from biomass, solar energy, wind power, geothermal energy and hydropower. The use of all renewable energy sources and their integration into an energy system in which each renewable complements the others, opens up a considerable potential for displacing imported fossil fuels. Since renewable energies comprise different resources which demand specific development strategies, exploitation and utilization technologies, as well as targeted funding schemes, the state has developed different development modules for each renewable energy, with state-wide subject-specific forums such as biomass conferences, wind power meetings or solar conferences.

Saarland

The plan is to increase the share of renewable energy in electricity consumption by 2020 to 20 % and the share of biogas gas consumption to 10 %.

Following the example of Baden-Württemberg, Saarland also seeks to extend the EEWärmeG to existing old buildings, and is preparing a legislative procedure to this avail. With the creation of the *Masterplans Neue Energien* (New Energy Master Plan), targets and opportunities for development of renewable energies in Saarland are presented, to enable at state level sustainable and affordable energy security. Furthermore, a register to identify appropriate solar roofs for photovoltaic systems has been created and measures for the further development of heat networks are being considered.

Saxony

In accordance with its Action Plan on Climate and Energy *(Aktionsplans Klima und Energie*), Saxony is banking on renewable energy and has set itself the goal of constantly increasing the share of renewable energies. Current measures include information campaigns and specific support as well as voluntary commitments made by the state administration.

Saxony-Anhalt

Saxony-Anhalt's Climate Protection Program 2020 *(Klimaschutzprogramm 2020*) provides for a 20 % share of renewable energies in primary consumption of energy in 2020. To achieve this target, Saxony-Anhalt has accelerated implementation of existing EU and federal programs and wants to lead other federal states as a positive example.

Schleswig-Holstein

An example is the *Klimapakt Wohnen 2009-2020* (Climate Pact Housing 2009-2020): The Climate Pact is a specific – negotiated but still open to changes – voluntary agreement of the Interior Ministry with the Working Group of Schleswig-Holstein Housing Companies in the Federation of North German Housing Companies (Verband Norddeutscher Wohnungsunternehmen – VNW), the Association *Nord* of the Federation of Real Estate and Property Management Companies (*Bundesverbandes freier Immobilien- und Wohnungsunternehmen), Haus & Grund Schleswig-Holstein* (House & Land Schleswig-Holstein) the Association of Property Managers of Schleswig-Holstein (*Verband der Immobilienverwalter Schleswig-Holsteins*) and the Association of Residential Property/Settlers of Schleswig-Holstein (*Verband Wohneigentum/Siedlerbund Schleswig-Holstein*). Measures until 2020 have been agreed upon that should improve the investment climate for building renovations and energy efficient new buildings. Focal points for action are areas where housing market mechanisms should be supported and improved.

Thuringia

Thuringia is relying increasingly on renewable energies and an efficiency-oriented energy industry which fulfils supply obligations while keeping pace with competition. The *Klimastrategie Thüringen 2015* (Climate Strategy Thuringia 2015) envisages a 22 % target of renewable energies in total final consumption of energy by 2015. To achieve this goal, all forms of renewable energy should be developed, whereby biomass is to have the largest share in this development. By the year 2020, a 35 % share of renewable energies in electricity production is aspired. To further the development of renewable energies, a ‘register of potentials’ is to be set up, which will describe the economic uses of renewable energies sources at local levels. To promote the development of solar power use, a 1 000-roofs Photovoltaik Program was launched. It supports the establishment of photovoltaic systems on roofs and building facades, through municipal investments especially, but also through funding by non-profit organizations.

In the building sector, an increase of 5 % in solar equipment on existing buildings by 2015 is pursued. The share of solar thermal and biomass in heating supply will be increased to 20 %. The proposed package of measures includes promotions and information campaigns. Building code regulations are not planned at present.

7.4.4. Chapter 4.2.3 point (h)

This chapter provides an overview of schemes at federal state level to ensure that public buildings fulfil their exemplary role. It must be noted, however, that this compilation is not based on any uniform definition of 'public building' and 'exemplary role'. It should also be considered that these measures have not yet fully met the requirements of Article 13(5) of Directive 2009/28/EC. The Federal Government is therefore preparing further guidelines as part of the European Law Adaptation Act for Renewable Energy (*Europarechtsanpassungsgesetzes Erneuerbare Energien*), which will be added to the already existing measures of the federal states described below.

Baden-Württemberg

End of 2008, the State Property and Construction Management Baden-Württemberg (*Staatliche Vermögens- und Hochbauverwaltung Baden-Württemberg*) developed a concept for energy-saving renovations and use of renewable energies in state-owned properties for the period 2010 to 2030. The modernization and renovation of the existing stock of 8 000 state-owned buildings is to be increasingly connected to energy optimisation and the use of renewable energies, in upcoming construction projects. On the basis of this concept, the federal state government decided to allocate funds from 2010 to the implementation of the concept.

A requirement was introduced to examine the use of renewable energies for energy supply in the planning of large building projects – while also considering economic criteria. This measure also applies to existing buildings. The use of biomass as an energy source must be examined when planning new central heating installations or modernising existing ones.

The use of renewable energy and the implementation of energy-saving measures are funded by granting a 20 % bonus for considering non-monetary aspects in the profitability analysis (bonus factor renewables).

The strategy for the increased use of renewable energy will be implemented by further regulations for state property and construction management: Administrative regulation 'Cost of energy-saving construction measures, taking into account environmental protection' (*Wirtschaftlichkeit energiesparender Baumaßnahmen unter Berücksichtigung des Umweltschutzes*) and administrative regulation 'Climate 2010 - concept for Baden-Wuerttemberg - implementation of measures in state property' (*Klimaschutz 2010 - Konzept für Baden-Württemberg - Umsetzung von Maßnahmen in Liegenschaften des Landes*).

In a joint statement of April 2010 by local associations and the Ministry for Environment, Nature Conservation and Transport on climate protection by means of utilising all savings potentials within buildings, state and local authorities set themselves the target of at least 35 % reduction of CO_2 emissions for public housing stock older than 20 years by 2020, as compared to 1990 levels.

