Federal Republic of Germany

Progress report pursuant to Article 22 of Directive 2009/28/EC on the promotion of the use of energy from renewable sources

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0 INTRODUCTION AND SUMMARY

The German Government recognises the ‘energy transformation’ as a correct and necessary step on the road to an industrial society that is committed to the idea of sustainability and conservation and accepts its responsibility to future generations. The energy transformation will make Germany and its economy less dependent on ever-scarcer fossil raw materials, create new growth areas with great potential for new jobs, and make a major contribution towards climate protection. It thus combines social and ecological progress.

The German Government will therefore pursue the development towards an energy supply without nuclear power and with a constantly growing share from renewable energy sources in a consistent and planned manner.

To this end, the Government presented a comprehensive reform of the Renewable Energies Act (EEG) in April 2014; this was passed by the German Parliament [Bundestag] on 27 June and entered into force on 1 August 2014. The new version is in line with the EU Directive on the promotion of the use of energy from renewable sources (2009/28/EC) and with the new guidelines on State aid for environmental protection and energy from the European Commission, which were also published in April 2014. To ensure that these provisions were fully covered, the amendment was discussed in detail with the European Commission before and during the legislative process.

The aim of this reform is a constant increase in the share of renewable energy sources in German electricity production; by 2050 at least 80 % of Germany’s gross electricity consumption should be covered by renewable energy. This amendment is also designed to break down past cost barriers to expanding the use of renewable energy and so limit the increase in electricity costs to end consumers. The continued expansion of renewable energy must also proceed according to plan for all operators in the energy industry, and the flows of electricity must be integrated into the energy supply system at the minimum cost to the economy.

The reform of the EEG 2014 is designed to create the necessary framework to increase the share of renewable energy in the electricity supply – as an interim goal on the way to a complete transformation of energy supplies – to 40 to 45 % by 2025 and 55 to 60 % by 2035. In particular, compulsory direct marketing is being introduced across the board for new plants (with the exception of small installations). The binding expansion corridor and its instrumental implementation will concentrate efforts on the cheapest technologies, wind and PV, and will make the pace of expansion more predictable and reliable for all operators. The amount of support will be known by 2017 by way of competitive tendering procedures.

In line with the requirements set out in Directive 2009/28/EC, this report focusses on the period from 01.01.2011 to 31.12.2012.

Renewable energy

The total consumption of energy from renewable sources in Germany rose from 15 124 ktoe to 27 326 ktoe (+81 %) in the period from 2005 to 2012. While the electricity sector displayed the highest annual growth rate in the use of renewable energy (approx. 18 %), the overall consumption of renewable energy grew by an average of about 12 % per year between 2005 and 2012. The total share of renewables in the gross final consumption of energy in Germany in 2012 was 12.4 %, slightly above the forecast value of 11.4 % given in the National Renewable Energy Action Plan (NREAP). Germany is thus well on the way to attaining its ambitious goals for the expansion of renewable energy: its share of the gross final consumption of energy should reach at least 18 % by 2020.

Electricity generation from solar, wind, hydro, biomass and geothermal energy rose during the reporting period from 18.1 % in 2010 to 23.6 % in 2012. This is about 10 % better than the estimates in the NREAP for 2012 (125 258 GWh). Major factors in this were the rapid spread of photovoltaic installations and the growth in electricity production from biogas. The estimates of installed capacity and electricity generation from hydropower were also conservative and the figures are higher than projected in the NREAP. While the installed capacity of all wind power plants roughly matches the estimates in the NREAP, normalised electricity production from wind power in 2012 was 3 720 GWh below the value forecast in the NREAP, on the back of several below-average years for wind.

The provision of **heat** from renewable energy sources in 2012 stood at 11 321 ktoe, higher than the estimate given in the NREAP (10 884 PJ). This is mainly attributable to the greater than expected rise in the use of logs and wood pellets to generate heat for private households.

The quantity of renewable energy sources in the **transport sector** rose slightly in 2012 compared to the preceding years, but at 3 131 ktoe (or 3 524 ktoe applying the weighting rules provided for in Article 3(4) of Directive 2009/28/EC), it was lower than the estimate of 3 850 ktoe in the NREAP (or 3 948–3 980 ktoe allowing for double-counting). For 2011 and 2012 in particular, the NREAP assumed a greater market penetration by bioethanol and pure biofuels (biodiesel, vegetable oils). In 2011 and 2012, it is pleasing to see that the quantity of biofuels eligible for double-counting, at 392 ktoe, is greater than the 98–130 ktoe expected in the NREAP by at least a factor of three.

Some of the figures for the 2012 reporting year are provisional. The German Government will report updated values for 2011 and 2012 in its next progress report.

Climate protection and socio-economic effects of renewable energy

In 2012, the use of renewable energy helped to prevent emissions totalling 145 million tonnes of CO_2 equivalents ($CO_{2\ eq}$), a major contribution to attaining Germany's climate protection targets. The largest reduction in greenhouse gases, 102 million tonnes $CO_{2\ eq}$ came in the electricity sector; for the 'heating and cooling' sector, the figure was 37 million tonnes $CO_{2\ eq}$ and in transport, around 4.5 million tonnes $CO_{2\ eq}$ (not counting the biofuels promoted by quotas and tax breaks, which made use of the 'old plants' provision).

For the first time for many years, employment in the renewable energy field fell back slightly in 2012. In 2012, 377 800 persons were employed (2011: 381 600). This trend was attributable to the sharp decline in module and cell production in the PV industry. However, the jobs lost were largely made up by the stabilisation of jobs in engineering and the global boom in the onshore and offshore wind sector, which also produced increases in revenue and jobs in the German wind power industry.

The use of renewable energy sources is increasingly replacing fossil fuels. In 2011 and 2012 imports of fossil energy sources worth around EUR 14.7 billion (net) were avoided, and hence saved.