Bavaria

Multiple parliament decisions (cf. point 7.3.3) have set down that public measures must consider and prove that the widest possible use of renewable energies has been made. In addition, roofs of government buildings are to be generally made available for private use.

As early as in 2008, the federal state initiated the 'Special program for energy retrofitting of public property' (*Sonderprogramm zur energetischen Sanierung*

staatlicher Liegenschaften – see point 7.3.3), which runs over four years. The declared aim is to achieve maximum CO_2-savings with available means. The implementation of all measures provided under the program leads – due in great part to increased use of renewable energy – to a reduction in CO_2-emissions of an estimated total 750 000 t.

In the current pilot phase, several measures have been adopted for creating non-residential buildings in the passive house standard. Buildings in this standard fulfil the structural requirement of so-called 'low-energy buildings', the standard set by the EU for 2020. As early as in 2005, the renovation of a technical administrative building to passive-house standards was initiated. The first construction phase has been completed; a scientific monitoring will evaluate the energy standard achieved.

Berlin

With the Solar Roof Exchange (*Solardachbörse*), suitable roofs of public buildings are made available for private investors to install photovoltaic systems, in accordance with the coalition agreement and Berlin's Energy Program 2006-2010. Berlin also intends to promote and expand, alongside district heating, the use of energy-efficient decentralized heating systems (e.g. solar thermal), in its estates and in local companies.

Brandenburg

Brandenburg intends to actively fulfil its exemplary role through measures to enhance efficiency and use of renewable energies in its public institutions, e.g. through the use of photovoltaic systems on state buildings.

Bremen

In Bremen, on 25 August 2009, the policy guideline 'Energy requirements for new construction and renovation of public buildings of the Free Hanseatic City of Bremen (federal state and municipality)' (*Energetische Anforderungen an den Neubau und die Sanierung von öffentlichen Gebäuden der Freien Hansestadt Bremen (Land und Stadtgemeinde))* was adopted. It came into force on January 1 2010 and stipulates that the renovation of public buildings must be carried out with low-energy standard and new public buildings must be constructed in the passive house standard. The buildings are to be connected primarily, where technically and economically feasible, to local or district heating based on combined heat and power generation, waste heat or renewable energy.

Hamburg

The exemplary role of public buildings is anchored through a set of measures set down in the climate protection program of the senate of Hamburg. This includes the increased use of renewable energy sources. These measures are accompanied by a planned procurement of a 4 % share of biogas (up to 20 million kWh of the total requirement of approx. 500 million kWh of natural gas per year) from 2012 for public buildings and from 2011 the purchase of renewable generated electricity for the total needs. Furthermore, at present there are plans to adapt future building standards to passive and zero-energy house standards.

Hesse

The sustainable development strategy has set the target of making the entire state administration CO_2-neutral in 2030. On 17 May 2010, the federal state government adopted five modules:

1. For the entire Hessian state administration, a CO_2 balancing and monitoring is being set up.
2. Under the Hessian model, new state buildings are to be built in principle so that they fall, in average, 50 % below requirements for building shells of current energy saving regulations for buildings (EnEV 2009 – valid since 1 October 2009), which is equivalent to passive house standard. Primary energy needs are to be reduced through energy optimisation in buildings and installations technology, the reduction in office and administrative buildings being up to 50 %, and other buildings up to 30 % below EnEV levels.
3. Extensive energy renovations in building stock are generally performed with the aim to meet the requirements of the applicable EnEV, without the mitigation offered by § 9(1)(2) EnEV – surpassing of primary energy demand by 40 per cent.
4. Mandatory guidelines have been adopted for procurement activities of the state administration which target energy efficient products and services.
5. A plan is to be drafted for the neutralisation of the inevitably remaining amount of CO_2-emissions, after minimizing energy needs and possible substitution of fossil fuels.

Lower Saxony

The federal state government supports local authorities and administrations in further exploiting existing energy efficiency and savings potentials in the municipal building stock. An integral part of the government's intergenerational and sustainable policies are continuous schemes to improve energy efficiency in state-owned real estate. The federal state government's goal of improving energy efficiency in state-owned buildings and reducing sustainably energy consumption will be gradually implemented, taking into account budgetary and economic circumstances.

The *EnergiesparContracting* measures adopted in this context will be accelerated and expanded within existing technical conditions. The continuation of the *EnergieSparInvestitionsProgramm* (Energy Saving Investment Program – ESIP) is also conceivable, depending on financial viability. It is also feasible to use state-owned buildings for the production of renewable energy. Therefore, the state is open to the operation of photovoltaic plants on its buildings through private enterprises.

North Rhine-Westphalia

The *Bau- und Liegenschaftsbetrieb Nordrhein-Westfalen* (Construction and Real Estate Company – BLB NRW) has the task of acquiring for state purposes land and land rights on a commercial basis, as well as managing and developing them, while taking into consideration state building policy objectives. Theses policy objectives include energy-efficient building and building with renewable energy.

Within economically reasonable constraints, BLB NRW considers renewable energy sources in the construction of new buildings – and thus the exemplary role of the public sector. Bearing this in mind, BLB NRW aims in principle to fall below the applicable limits. This approach will be pursued after the anticipated future tightening of the EnEV.

Rhineland-Palatinate

In Rhineland-Palatinate, the fulfilment of the exemplary role has already been followed by action: In a majority of state-owned buildings photovoltaic systems are installed.

Saarland

In Saarland, the *GebäudeEnergieManagement* (GEM Saar) is being developed for state-owned properties, to promote energy savings and the use of renewable energy. The passive-house standard for public buildings is still the target, and the use of photovoltaic systems on state-owned roofs is being examined.

Saxony

In Saxony, to ensure the state's exemplary role, new construction or renovation of state buildings must preferably use renewable energy technologies. This will be supported under the *VwV Energieeffizienz* (Regulation on Energy Efficiency) by defining special constraints for profitability analysis. In addition, a total of 20 000 m² of public building roofs will be provided for the construction of solar installations.

Schleswig-Holstein

Targets and voluntary commitment of the federal state government: Reduction of energy consumption in state property by 40 % by 2020 compared to 1990; this includes the development of a modernisation controlling. A special electricity savings program will also be implemented.