Acceptance of the energy transformation remained constant in the reporting period, but the debate on the affordability of energy intensified in the reporting period, especially with regard to vulnerable consumers. The affordability of energy for citizens and industry must therefore be safeguarded as the use of renewable energy expands, as must security of supply and compatibility with national climate protection goals; the amendments to the EEG in recent years have been precisely for this purpose.

Reporting on the Federal Government's Biomass Sustainability Regulations

In its Biomass Sustainability Regulations (Section 64 of the Biofuel Sustainability Regulation [Biokraft-NachV] and Section 72 of the Biomass Electricity Sustainability Regulation [BioSt-NachV]), Germany has undertaken to report to the European Commission on the compliance with these Regulations within the scope of the progress reports. This is in addition to the template supplied in section 13 of this report and falls outside the reporting obligation relating to the progress report itself.

Reporting as part of the 'Energy for the future' monitoring process

In autumn 2011, the German Government launched its own monitoring process called 'Energy for the future'. This involves regular reviews of German energy policy and of progress in attaining its targets. The process has no end-date. An annual monitoring report presents the facts and progress in implementing the measures. Every three years, starting in 2014, a comprehensive progress report will be

produced, based on data covering several years and providing an opportunity for deeper analysis. The monitoring is supported by research. An independent committee of four well-known energy experts is on hand to advise the Government.

The developments in the area of renewable energy presented in this second progress report are also described in the 'Energy for the future' monitoring process, albeit in a wider context also covering areas like energy efficiency, security of supply, network expansion, power plants and energy prices and costs.

Structure of the progress report

This progress report sets out the content required by Article 22 of Directive 2009/28/EC. The template provided was used to produce the progress report. Information going beyond the template, such as reports on the Biomass Sustainability Regulations and more detailed Annexes, is identified as such.

1 SECTORAL AND OVERALL SHARES AND ACTUAL CONSUMPTION OF ENERGY FROM RENEWABLE SOURCES IN THE PRECEDING TWO YEARS (2011 AND 2012)

(Article 22(1)(a) of Directive 2009/28/EC))

The notes below are largely based on values calculated using the SHARES tool developed by Eurostat[1]. They are based on data from the working group on renewable energy statistics (AGEE-Stat) and the working group on energy balances (AGEB).

Some of the statistical data for the 2012 reporting year is provisional. In subsequent progress reports out to 2021 pursuant to Directive 2009/28/EC, the time series for the gross final consumption of energy (GFCE) and for the consumption of renewable energy may therefore be adjusted to reflect the latest state of knowledge. Consequently, the reported shares of renewable energy in energy supplies in Germany should also be taken as provisional. All results in this second progress report are based on the definitions and calculation rules set out in the National Renewable Energy Action Plan (NREAP), as specified in Directive 2009/28/EC. The values for 2011 and 2012 which form the focus of this report are identified as such.

Development of gross final consumption of energy

GFCE in Germany has exhibited a falling trend in the last few years, albeit overlaid with economic and temperature-driven fluctuations (see Table A): From 226 202 kilotonnes oil equivalent (ktoe) in the base year of 2005, it amounted to 216 666 ktoe in 2011 and 220 492 ktoe in 2012. This is a decrease of 4.2 %/2.5 % against the base year of 2005. The bulk of this drop came from the ‘heating and cooling’ sector, in both absolute (-4 682 ktoe) and relative terms (-4.1 %). In the electricity (-685 ktoe or -1.3 %) and transport sectors (-1 574 ktoe or -3.0 %), on the other hand, the changes from 2005 were smaller.

Gross final consumption of energy in 2012 was then forecast as in the ‘Scenario with further efficiency measures’ (EFF) in the NREAP for Germany (220 479 ktoe for 2012). At the sectoral level too, the differences from the values forecast in the NREAP for 2011 and 2012 are comparatively small.

[1] Eurostat (2013), SHARES Tool Manual. http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/documents/SHARES_tool_manual.pdf

Table A: Evolution of (gross) final consumption of energy (GFCE) in Germany in the heating and cooling, electricity and transport sectors and total gross final consumption of energy (in ktoe/year)

	2005	2006	2007	2008	2009	2010	2011	2012
GFCE Heating and cooling[2]	114 379	117 591	105 632	113 689	105 313	116 902	106 098	109 697
GFCE Electricity [3]	52 501	52 893	53 007	52 776	49 638	52 545	51 854	51 816
FCE Transport[4]	52 857	53 583	52 195	51 358	50 421	51 083	51 645	51 283
GFCE Total[5],[6]	**226 202**	**231 029**	**218 268**	**225 680**	**212 879**	**227 987**	**216 666**	**220 492**

Shares of renewable energy in the gross final consumption of energy

The total consumption of energy from renewable sources rose from 15 124 ktoe to 27 326 ktoe (+81 %) in the period from 2005 to 2012 (see Table 1a row G). If we compare the three sectors, electricity displayed the highest growth rate in the use of renewable energy, averaging around 18 % per year. In transport and 'heating and cooling', the average annual growth was approx. 8 %. Overall, the consumption of renewable energy grew by an average of around 12 % per year between 2005 and 2012.

In absolute terms too, the electricity sector contributed the most to the increase in the consumption of renewable energy. Gross electricity production from renewable energy rose by 6 644 ktoe from 2005 to 2012, more than doubling (+123 %). Gross final consumption of energy from renewable sources for heating and cooling has grown by 4 397 ktoe (+57 %) since 2005. Final consumption of energy from renewable sources in the transport sector rose by 1 166 ktoe (+59 %) (according to the calculation rules in Directive 2009/28/EC).

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[2] Final consumption of energy for all energy products except electricity for purposes other than transport, plus the consumption of heat for internal use in heat and power plants and heat losses in networks (points '2. Own 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).

[3] Gross electricity consumption: gross national electricity production including own generation, plus imports, minus exports.

[4] Consumption in the transport sector according to the definition in Article 3(4)(a) of Directive 2009/28/EC.

[5] As defined in Article 2(f) of Directive 2009/28/EC This includes final consumption of energy plus network losses and own consumption of heat and electricity in heat and power plants (NB: not electricity used for pumped storage or for conversion in electric boilers or heat pumps in district heating plants).