Thuringia

Thuringia wants its public properties to fulfil an exemplary role in the field of renewable energy. Heating supply in public buildings will be covered by 12 % bioenergy by 2015. To achieve this, in rural areas, particularly in public buildings and institutions (schools, hospitals, nursing homes, fun pools, etc.) old oil and gas heating will be replaced with biomass boilers. In the medium term, heat supply with a 15 % bio-energy share is envisaged in municipal buildings. One example is the municipality Eisenach, which is being researched within the DBU project *Klimaschutz in Kommunen – Strategische Umsetzung des nachhaltigen Energiemanagements zur CO_2-Minderung* (Climate protection in municipalities - Strategic implementation of sustainable energy for CO_2 reduction).

7.4.5. Chapter 4.2.4 point (g)

Table s: Examples of existing and planned information, awareness and training programs that inform citizens about the benefits of the development and use of energy from renewable sources and on related practical aspects.

Title	Target	Target group	Instruments
www.erneuerbare-energien.de	Information Platform on Renewable Energies (information technologies, legislation, funding opportunities, current discussions, etc.)	Interested public from all fields	Comprehensive information portal www.erneuerbare-energien.de, provision of relevant documents (studies, laws, surveys) as a download
Information services of the *Fachagentur Nachwachsende Rohstoffe* (Agency of Renewable Resources – FNR)	Information platforms on bioenergy and advice in the areas of: Solid biofuels, biofuels, biogas as well as construction with renewable raw materials and regional bio-energy consultation services	Interested public from all fields	Comprehensive information portals, FNR, providing relevant documents and statistics on energy and material use of biomass (for downloading) www.bioenergie.de, www.nachwachsende-rohstoffe.de, www.bioenergie-portal.info
Deutschland baut auf Erneuerbare Energien (Germany banks on renewable energy)	Information on the Renewable Energies Heat Act	Consumers, homeowners, builders, craftsmen, architects	Website: www.waerme-mit-zukunft.de advertisements, brochures, information hotline
Agentur für Erneuerbare Energien (Agency for Renewable Energy – AEE)	Information about the benefits of sustainable energy supply based on renewable energies		Establishment of an agency for renewable energy: Website: www.unendlich-viel-energie.de, events
Agentur für Erneuerbare Energien Second phase of the Bioenergy Module	Enhance public confidence in bio-energy, information, active introduction of new topic for discussions in the media	National and regional decision-makers, journalists and opinion leaders	Media services, newsletters, websites, images and graphics database, studies, brochures and talking points, events (e.g. innovation award renewable energy, federal state rankings)
Other examples are listed alphabetically:			
BINE Informationsdienst	Information on support for renewable energy and energy efficiency at national, regional and local level.	Private, commercial and institutional investors	Website: http://www.energiefoerderung.info/ Development of guidelines for individual renewable energy technologies and different applications/target groups, Synchronisable funding compass in CD-ROM format

Competition	Increased use of	Regions,	Awarding of funds in the competition

Bioenergie-regionen (Bio-energy regions)	bioenergy potential in rural areas, creation of model regions, network building, enhancing approval of bioenergy	municipalities, rural areas and local population	proceeding, promoting public outreach in model regions, scientific research, Guidelines for Bioenergy regions, alongside: Website, press relations, events
Information from *Centralen Agrar-Rohstoff-Marketing-Entwicklungs-Netzwerkes* (Central Agricultural Commodity Marketing Development Network – C.A.R.M.E.N. e.V.)	Practical information on the topic 'Renewable Resources'	Interested public from all fields	Detailed information on energy and material use of renewable resources with many practical examples and information transfer www.carmen-ev.de
Energetische Stadtentwicklung (Energy-related Urban Development) (BMVBS)	Gaining experience on communicable ideas and concepts of urban energy development	Municipalities, policy makers	Energy-related urban regeneration in local model communities
Consumer information portal 'Energie Verstehen' (Understanding Energy)	Practical information on energy	Private households, consumers	Website creation www.energie-verstehen.de with practical information about energy, with many links
Image brochure '*Erneuerbare Energien - made in Germany*'	Presentation of companies and products from renewable energy sources and contacts with the German renewable energy industry at home and abroad	Decision-makers from politics and industry abroad	Image brochure in the languages German, English, Spanish
Research project 'World of Renewable Energy: Powerado '	Research in effective communication methods for promoting renewable energies in children and adolescents, Overview of training opportunities in renewable energy	Teachers, pupils, students, decision makers	Report '*Bildung und Erneuerbare Energien*', (Education and renewable energies), website: www.powerado.de
'Fördergeld für Energieeffizienz und erneuerbare Energien – Private Haushalte, Unternehmen, Öffentliche Haushalte', (Funds	Information on sponsorship opportunities and amounts	Households, businesses, public budgets	Brochure

for energy efficiency and renewable energy sources - households, enterprises, general government)			