[6] The aviation clause in Article 5(6) has no bearing in the reporting period, as the share of aviation in the gross final consumption of energy in Germany in 2011 and 2012 was 3.9 % and 4.0 % respectively, and hence below 6.18 %.

From the gross final consumption of energy shown in Table A and the consumption of renewable energy in Table 1a, we can derive the shares of renewable energy in the GFCE for the individual sectors as shown in Table 1.

Between 2005 and 2012, the share of renewable energy in the GFCE rose from 6.7 %[7] to 12.4 % For comparison: The NREAP assumed that renewable energy would make up 11.4 % of the gross final consumption of energy in 2012. The larger proportion in 2012 compared to the NREAP is attributable to faster growth in the electricity and heat sectors, which more than compensated for the smaller share of biofuels in the total.

Specifically, the share of renewable energy in the electricity sector, after applying the normalisation rules for wind and hydropower, stood at 23.6 % in 2012, around 2.7 percentage points higher than the value forecast in the NREAP. This is mainly due to an increase in electricity production. In the 'heating and cooling' sector, the forecast value in the NREAP of 10.0 % for 2012 was also exceeded, at 11.1 %. However, this is attributable not just to real growth but also to statistical improvements. In the transport sector, the estimated share of renewable energy in the gross final consumption of energy (7.6 % in the NREAP) is more than the actual value of 6.9 %. The reason for this is the smaller consumption of biofuels compared to the estimate in the NREAP.

[7] Based on more recent statistical data, the share of renewable energy in the GFCE for Germany in 2005 (6.4 %), given here and in Table 1, differs from the value for Germany in 2005 (5.8 %) given in Annex I, Table A in Directive 2009/28/EC.

Table 1: The sectoral (electricity, heating and cooling, and transport) and overall shares of energy from renewable sources[8]

	2005	2006	2007	2008	2009	2010	2011	2012	…	Targets 2020
Renewable energy – Heating and cooling[9] **(%)**	6.8	6.9	8.3	7.4	9.2	10.3	10.8	11.1		
Renewable energy – Electricity[10] **(%)**	10.5	11.8	13.6	15.1	17.4	18.1	20.9	23.6		
Renewable energy – Transport[11] **(%)**	3.7	6.4	7.4	6.0	5.5	6.0	5.9	6.9		10
Share of renewable energy, total Total[12] **(%)**	**6.7**	**7.7**	**9.0**	**8.5**	**9.9**	**10.7**	**11.6**	**12.4**		
of which via cooperation mechanisms[13] (%)							0	0		
Surplus for cooperation mechanisms[14](%)							3.4	4.2		
For information: Overall share of renewable energy according to the indicative trajectory given in Directive 2009/28/EC							8.2	8.2		18.0
Overall share of renewable energy according to National Action Plan (NREAP)							10.8	11.4		19.6

[8] Facilitates comparison with Table 3 and Table 4a in the NREAP.

[9] Share of renewable energy in heating and cooling: gross final consumption of energy from renewable sources for heating and cooling (as defined in Article 5(1)(b) and Article 5(4) of Directive 2009/28/EC) divided by gross final consumption of energy for heating and cooling. The same methodology as in Table 3 of the NREAP applies.

[10] Share of renewable energy in the electricity sector: gross final consumption of electricity from renewable sources for electricity (as defined in Article 5(1)(a) and Article 5(3) of Directive 2009/28/EC) divided by total gross final consumption of electricity. The same methodology as in Table 3 of the NREAP applies.

[11] Share of renewable energy in the transport sector: final consumption of energy from renewable sources in transport (cf. Article 5(1)(c) and Article 5(5)of Directive 2009/28/EC) divided by the consumption in the transport sector of 1) petrol; 2) diesel; 3) biofuels used in road and rail transport and 4) electricity used in land transport. Electricity consumption from renewable energy in road transport is multiplied by 2.5 in accordance with Article 3(4)(c). The contribution of biofuels made from waste, residues, non-food cellulosic material, and ligno-cellulosic material carries twice the weight of other biofuels when verifying target attainment in the transport sector pursuant to Article 21(2).

[12] Share of renewable energy in the gross final consumption of energy. The same methodology as in Table 3 of the NREAP applies (row G in Table 1a divided by row 4 in Table A).

[13] In percentage points of overall RES share.

[14] The potential surplus for cooperation mechanisms in percentage points of the total share from renewable energy sources is simply the arithmetical difference from the minimum shares for the indicative trajectory given in Directive 2009/28/EC.

Table 1a: Calculation table for the renewable energy contribution of each sector to (gross) final consumption of energy (ktoe/year)[15]

		2005	2006	2007	2008	2009	2010	2011	2012
A)	*GFCE from renewable sources for the provision of heating and cooling*	7 768	8 138	8 780	8 373	9 696	12 050	11 445	12 165
B)	*GFCE from electricity from renewable energy sources*	5 391	6 150	7 082	7 844	8 500	9 362	10 646	12 035
C)	*FCE from renewable sources in the transport sector*	1 965	3 454	3 877	3 058	2 775	3 055	2 986	3 131
D)	***Gross total consumption of energy from renewable sources***[16]	**15 124**	**17 743**	**19 739**	**19 275**	**20 971**	**24 468**	**25 077**	**27 331**
E)	*Transfer of energy from renewable sources to other Member States*	0	0	0	0	0	0	0	0
F)	*Transfer of energy from renewable sources from other Member States and third countries*	0	0	0	0	0	0	0	0
G)	***Gross total consumption of energy from renewable sources after adjustment (D)-(E)+(F)***	**15 124**	**17 743**	**19 739**	**19 275**	**20 971**	**24 468**	**25 077**	**27 331**

Development of renewable energy in the electricity sector

In the electricity sector, the actual growth in the consumption of electricity from renewable sources (137 200 GWh) exceeds the estimate in the NREAP for 2012 (125 258 GWh) by around 10 %.