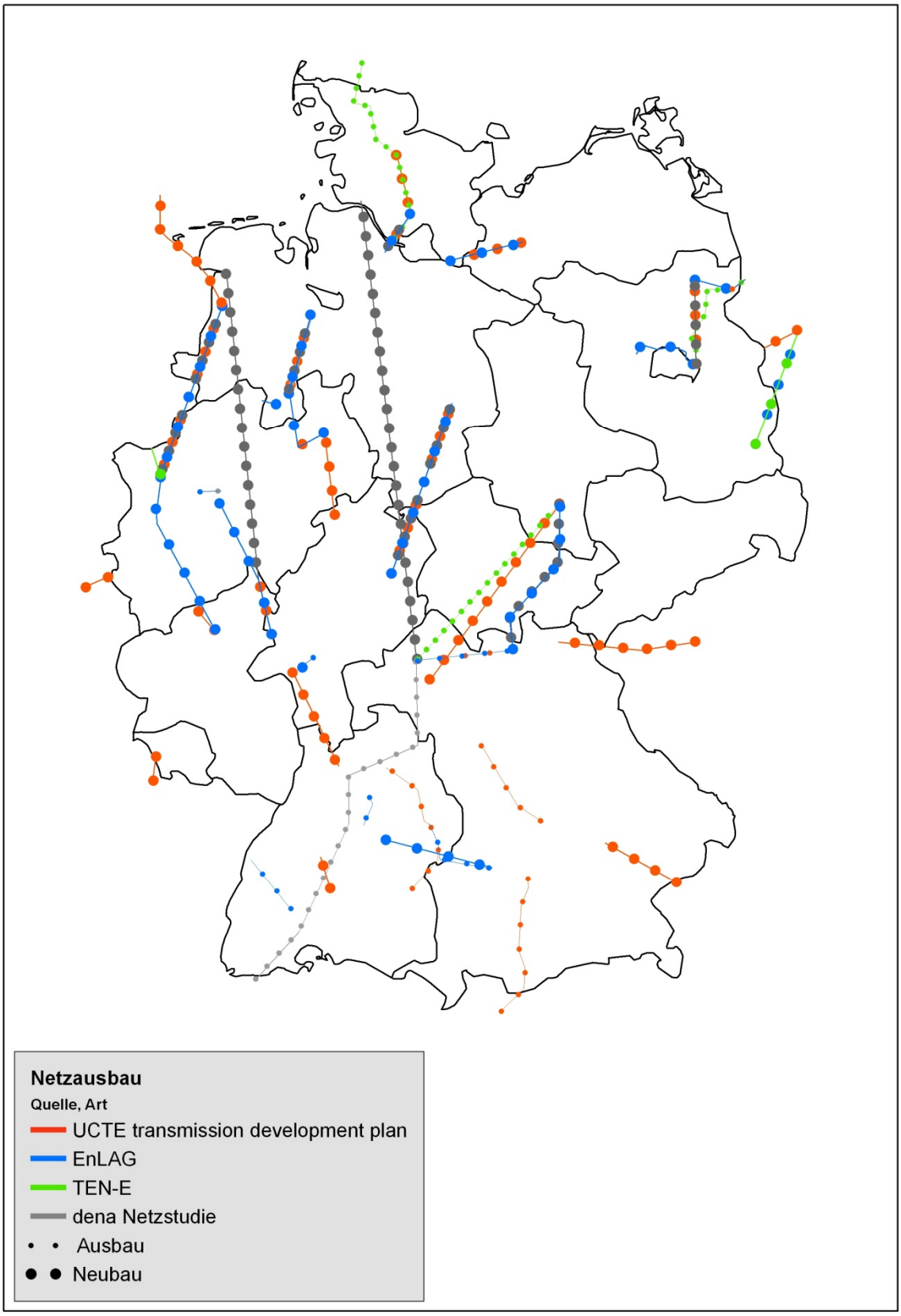
Funding for schools and educational institutions	Information about opportunities to support projects related to climate protection/renewable energy	Schools and other educational institutions, municipalities, teachers	Brochure
Haus sanieren - profitieren (Renovate a house - and benefit from it)	Motivation to comprehensive and high-quality energy renovation with the use of renewable energies	Private homeowners, particularly single-family homes	Energy check by local craftsmen, Promotional material, website: www.sanieren-profitieren.de, PR
Energetische Sanierung – Komfort mit Umweltbonus für ihr Haus (Energy Renovation - comfort with an environmental bonus for your house) *KfW-Programm Energieeffizient Sanieren auf einen Blick* (KfW Energy-efficient renovation program at a glance – from July 2010)	Motivation to comprehensive and high-quality energy restoration with the use of renewable energies	Private homeowners, particularly detached and semi-detached houses	Information brochure
Campaign '*Klimaschutz in Schulen und Bildungsein-richtungen'* (Climate in schools and educational institutions)	Enhancing awareness, training teachers	Schools and other educational institutions, teachers, students	Self-study and guidelines for teachers, teaching materials and workbooks for different grades, online game 'Keep Cool', Climate Action Day, equipment of school solar systems with visualization equipment, model projects
Klimawerkstatt – Umweltexperi-mente für Zukunftsforscher (Climate Workshop - Environmental experiments for future researchers)	Information on climate change and renewable energies; recommendations for action	General population, particularly school groups, families	Interactive travelling exhibition, brochures, direct mail, flyers, website: www.klimawerkstatt.net
Competence Centre for Renewable Resources www.konaro.de	Information on the topic 'Renewable Resources'	Anyone interested in science, technology, agriculture and forestry and the general public	Detailed information on energy and material use of renewable resources
'*Medienpaket Energie und Klimawandel*'	Media package *Nachhaltige Energieversorgung*	Schools and institutions for adult	Media package (movies, concept for media-education monitoring)

(Media package Energy and Climate Change)	*und Klimawandel* (Sustainable Energy and Climate Change)	education, cinemas	
NGO cooperation project *nachhaltige Biomasse* (Sustainable Biomass)	Environmental and development associations' stance on gentle cultivation of resources, trade and use of biomass	German Environment, Nature Conservation and Development Associations	Website: http://www.plattform-nachhaltige-bioenergie.de/

pro E3 – Elektrisch – Effizient – Erneuerbar (Pro E3 - Electrical - Efficient - Renewable) to post-fossil mobility	Action campaign to promote the use of renewable energy in the electric mobility	Motorists; decision-makers in politics, administration and business	Brochure, website: www.solarmobil.net, workshops, position papers with recommendations for action
Qualification in the field of renewable energies			Report on a detailed assessment of training opportunities in renewable energy, hotline for further training in renewable energy technologies crafts, consulting services, brochure and DVD to dual training opportunities in renewable energy, informational study options: www.studium-renewable-energien.de
Regional Bioenergy advice	Development of decentralized energy production and applications in rural areas, information on the opportunities/risks of energy crops cultivation, improved acceptability and image of the subject field	Farmers and foresters, general public	Operational analysis and concept development, field trips to demonstration farms, information, provision of information material, website: www.bioenergie-portal.info, build up of bioenergy networks Competitions: 'Bioenergieregionen' (Bioenergy Regions)
Roadshow Energie-kommunikation (Roadshow Energy Communication) in several big cities in Germany	Communication on energy-efficient behaviour, focus on renewable energy	General public, interested audience	Exhibition and demonstration of exhibits in major cities in Germany
Solarsupport – erneuerbare Energien sichtbar machen! (Solar Support - make renewable energies visible!)	Equipping schools with visualization facilities and data loggers for PV systems in schools, equipping schools with weather stations	Schools and educational institutions	Website (www.ufu.de > Solarsupport), flyers, information material; BMU-Website www.klimaschutzschulen.de
Umweltbewusst-sein und Verhalten in sozialen Milieus Deutschlands (Environmental awareness and behaviour in social milieus in Germany)	Study to improve environmental communication for target groups (consumers)	Policy makers	Polls
Woche der Sonne (Week of Sun) (Also for other technologies)	Practical information about solar energy and its fields of application, education of local networks	Consumers, communities, schools, homeowners, builders, craftsmen, architects	Local activities and events, website: www.woche-the-sonne.de