This is partly due to the much faster growth in photovoltaic installations in the years 2009 to 2012 compared to the NREAP (total installed capacity at the end of 2012: 32.6 GW, compared to 23.8 GW in the NREAP). Electricity production from biogas in the years 2009 to 2011 also saw a very large increase compared to the estimates in the NREAP (installed capacity 2012: 3.8 GW, compared to 2.7 GW in the NREAP). The estimates in the NREAP of installed capacity and electricity generation from hydropower were also conservative, to allow for the uncertainties in the data on hydropower that still existed in 2010. The base data for installed capacity and electricity generation from hydropower have since been revised. According to the new estimates, both the installed hydropower capacity and the (normalised) electricity production are greater than projected in the NREAP.

The installed capacity of all wind power plants roughly matches the estimates in the NREAP. However, because of a succession of below-average years for wind, normalised electricity production from wind power in 2012 was 3 720 GWh below the

[15] Facilitates comparison with Table 4a in the NREAP.

[16] Article 5(1) of Directive 2009/28/EC states that gas, electricity and hydrogen from renewable energy sources should be considered only once. They must not be included in the calculation twice.

value forecast in the NREAP. The growth in electricity generation from solid and liquid biomass was below par compared to the estimates in the NREAP. In particular, the construction of biomass (heat and) power plants slowed down. Electricity production from liquid biomass declined sharply because of very high global market prices for vegetable oil from 2011 onwards. Funding under the EEG for plants to generate electricity from liquid biomass was also withdrawn for plants commissioned from 1 January 2012 onwards. The use of liquid biomass is therefore limited to existing plants.

Electricity supplies from cogeneration[17] reached some 14 % of total gross electricity production from renewable energy in 2012. In relation to cogeneration-enabled electricity provision from biomass and geothermal energy, the proportion of cogeneration in 2012 was around 48 %.

Table 1.b-i Actual total contribution (installed capacity in MW) of each technology to the use of renewable energy sources in Germany in relation to the binding targets for 2020 and the indicative trajectories for the proportion of energy from renewable sources in the electricity sector[18]

	2005	2006	2007	2008	2009	2010	2011	2012
Hydropower	10 858	10 842	10 833	10 805	11 238	11 218	11 436	11 257
non-pumped	4 134	4 117	4 083	4 104	4 283	4 252	4 469	4 451
< 1 MW	613	624	635	642	682	687	700	713
1 MW–10 MW	1 041	1 023	998	1 000	1 031	1 014	1 088	1 067
> 10 MW	2 480	2 470	2 450	2 462	2 570	2 551	2 681	2 671
pumped	5 648	5 649	5 696	5 641	5 898	5 811	5 811	5 650
mixed[19]	1 076	1 076	1 054	1 060	1 057	1 155	1 156	1 156
Geothermal	1	1	3	3	8	8	8	12
Solar	2 056	2 899	4 170	6 120	10 566	17 554	25 039	32 643
photovoltaic	2 056	2 899	4 170	6 120	10 564	17 552	25 037	32 641
concentrated solar power	0	0	0	0	2	2	2	2
Tide, wave, other marine energy	0	0	0	0	0	0	0	0
Wind	18 375	20 568	22 183	23 815	25 692	27 180	29 060	31 304
onshore	18 375	20 568	22 183	23 815	25 614	26 895	28 730	30 869
offshore	0	0	0	0	78	285	330	435
Biomass	2 352	3 010	3 495	3 905	4 544	5 048	5 607	6 052
solid biomass	1 218	1 411	1 524	1 663	1 843	1 913	1 966	2 034
biogas	1 074	1 422	1 676	1 901	2 356	2 802	3 337	3 764
bioliquids[20]	60	177	295	341	345	333	304	254
Total	**33 642**	**37 320**	**40 684**	**44 648**	**52 048**	**61 008**	**71 150**	**81 268**
of which CHP:	K. A.	K. A.	K. A.	K. A.	K. A.	K. A.	K. A.	K. A.

[17] Gross electricity production from cogeneration where the surplus heat is only used as 'useful heat' outside the plant pursuant to the KWKG. The electricity generation corresponding to internal heat consumption (e.g. fermenter heating in biogas plants) is not included.

[18] Facilitates comparison with Table 10a in the NREAP. For greater clarity, Table 1b as shown in the template has been split into Tables 1b-i and 1b-ii.

[19] In accordance with new Eurostat methodology.

[20] Take into account only those complying with applicable sustainability criteria, cf. Article 5(1) of Directive 2009/28/EC, last subparagraph.

Table 1.b-ii: Actual total contribution (gross electricity generation in GWh) of each technology to the use of renewable energy sources in Germany in relation to the binding targets for 2020 and the indicative trajectories for the proportion of energy from renewable sources in the electricity sector[18]

	2005	2006	2007	2008	2009	2010	2011	2012
Hydropower[21]	21 654	21 660	21 447	21 469	21 988	21 575	21 970	21 880
non-pumped	21 565	21 575	21 368	21 403	21 927	21 527	21 948	21 862
< 1 MW	2 446	2 516	2 567	2 590	2 717	2 700	2 687	2 734
1 MW–10 MW	4 865	4 784	4 655	4 633	4 691	4 522	4 679	4 582
> 10 MW	13 425	13 448	13 346	13 385	13 765	13 532	13 830	13 810
pumped	0	0	0	0	0	0	0	0
mixed	830	827	800	796	754	773	751	736
Geothermal	0	0	0	18	19	28	19	25
Solar	1 282	2 220	3 075	4 420	6 583	11 729	19 599	26 380
photovoltaic	1 282	2 220	3 075	4 420	6 583	11 729	19 599	26 380
concentrated solar power (CSP)	0	0	0	0	0	0	0	0
Tide, wave, other marine energy	0	0	0	0	0	0	0	0
Wind	26 641	30 140	34 762	38 845	41 268	43 074	46 746	49 335
onshore	26 641	30 140	34 762	38 845	41 268	43 074	46 746	49 335
offshore	0	0	0	0	0	0	0	0
Biomass	11 102	14 792	19 831	23 122	26 255	29 560	32 839	39 580
solid biomass	7 126	8 579	8 436	9 074	9 488	10 768	11 296	12 091
biogas[22]	3 861	5 495	10 447	12 959	15 022	17 431	21 189	27 238
bioliquids[23]	116	719	111	1 088	1 745	1 362	354	250
Total[24]	**60 680**	**68 813**	**79 115**	**87 873**	**96 113**	**105 966**	**121 173**	**137 200**
of which **Cogeneration**[25]	6 265	8 567	9 897	10 963	14 007	15 668	16 151	19 073