7.4.6. Chapter 4.2.6 point (b)

The map displayed here gives an overview of necessary grid expansion measures in the German power grid, compiled from various sources (UCTE Transmission development plan [UCTE 2008], *dena* Grid Study I, TEN-E Guideline, EnLAG). First the UCTE Transmission development plan (UCTE 2008) was referred to; in addition, the results of the *dena* Grid Study were presented as well as the priority projects of the TEN-E Guideline. The cataloge of urgent projects mentioned in the *Energieleitungsausbaugesetz* (Electricity Grid Expansion Act – EnLAG) is also listed.


Netzausbau
Quelle, Art
UCTE transmission development plan
EnLAG
TEN-E
dena Netzstudie
Ausbau
Neubau

7.4.7. Chapter 4.2.6 point (d)

Table t: Increase in interconnection capacity with neighbouring countries

Line	Time horizon	Planned capacity [MW]	Comments/Status	Source[97]
Region Aachen/Düren (DE) - Lixhe (BE)	n.s.	n.s.	Line layout unknown, 'under study'	ENTSO-E
Tonsatd (NO). tbd (DE)	long-term	700-1400	'Nord.Link' HVDC submarine cable	ENTSO-E
Flekkefjord (NO)-Wilhelmshaven (DE)	medium term	n.s.	'under consideration'	Press release
Eisenhüttenstadt (DE) – Baczyna/Plewiska (PL)	medium term	n.s.	'under consideration'	EnLAG, TEN-E, ENTSO-E
Ensdorf (DE) - St.Avold (FR)	n.s.	n.s.	'under study'	ENTSO-E
Niederrhein/Wesel (DE) – Doetinchem (NL)	after 2013	2 x 1800	in process of approval	TEN-E, EnLAG, ENTSO-E
Isar (DE) - St.Peter (AT)	2017	n.s.	'under consideration'	ENTSO-E
Vierraden (DE) - Kanjnik (PL)	until 2015	Grid reinforcement	Studies in progress, grid reinforcement in Poland also necessary	EnLAG, TEN-E, ENTSO-E
Ishoj/Bjaerverskov (DK – Bentwisch (DE)	2014	n.s.	Via Kriegers Flak offshore windfarm	ENTSO-E
Hamburg (DE) - Kassø (DK)	Until 2018	3500	Difficult approval procedure for line layout	TEN-E, EnLAG

7.4.8. Chapter 4.6.1, Tables 7 and 7a

All calculations are based on a detailed analysis of the years **2007 and 2015, 2020, in energy units (PJ).** These base values are shown in Tables u and v. Following sources were used:

- BMU-Project: *Identifizierung strategischer Hemmnisse und Entwicklung von Lösungsansätzen zur Reduzierung von Nutzungskonkurrenzen beim weiteren Ausbau der energetischen Biomassenutzung* (Identification of strategic barriers and development of solutions to reduce competitive uses in the further

[97] Supreme technical supervisor is the Ministry for the Environment, Nature Conservation and Transportation, local enforcement is done by lower building legislation authorities.

development of biomass for energy), http://www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/zwischenber_nutzungskonkurr.pdf

- *Erschließung der Biomassepotenziale in Österreich bis 2050* (Exploitation of biomass potential in Austria until 2050) http://www.nachhaltigwirtschaften.at/results.html/id4309
- BMU-Project: *Monitoring zur Wirkung des Erneuerbare-Energien-Gesetzes (EEG) auf die Entwicklung der Stromerzeugung aus Biomasse* (Monitoring the effect of the Renewable Energy Act (EEG) on the development of electricity production from biomass), 2 Interim report, September 2009
- Berner, J. 2008: *Einmal um den Pelletsglobus* (Once around the Globe of Pellets). Pellets – Das Fachmagazin. 2 (2008). 32-35.
- Oest, Dr. W.: *Neustart einer Energiepflanze (New Start of an Energy Plant)*. Erneuerbare Energien, März 2010
- Servicegesellschaft Tierische Nebenprodukte mbH: *Verarbeitung tierischer Nebenprodukte* (Processing Animal Waste), http://www.stn-vvtn.de
- BMU/BMELV: National Biomass Action Plan for Germany
- BMU: *Erneuerbare Energien in Zahlen 2008* (Renewale Energy in Figures 2008)
- BMU: *Erneuerbare Energien in Deutschland 1990 bis 2007* (Renewale Energy in Germany 1990 to 2007))
- Statistisches Bundesamt: *2007 – gut 2 Millionen Tonnen Klärschlamm entsorgt* (Over 2 Million Tons of Sewage SludgeDisposed), press release Nr. 480 vom 12.12.2008, http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Presse/pm/2008/12/PD08__480__322,templateId=renderPrint.psml
- UBA: *Statistik der grenzüberschreitenden Abfallverbringung – Basler Übereinkommen* (Statistics on Cross-Border Waste Shipment – Basel Convention)

  http://www.umweltbundesamt.de/abfallwirtschaft/abfallstatistik/basel.htm

Table u: Availability of biomass in 2007, stated as biogenic fuels in energy units (PJ or ktoe)

Origin sector		domestic resources (PJ)	Imports		Exports	Net (PJ)	Primary energy production (ktoe)
			EU (PJ)	Non-EU (PJ)	EU/non-EU (PJ)		
A) Biomass from forestry[98]:	*of which:*						
	1. Direct supply of wood biomass from forests and other wooded land for energy generation	282	1	-	-	283	6 760
	Optional – if information is available you can further detail the amount of feedstock belonging to this category: a) logging b) residues from logging (crowns, branches, bark, stumps) c) residues from landscape management (wood biomass from parks, gardens, rows of trees, shrubs) d) other (please specify)	a) 121 b) 107 c) 54 d) -	a) 1 b) neg. c) - d) -	a) - b) - c) - d) -	a) neg.[99] b) neg. c) - d) -	a) 121 b) 107 c) 54 d) -	a) 2 890 b) 2 556 c) 1 290 d) -
	2. indirect supply of wood biomass for energy generation	151	16		-	167	3 988
	Optional – if information is available you can further detail: a) residues from sawmilling, woodworking, furniture industry (bark, sawdust) b) by products of the pulp and paper industry (black liquor, tall oil) c) processed wood-fuel d) post consumer recycled wood (recycled wood for energy generation, household waste wood) e) other (please define)	a) 55 b) 28 c) see logging d) 68 (waste wood) e) -	a) neg. b) neg. c) - d) 16 e) -		a) neg. b) neg. c) neg. d) neg. e) -	a) 55 b) 28 c) see logging d) 84 e) -	a) 1 314 b) 669 c) - d) 2 006 e) -

[98] ENTSO-E Pilot Ten Year Network Development Plan. The consultation process from 03.01.2010 to 04.11.2010 was terminated. The ENTSO-E development plan has come into force.

[99] Biomass from forestry should also include biomass from forest-based industries. Under the category of biomass from forestry processed solid fuels, such as chips, pellets and briquettes should be included in the corresponding subcategories of origin. à pellets are not counted here but not shown separately in C2.

B) biomass from agriculture and fisheries:	*of which:*					
	1. directly available for energy crops, agricultural and fishery products	179	183[100]	-	362	8 646
	Optional – if information is available you can further detail a) arable crops (cereals, oilseeds, sugar beet, silage maize) b) plantations c) short rotation trees d) other energy crops (grasses) e) algae f) other (please specify)	a) of which: Rape: 98 Rye: 5.5 Wheat: 7.3 Silage maize: 50 Grain WCS: 5 Sugar beet: 4 Other GP: 5 b) of which Palm oil: 0 Sugar cane: 0 c) approx. 0.15 d) of which: Silage: 4 Miscanthus: 0.2	a) Rape: 65 b) Palm oil: 95 Sugar cane: 25 c) - d) -	a) no info b) - c) - d) -	a) of which: Rape: 163 Rye: 5.5 Wheat: 7.3 Silage maize: 50 Grain WCS: 5 Sugar beet: 4 Other GP: 5 b) Palm oil: 95 Sugar cane 25 c) approx. 0.15 d) of which: grass silage: 4 Miscanthus: approx. 0.2	a) 5 728 b) palm oil 2 269 Sugar cane 587 c) 4 d) 100
	2. Agricultural by-products/processed residues and fishery by-products for energy	21	40 [101]	-	61	1 457
	Optional – if information is available you can further detail a) straw b) manure c) animal fat d) meat and bone meal e) by-products in the form of 'cakes' (including olive oil cake and other oil cakes for energy production) f) fruit biomass (including shells, seeds) g) Fisheries by-products h) cuts from vines, olive trees, fruit trees i) other (soybean oil)	a) <0.1 b) 7 (FCEes) c) 7.6 (animal fat) d) 5.3 (animal meal) e) neg. f) neg. g) neg. h) overlap with residues from landscape management i) 0	a) - i) neg. / a) - h) neg. i) 40	a) - i) neg.	a) < 0.1 b) 7 (FCEes) c) 7.6 (animal fat) d) 5.3 (animal meal) e) neg. f) neg. g) neg. h) overlap with residues from landscape managem	a) < 2 b) 167 c) 182 d) 127 e) neg. f) neg. g) neg. h) overlap with residues from landscape management i) 955

[100] neg. - negligible

[101] Distinction between EU and non-EU not possible.

						ent i) 40	
C) Biomass from waste:	*Of which:*						
	1. Biodegradable fraction of municipal solid waste including biowaste (biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises, and comparable waste from food processing plants) and landfill gas	24 of which: *5 (biological waste)* *1 (industrial waste)* *18 (Biogenic share of waste)*	Negligible			24	573
	2. Biodegradable fraction of industrial waste (including paper, cardboard, pallets)	25	1		11	15	358
	3. Sewage sludge	11	1	-	-	12	287

Table v: Estimated availability of domestic biomass in 2015 and 2020[102] (PJ or ktoe)

Sector of origin		2015		2020	
		expected amount of domestic resource (PJ)	**Primary energy production (thousand toe)**	**expected amount of domestic resource (PJ)**	**Primary energy production (thousand toe)**
A) Biomass from forestry:	**1. Direct supply of wood biomass from forests and other wooded land for energy generation**	357-368 *	8527 - 8790*	343 **	8192 **
	2. Indirect supply of wood biomass for energy generation	149 **	3559 **	158 **	3774 **
B) biomass from agriculture and fisheries:	**1. Agricultural crops and fishery products directly provided for energy generation**	289	6903	319	7619
	2. Agricultural by-products/processed residues and fishery by-products for energy	34-45 *	812-1075 *	49-78 *	1170-1863 *

[102] This is imported soybean oil and biodiesel from soybean oil.