Development in the heating and cooling sector

In the 'heating and cooling' sector, the consumption of renewable energy in 2012 stood at 11 321 ktoe (Table 1a), higher than the estimate given in the NREAP (10 884 PJ). This is mainly attributable to the greater than expected rise in the use of logs and wood pellets to generate heat for private households (6 397 ktoe in 2012 against 5 648 ktoe in the NREAP).

Despite this absolute increase, the share of the solid biomass used in private households in the total consumption of renewable energy in the 'heating and cooling' sector fell slightly, from 63 % in 2005 to 57 % in 2012. At the same time, the provision of heat from solar thermal energy and the use of environmental heat has more than

[21] Normalised in accordance with Directive 2009/28/EC and Eurostat methodology.

[22] including electricity generation from sewage treatment and landfill gas

[23] Only electricity generation from liquid biomass complying with the applicable sustainability criteria in Directive 2009/28/EC.

[24] Excluding hydropower generation in pure pump storage plants ('pumped')

[25] Gross electricity production from cogeneration where the surplus heat is used as 'useful heat' outside the plant pursuant to the KWKG. The electricity generation corresponding to internal heat consumption (e.g. fermenter heating in biogas plants) is not included.

doubled while the use of near-surface geothermal energy via heat pumps has trebled since 2005. Their use in 2012 roughly matches the estimates in the NREAP. This is also true of the externally used heat from biogas plants, which has increased almost fivefold since 2005, in step with electricity production from biogas. Deep geothermal energy continues to play only a minor role in heat generation in Germany. It is growing more slowly than was assumed in the NREAP (66 ktoe in 2012, compared to 114 ktoe in the NREAP) (Table 1c).

Table 1c: Actual total contribution (final consumption of energy[26]) of each technology to the use of renewable energy sources in Germany in relation to the binding targets for 2020 and the indicative trajectories for the proportion of energy from renewable sources in the heating and cooling sector (ktoe/year)[27]

	2005	2006	2007	2008	2009	2010	2011	2012
Geothermal[28]	43	45	45	45	51	57	60	66
Solar	261	305	339	386	454	484	554	576
Biomass	6 618	6 790	7 128	6 995	8 129	10 305	9 460	9 997
solid biomass	6 299	6 395	6 485	6 299	7 221	9 182	8 269	8 742
biogas	257	285	482	468	620	849	1 020	1 085
bioliquids[29]	61	110	161	228	288	275	171	170
Renewable energy from heat pumps[30]	194	236	296	364	454	532	613	682
- aerothermal	37	53	80	116	168	216	263	308
- geothermal	124	146	174	201	227	247	276	297
- hydrothermal	33	37	42	47	59	68	73	76
Total	**7 115**	**7 376**	**7 808**	**7 790**	**9 088**	**11 379**	**10 687**	**11 321**
Of which district heating[31]	215	211	241	289	382	428	507	641
Of which biomass in households[32]	4 506	4 797	4 660	4 880	5 332	6 831	5 804	6 397

Development in the transport sector

The quantity of renewable energy sources in the **transport sector** (table 1d) rose slightly in 2012 compared to the preceding years, but at 3 131 ktoe (or 3 524 ktoe applying the weighting rules provided for in Article 3(4) of Directive 2009/28/EC), it was lower than the estimate of 3 850 ktoe in the NREAP (or 3 948–3 980 ktoe allowing for double-counting).

For 2011 and 2012 in particular, the NREAP assumed a greater market penetration by bioethanol and pure biofuels (biodiesel, vegetable oils).

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[26] Direct consumption and district heating pursuant to Article 5(4) of Directive 2009/28/EC.

[27] Facilitates comparison with Table 11 in the NREAP.

[28] (excluding low temperature geothermal heat in heat pump applications)

[29] Take into account only those complying with applicable sustainability criteria, cf. Article 5(1) of Directive 2009/28/EC, last subparagraph.

[30] includes only the renewable environmental heat harnessed by heat pumps according to Directive 2009/28/EC.

[31] District heating and/or cooling from total renewable heating and cooling consumption. The gross final consumption of energy in the form of heat from district heating and cogeneration plants is reported in the official energy statistics as district heat

[32] From the total renewable heating and cooling consumption.

If we look at the market penetration of **advanced biofuels** in 2011 and 2012, it is pleasing to see that the quantity of biofuels eligible for double-counting, at 392 ktoe, is greater than the 98-130 ktoe expected in the NREAP by at least a factor of three. This is likely to be attributable especially to the introduction of double-counting of these biofuels towards the biofuel quota. While there was hardly any consumption of bioethanol pursuant to Article 21(2) of Directive 2009/28/EC in 2012 (2 ktoe), significant quantities of biodiesel and other biofuels (biomethane) were counted towards the biofuel quota (biodiesel: 365 ktoe in 2012 against 98 ktoe in the NREAP; biomethane: 25 ktoe in 2012 against 1 ktoe in the NREAP). Altogether, then, the biofuels eligible for double-counting under Article 21(2) of Directive 2009/28/EC accounted for around 13 % of the total consumption of biofuels in 2012.

The consumption of electricity from renewable sources in road transport, extrapolated from the numbers of electric cars, bicycles and commercial vehicles, ran to approx. 1 ktoe in 2012.[33] The quantity of electricity from renewable sources used in rail transport in 2012 (187 ktoe) is slightly higher than reported in the first progress report because of the switch to an official data source.[34]

No hydrogen from renewable energy was consumed in the transport sector in 2012.

[33] The population of electric vehicles in Germany as of 1.1.2013 totalled 7 114 all-electric cars, 1 119 plug-in hybrid cars, 4 652 electric bicycles and motorcycles and 2 964 electric-powered trucks and buses (Federal Motor Transport Authority [Kraftfahrt-Bundesamt], quoted from Schott et al. 2013).

[34] The consumption of electricity from renewable sources in rail transport for the years 2011 and 2012 is determined by the same method as in the NREAPs: it was based on the national share of renewable energy in total electricity consumption for 2009 and 2010, which was in turn calculated from the normalised wind and hydro-electric power supplies for these years.

Table 1d: ***Actual total contribution of each technology to the use of renewable energy sources in Germany in relation to the binding targets for 2020 and the indicative trajectories for the proportion of energy from renewable sources in the transport sector (ktoe/year)***[35]

	2005	2006	2007	2008	2009	2010	2011	2012
Bioethanol/bio-ETBE	153	329	296	402	574	749	782	792
of which biofuels, Article 21(2)[36]	0	0	0	0	0	0	0	2
of which imported:[37]	no info	no info	no info	no info	no info	no info	no info	no info
Biodiesel[38]	1 537	2 416	2 827	2 269	1 993	2 085	1 989	2 034
of which biofuels, Article 21(2)[39]	0	0	0	0	0	0	40	365
of which imported:[40]	no info	no info	no info	no info	no info	no info	no info	no info
EE-H_2[41]	0	0	0	0	0	0	0	0
Renewable electricity[42]	106	103	111	113	136	157	182	188
of which road transport	0	0	0	1	1	1	1	1
of which non-road transport	106	102	110	113	135	156	181	187
Others (biomethane, vegetable oils)	169	606	644	274	72	64	34	117
of which biofuels, Article 21(2)[43]	0	0	0	0	0	0	5	25
Total[44]	**1 965**	**3 454**	**3 877**	**3 058**	**2 775**	**3 055**	**2 986**	**3 131**

[35] Facilitates comparison with Table 12 in the NREAP. For biofuels, take into account only those compliant with the sustainability criteria, cf. Article 5(1) last subparagraph.

[36] Biofuels that are included in Article 21(2) of Directive 2009/28/EC.

[37] From the whole amount of bioethanol/bio-ETBE

[38] including HVO (hydrated vegetable oil)

[39] Biofuels that are included in Article 21(2) of Directive 2009/28/EC.

[40] From the whole amount of biodiesel.

[41] Hydrogen from renewables

[42] Electricity from renewables

[43] Biofuels that are included in Article 21(2) of Directive 2009/28/EC.

[44] without double-counting

2 MEASURES TAKEN IN THE PRECEDING TWO YEARS AND/OR PLANNED AT NATIONAL LEVEL TO PROMOTE THE GROWTH OF ENERGY FROM RENEWABLE SOURCES TAKING INTO ACCOUNT THE INDICATIVE TRAJECTORY FOR ACHIEVING THE NATIONAL RES TARGETS AS OUTLINED IN THE NATIONAL RENEWABLE ENERGY ACTION PLAN

(Article 22(1)(a) of Directive 2009/28/EC))

(Reporting pursuant to Article 22(1)(a) of the RE Directive is covered in detail in subparagraphs (b)-(f))

Table 2: Overview of all key strategies and measures

Name and reference of the measure	*Type of measure**	*Expected result***	*Target group and/or activity****	*Existing or planned *****	*Start and end dates of the measure*	*Amendments to the NREAP*
Renewable Energies European Law Adaptation Act (EAG EE)	Regulatory	Transposition of Directive 2009/28/EG into national law	Public sector	Exists	24.02.2011 Bundestag resolution, approved by the Bundesrat on 18.03.2011	The EAG EE entails changes to the EEG, the EEWärmeG, the Energy Statistics Act [Energiestatistikgesetz], the Federal Building Code [Baugesetzbuch], the Construction Statistics Act [Hochbaustatistikgesetz] and the Biomass Electricity Sustainability Regulation. Key elements of the EAG EE are the introduction of an electronic guarantee of origin register and the example to be set by public buildings.
Renewable Energies Act [Erneuerbare-Energien-Gesetz – EEG]	Regulatory	Increased share of renewable energy in electricity generation	Investors, private households	Exists	Start: April 2000 (as a successor to the Act on the Sale of Electricity to the Grid [Stromeinspeisungsgesetz] which has been in place since 1991); amendments in 2004, 2009, 2012 and 2014; the Act has no end-date	1. Amendments via the EAG EE: Introduction of electronic register for guarantees of origin Timetable for connection to the grid etc. 2. EEG status report from 2011 3. EEG amendment of July 2011 (entry into force: 1 January 2012) Major changes • Introduction of the market premium model (to provide an incentive to feed in renewable energy at fairer prices) • Introduction of the flexibility premium (to provide an incentive to feed in energy from biomass at fair prices). • Adjustments to payment amounts 4. 'PV amendment' of 23.8.2012 (entry into force back-dated to