C) Biomass from waste :	**1. biodegradable fraction of municipal solid waste including biowaste** (biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises, and comparable waste from food processing plants) **and landfill gas**	32	764	25	597
	2. Biodegradable fraction of industrial waste (including paper, cardboard, pallets)[103]	46	1099	61	1457
	3. Sewage sludge	11	263	11	263

Range depends on the successful launch of second generation fuels (upper value) or delayed development of this segment (lower value)
** extensive exploitation of domestic opportunities, likely to be additional demand for imports

The energy units presented in Tables 7 and 7a were calculated, depending on conversion path, according to lower heating value (Hu/t) or to biogas yield (m^3/t fresh weight) (see conversion factors). When comparing the energy units (PJ) with units of measurement (t FM), through the aggregation of different biomass substrates in energy units (PJ) a shift in the years may occur, when the share of biomass from different conversion paths changes over time. This is because conversion over biogas yield tends to lead to a higher energy value than the conversion over heating value.

Derivation of database 2006

Since data availability for 2006 was much more limited compared to 2007, the data for biogas and biogenic solid fuels for 2006 had to be calculated backward. The derivation of primary energy production of biogas and solid biofuels was based on the development of final consumption of energy of electricity and heat between 2006 and 2007. Thus final consumption of energy of solid fuels rose by 9 % (pellets 57 %) and biogas by 48 % (source: BMU: Renewable energy sources 1990-2007). The data for the remaining biomass fractions are based on the above-mentioned sources.

Conversion factors for calculating the quantities of raw materials

The use of the fuel is charted here. It is based on volume data, converted according to substrate; depending on the conversion path, either to lower heating value (H_u/t) or to biogas yield ($m^3/t_{fresh\ weight}$).

[103] The estimate for 2015 and 2020 for the use of available biomass energy includes only domestic biomass. The total biomass demand may be greater and may also be covered by imports — this follows market mechanisms.

Table w: Biomass conversion table

Biomass Group	Water content [%]	Lower heating value [GJ/t_{atro}]	Average biogas yield [m^3/$t_{fresh\ weight}$]	Methane content in biogas [%]	Comments
Sector of origin	-	18.5			1 solid cubic meter (Fm) = 0.47 t_{atro}
Rapeseed	9	26.5			
Grain	14	17			
Maize silage			202	54	
Grass silage			172	54	
Grain-WCS			163	52	
Sugar beet			175	54	
Palm oil fruit	0.6	31.7			
Sugar cane	31	17			
Straw	14	17			
FCEes			33	60	
Animal fat	0	39			
Animal meal	8	19			
Organic waste, industrial waste			100	60	
Municipal Waste		10			
Pellets	10	18			
Sewage sludge	70	11			

1 PJ = 23.8846 ktoe
Lower heating value biomethane = 36 MJ/m^3

Derivation of the quantities (Fm/t) in Table 7a:

The derivation of the amounts given in Table 7a (see main section) was performed using the following formula on the basis of primary energy production (thousand toe) from table v:

$$\frac{x_{1,Fm/t,2006}}{y_{1,thousand\ \ t\ oe,2006}} = \frac{x_{2,Fm/t,2015,2020}}{y_{2,thousand\ \ t\ oe,2015,2020}};$$

$$\frac{x_{1,Fm/t,2006}}{y_{1,thousand\ \ t\ oe,2006}} * y_{2,thousand\ \ t\ oe,2015,2020} = x_{2,Fm/t,2015,2020}$$

7.4.9. Chapter 5.4 point (b)

Table x: List of so far identified 100% Renewable Energy Regions (as of June 2010)

100%-EE region	Land	Population	Administrative designation
Freiamt	BW	4271	Municipality
Hegau-Bodensee	BW	565 000	Region
Schönau	BW	2 486	Town
Schwäbisch Hall	BW	189 346	Rural district
Wolpertshausen	BW	2 034	Municipality
Altötting LK	BY	1.2681	Rural district
Amberg-Sulzbach	BY	107 794	Rural district
Asha	BY	1 532	Municipality
Berchtesgadener Land LK	BY	7 649	Municipality
Ebersberg	BY	125 052	Rural district
Freising	BY	164 692	Rural district
Fürstenfeldbruck	BY	200 619	Rural district
Furth bei Landshut	BY	3 272	Municipality
Merkendorf	BY	2 932	Town
Moosburg a.d. Isar	BY	17 492	Town
Munich LK	BY	317 543	Rural district
Oberland	BY	215 879	Region (2 rural districts)
Ostallgäu LK	BY	134 843	Rural district
Sauerlach	BY	7 065	Municipality
Starnberg	BY	129 220	Rural district
Traunstein	BY	170 819	Rural district
Weilheim-Schongau	BY	130 777	Rural district
Wildpoldsried	BY	2,519	Municipality
Barnim	BB	175 157	Rural district
Prenzlau	BB	21 224	Town
Uckermark	BB	137 209	Rural district
Alheim	HE	5 283	Municipality
Hersfeld-Rotenburg	HE	126 261	Rural district
Kassel LK	HE	240 728	Rural district
Marburg-Biedenkopf	HE	251 917	Rural district
Niestetal	HE	10 588	Municipality
Trendelburg	HE	5 689	Municipality
Vogelsbergkreis	HE	112 264	Rural district
Wolfhagen	HE	13 131	Town

Lübow-Krassow	MV	10 428	Region
Aller-Leine-Tal	NI	75 000	Region (eight municipalities)
Emden	NI	51 742	Town
Gehrden	NI	14 611	Town
Hameln-Pyrmont	NI	159 840	Rural district
Lüchow-Dannenberg	NI	50 878	Rural district
Ostfriesland/Papenburg	NI	500 523	Region (town + 2 rural districts)
Ottersberg	NI	3 220	Municipality
Salzhemmendorf	NI	10 400	Municipality
Rhein-Sieg	NRW	598 805	Region
Saerbeck	NRW	7 189	Municipality
Steinfurt	NRW	444 644	Rural district
Wetter (Ruhr)	NRW	28 445	Weather + Region
Alzey-Worms	RP	125 244	Rural district
Cochem-Zell	RP	64 863	Rural district
Landau (Pfalz)	RP	43 008	Town
Morbach	RP	11 055	Municipality
Neuerburg	RP	9 725	Association of municipalities
Weilerbach	RP	14 128	Association of municipalities
Wörrstadt	RP	28 991	Association of municipalities
Nalbach	SL	9 424	Municipality
Annaberg country	SN	47 600	Region (13 municipalities)
Ostritz	SN	2 847	Town
Vogt rural district	SN	250 246	Rural district
Westlausitz	SN	53 285	Region (13 municipalities)
BINGO	ST	650 000	Region (three districts)
Dardesheim	ST	976	Locality
Gräfenhainichen	ST	7 466	Municipality
Harz	ST	242 813	Rural district
Krummesse	SH	1 533	Municipality
Molfsee (Amt)	SH	8 459	Association of municipalities (district)
North Friesland	SH	166 727	Rural district
Pellworm	SH	1 124	Island
St. Michaelisdonn	SH	3 641	Municipality
Uthlande	SH	36 000	Region