						April 2012) Major changes • Change of construction-based payment degression to monthly intervals. • Restriction of funding for PV to a total expansion of 52 GW. 5. Management Premium Regulation *[Managementprämienverordnung]* of 2 November 2012 (applicable to electricity generated from 1 January 2013 onwards) Major changes • Reduction of management premium from 2013 Introduction of an additional incentive to equip systems for remote control 6. EEG amendment 2014, planned entry into force 1 August 2014 (outside the report period)
KfW special programme for 'Offshore wind energy'	Financial	To speed up the expansion of offshore wind energy	Project companies, investors	Exists	Start: June 2011; programme ends when the funding has been used up.	Support for the financing of max. 10 offshore wind farms Total volume: EUR 5 billion
Grid Expansion Acceleration Act [NABEG]	Regulatory	To speed up the approval process for grid expansion (electricity) beyond the existing Energy Transmission Expansion Act [Energieleitungsausbaugesetz]	Owners of very high voltage lines (expansion) and high voltage lines (construction)	Exists	in force since 5.8.2011, amended 20.12.2012	- Introduction of a Federal Requirement Plan for extra high voltage lines crossing federal state or national borders, in which there is an overriding public interest, and new provisions for a planning approval procedure for such lines - Amendment: Addition of connection lines from offshore wind farm transformers to the network hubs on land; requirement to comply with the Federal Sectoral Plan for offshore wind
Energy Management Act [Energiewirtschaftsgesetz – EnWG]	Regulatory	Implementation of EU Regulations under the third internal market package for energy, incl. unbundling	Energy supply undertaking *[Energieversorgungsunternehmen]*	Exists	Energy Management Act of 7 July 2005, amended 14.12.2012	- Promotion of smart grids - Information on the origin and composition of electricity for end-consumers - Reporting requirement for network operators

Cogeneration Act [KWKG]	Regulatory	Construction and modernisation of cogeneration plants and upgrading of conventional plants; construction of heating and cooling networks and stores	Power plant operators, energy suppliers, investors	Exists	Amendment to the KWKG (KWKG 2012), in force since 19.7.2012	• Increase in payment for all plants by 0.3 ct/kWh, with a further 0.3 ct/kWh for plants covered by emissions trading (from 2013). • Introduction of an additional payment band (50 kW to 250 kW at 4 ct/kWh) • • Reduced eligibility requirements for plant modernisation projects • CHP upgrades to pure condensation plants • Resumption of funding for heating and cooling stores in cooling networks • Improved funding conditions for heating and cooling networks with small nominal ranges • Simplified procedures for heating networks and small cogeneration plants.
Renewable Energies Heat Act [Erneuerbare Energien Wärme-Gesetz — EEWärmeG]	Regulatory	Increased share of renewable energy in heating and cooling supplies (priority: new buildings)	Building owners (private and public)	Exists	Start: Jan. 2009; first review 2012; first progress report end 2012	Amendment via the EAG EE of 18.3.2011 Progress report to be published end 2012
Regulations on the operation of an electronic guarantee of origin register	Regulatory	Transposition of Directive 2009/28/EC	Electricity market	Exists	Start: 9.12.2011: Guarantee of Origin Regulation 19.10.2012: Guarantee of Origin Implementing Regulation [Herkunftsnachweis-Durchführungsverordnung] 31.12.2012: Guarantee of Origin Fees Regulation [Herkunftsnachweis-Gebührenverordnung]	Operationalising the specifications of Section 55 EEG in the form of non-statutory regulations
Liability and compensation rules for offshore wind power	Regulatory	Increased security of investment for investors	Investors	Exists	In force since 28.12.2012	Compensation rules in the case of delays to grid connection for offshore wind power plants
Offshore network development plan	Regulatory	Reliable planning for offshore wind energy	Investors, transmission system operators	Exists	Confirmed by the Federal Network Agency in January 2013.	Reliable planning for new connection lines to be installed in 'clusters'
Market incentive programme	Financial	Investment in renewable	Private households,	Exists	Guideline in existence since 1999; new	New guideline since 15.8.2012

(MAP)		energy in the heating sector	undertakings, municipalities, other investors such as associations, schools and churches		conditions since 15 August 2012	
KfW funding programmes	Financial	Energy efficiency measures and investments in renewable energy in buildings	Private households, investors, building owners, municipalities, social bodies	Exists	No end-date for measures	Some requirements have changed. Aligned with the EnEV 2009 from 1.7.2010. Removal of funding for KfW 130 (renovation) and KfW 85 (newbuild). New funding for 'Effizienzhaus 40'.
Notice of funding for research and development for climate-efficient optimisation of biomass use for energy production	Financial	Technologies, flexible plant concepts and products to generate electricity and heat from biomass and biogenic wastes and residues.	Investors, research, industry	Exists	In existence since 2008; republished 17.08.2011 (last submission date 22.11.2013)	Funding programme since 18.06.2008
Energy Saving Regulation [EnEV]	Regulatory	Compliance with minimum standards for the overall energy efficiency (non-renewable portion of primary energy demand) of buildings and heating and cooling plants in the renovation and construction of residential and non-residential buildings	Building owners (private and public)	Existing, amendment planned	Had to be implemented by 9 July 2012 (time limit set in Directive 2010/31/EU). The amended Regulation will enter into force six months after promulgation, as allowed by the new version of the Directive.	Tightening/adjustment of the EnEV 2009 in line with the new Buildings Directive
Federal Building Code	Regulatory	Amendments to the Federal Building Code are designed to support climate-friendly urban development in municipalities	Particularly municipalities responsible for overall planning approval	Exists, further amendment planned for 2013	Act to promote climate protection in urban and municipal development [Gesetz zur Förderung des Klimaschutzes bei der Entwicklung in den Städten und Gemeinden] of 22 July 2011 (entered into force: 30 July 2011)	Significant changes are: Climate protection clause, improved ways of presenting and approving plans for plants or areas with a bearing on climate protection, RE plants as possible extended objects of urban development contracts, greater flexibility in the use of

						biomass/biogas for energy production in outlying areas, preference for building-mounted solar energy installations in rural areas, support for energy saving measures on buildings under planning law, simplified planning rules for repowering
Biofuel quota in the Federal Immission Control Act [BImSchG])	Regulatory	Minimum share of biofuels in the total quantity of fuel brought into circulation; from 2015, minimum saving in greenhouse gases from road transport	Marketers of fuels	Exists	Start of 2007; switch from quantity-based to minimum greenhouse gas savings quota from 2015; no end-date.	No changes to the NREAP
Biomass Electricity Sustainability Regulation [Biomassestrom Nachhaltigkeitsverordnung – BioSt-NachV]	Regulatory	Implementation of the sustainability requirements for bioliquids under Directive 2009/28/EC	Operators of plants to generate electricity from liquid biomass under the EEG or those bound by referral from the EEWärmeG who meet their obligation to use liquid biomass; Producers of liquid biomass	Exists	Mostly entered into force on 24.8.2009	Amendment via EAG EE Applicable since 1.1.2011 without restrictions
Biofuel Sustainability Regulation [Biokraft-NachV]	Regulatory	Implementation of the sustainability requirements for biofuels under Directive 2009/28/EC	Persons placing taxable petrol or diesel fuels in circulation commercially or as part of economic undertakings Biofuel manufacturers	Exists	Mostly entered into force on 2.11.2009	Applicable since 1.1.2011 without restrictions