Table y: List of bioenergy regions (as June 2010)

Region	Area	Land	Project
Bioenergy region of Lake Constance	District of Constance, Lake Constance district	BW	solarcomplex AG
Bioenergy region Hohenlohe-Odenwald-Tauber	Districts Hohenlohekreis, Neckar-Odenwald-Kreis, Main-Tauber-Kreis	BW	Bioenergy region *Hohenlohe-Odenwald-Tauber GmbH*
Bioenergy region Achental	Seven municipalities in the district of Traunstein	BY	*Biomassehof Achental GmbH & Co. KG*
Bioenergy region Straubing-Bogen	District Straubing-Bogen Straubing	BY	District Straubing-Bogen
Bioenergy region Bayreuth	City and district of Bayreuth, Economic Alliance A 9 - Franconian Switzerland	BY	Regional management *Stadt und Landkreis Bayreuth GbR*
Bioenergy region Oberland	Districts Bad Töz-Wolfratshausen, Miesbach	BY	Civic foundation *Energiewende Oberland*
Region Ludwigsfelde	Ludwigsfelde (city)	BB	Bioenergy region *Ludwigsfelde GbR*
District Märkisch-Oderland	District Märkisch-Oderland	BB	*STIC-Wirtschaftsfördergesellschaft MOL*
Nature-region/bioenergy-region Hersfeld-Rotenburg/Schwalm-Eder	Districts Hersfeld-Rotenburg and Schwalm-Eder	HE	Association district of Knüll
Bioenergy region of Central Hesse	Districts Gießen und Vogelsberg	HE	*Regionale Klimaschutz- und Energieagentur Mittelhessen e.V.* (Regional Climate Protection and Energy Agency of Central Hesse)
Mecklenburg Lake district	Rural districts Demmin, Müritz, Mecklenburg-Strelitz and city Neubrandenburg	MV	ARGE *Bioenergieregion Mecklenburgische Seenplatte GbR*
'*Natürlich Rügen' - Voller Energie* (Natural Rügen - full of energy)	District Rügen	MV	District Craftsmen Association Rügen
Region Wendland-Elbetal	Parts of the districts of Lüchow-Dannenberg and Lüneburg	NI	Business development Lüchow-Dannenberg
Bioenergy region Weserbergland plus	Districts Holzminden, Hameln-Pyrmont, Nienburg / Weser, Schaumburg	NI	*Weserbergland Aktiengesellschaft*
Bioenergy region South Oldenburg	Rural districts of Vechta and Cloppenburg	NI	*Agrar- und Ernährungsforum Oldenburger Münsterland e.V.* (Agricultural and Food Forum Oldenburger Münsterland e.V.)
Bioenergy region *Kulturland Kreis Höxter*	Rural district Höxter	NW	District Höxter
Bioenergy region Eifel	Parts of the districts of Aachen, Düren und Euskirchen, Bernkastel-Wittlich, districts Vulkaneifel, Eifelkreis Bitburg-Prüm	NW	Local Action Group of the LEADER-Region 'Eifel' at *Naturpark Nordeifel e.V.*
BioEnergieDialog Oberberg Rheinerft	Districts of Oberberg and Rhine-Erft	NW	*Gründer- und TechnologieCentrum Gummersbach GmbH*
Rural district Cochem-Zell	Rural district Cochem-Zell	RP	District administration Cochem-Zell

Region Sächsische Schweiz-Osterzgebirge	Rural district Sächsische Schweiz-Osterzgebirge	SN	Landschaf(f)t Zukunft e.V.
Bioenergy region Altmark	Rural district Altmark	ST	Regional association Altmark e.V.
Bioenergy region Burg - St. Michaelisdonn	District Burg-St. Micheaelisdonn	SH	District Castle-St. Michaelisdonn
AktivRegion North Friesland North	Northern district of North Friesland	SH	LAG AktivRegion Nordfriesland Nord e.V.
Bioenergy region Thuringian Vogtland	Rural district Greiz, Saale-Orla-Kreis	TH	Kompetenzzentrum Nachwachsende Rohstoffe und Bioenergie Pahren (Competence centre for renewable resources and bioenergy Pahres)
Bio-energy region Jena-Saale-Holzland	District of Saale-Holzland, Jena	TH	RAG Saale-Holzland e.V.

7.5. Additions to Chapter 5

Table z: Assumptions on the annual electricity production in wind energy plants with and without application of normalisation rule from Annex II of Directive 2009/28/EC (all figures in GWh/a). The normalised values are identical with the corresponding values in Table 10

	2005		2010		2011		2012		2013		2014	
	not norm.	norm.	not norm.	norm.	not norm.	norm.	not norm.	norm.	not norm.	norm.	not norm.	norm.
Land-based	27229	26658	43630	44397	50827	48461	54544	51152	57855	54064	61889	58420
Offshore	0	0	271	217	935	959	1835	1903	3244	3250	5297	5237
Sum	27229	26658	43901	44668	51762	49420	56379	53055	61099	57314	67187	63657

	2015		2016		2017		2018		2019		2020	
	not norm.	norm.	not norm.	norm.	not norm.	norm.	not norm.	norm.	not norm.	norm.	not norm.	norm.
Land-based	63807	61990	66541	64583	69156	66873	71395	68913	73513	70694	75528	72664
Offshore	8192	8004	11838	11484	16048	15592	20856	20297	26314	25666	32517	31771
Sum	71999	69994	78379	76067	85205	82466	92251	89210	99827	96359	108045	104435