Gas Network Access Regulation [GasNZV]	Regulatory	Promotion of biogas fed into the natural gas network	Investors, operators of biogas plants	Exists, amended on 03.09.2010.	Entry into force 9.9.2010	- Costs of network connection shared 25 % by the recipient, 75 % by the network operator - At least 96 % availability of the network connection to be guaranteed over time - Implementation roadmap pursuant to Section 33(7) GasNZV, specifying the time frame for connection to the network
Government electro-mobility programme	Financial	Increased share of electro-mobility in road transport; strategy to promote research, development and market launch of electro-mobility	Investors, research, industry	Programme exists/concrete actions planned	Implementation of the notified measures started in 2011	Actions envisaged (examples): R&D programme Vocational training Raw materials, materials and recycling
Strategic funding initiatives for energy storage	Regulatory	Increased storage capacity for electricity and heat	Research, industrial partnerships	Exists	Entered into force 17 May 2011	Newly established funding programme in 2011 for electrical and thermal storage and general issues, e.g. environmental acceptability of stores.
Winter Act for security of supply	Regulatory	Maintaining sufficient generation capacity, particularly in winter months	Power plant operators	Exists	Entered into force 28 December 2012, time-limited to end 2017	No change to the NREAP
Reserve Power Plant Regulation [Reservkraftwerksverordnung]	Regulatory	Systematic review of system security and call for tenders for reserve capacity if necessary	Transmission system operators, Federal Network Agency	Exists	Entered into force 28 June 2013, time-limited to the end of 2017	No change to the NREAP
Regulation on Agreements on Interruptible Loads	Regulatory	Increased system flexibility by the use of flexible industrial loads determined by tender	Network operators, industry	Exists	Entered into force 29 December 2012; first calls for tenders on 24 and 25 June 2013; time-limited to 1 January 2016	No change to the NREAP
System Stability Regulation	Regulatory	Solution to the '50.2 Hz problem'	Distribution network	Exists	Entered into force 26 July 2012	No change to the NREAP

		(simultaneous disconnection of PV installations)	operators			
Act amending the Act to establish a special Energy and Climate Fund [Gesetz zur Änderung des Gesetzes zur Errichtung eines Sondervermögens 'Energie- und Klimafonds' – EKFG-ÄndG]	Financial	Funding of measures Energy efficiency, renewable energy, Energy storage and network technologies, energy-related building renovation, national climate protection, international climate and environmental protection, development of electro-mobility	Programme owners and those eligible to apply.	Exists	Entered into force 1 January 2011 Amendment entered into force 29 July 2011 Draft 2nd EKF Amendment Act of 28 May 2014	Other measures: Further funding available for the development of electro-mobility. Grants for energy-intensive undertakings from 2013 to compensate for electricity price increases caused by emissions trading. E.g. Financing of the CO_2 building renovation programme and MAP.

* 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)?
*** What is the target group: investors, end-users, public administration, planning offices, architects, installers etc.? Or what is the target activity/sector: biofuel production, energy production from animal manure etc.?
**** Does this measure replace or complement measures contained in Table 5 of the NREAP?

Federal state and municipal schemes

This progress report sets out the provisions enacted by the German Government to promote renewable energy, updated since the NREAP. The measures described in the NREAP, mostly model projects by the federal states and municipalities, are too numerous to be presented in updated form in the progress report. However, these regional measures continue to play a major role in attaining the national targets in the field of renewable energy.

2.a Please describe the progress made in evaluating and improving administrative procedures to remove regulatory and non-regulatory barriers to the development of renewable energy.

(Article 22(1)(e) of Directive 2009/28/EC)

When the Renewable Energies European Law Adaptation Act was being drawn up, it was established that there were no legal or other barriers to the expanded use of renewable energy in Germany. Although, for example, facilities to exploit wind energy with a total height of more than 50 metres are subject to approval according to Annex 1 No 1.6 of the 4th Federal Immission Control Regulation [BImSchV], this approval is a matter of course where the criteria are met. Nevertheless, the existing rules are being constantly reviewed and enhanced.

2.b. Please describe the measures in ensuring the transmission and distribution of electricity produced from renewable energy sources and in improving the framework or rules for bearing and sharing of costs related to grid connections and grid reinforcements.

(Article 22(1)(f) of Directive 2009/28/EC)

2.b.1 Renewable Energies European Law Adaptation Act

The Renewable Energies European Law Adaptation Act [EAG EE] requires grid operators to provide plant operators with timetables and cost estimates for connecting them to the grid. As before, the costs of the grid connection line are borne by the plant operator, while the grid operator has to cover the costs of the necessary network expansion.

2.b.2. Energy Management Act

The revision of the Energy Management Act [EnWG] in 2011 introduced a national grid expansion plan for extra high-voltage lines (220/380 kV) for the first time. This obliges the transmission system operators (TSOs) to draw up a ten-year Network Development Plan (NEP) each year on the basis of an agreed Scenario Framework to determine the nationwide need for grid expansion at the extra high voltage level for the next decade. The TSOs presented their first Network Development Plan for electricity to the Federal Network Agency on 29 May 2012. The 2012 Network Development Plan for electricity and the associated environmental report produced by the Federal Network Agency were consulted by the public and network users and confirmed by the Agency on 25 November 2012, incorporating feedback from authorities and the public. The Federal Network Agency presented the 2012 Network Development Plan for electricity as a draft Federal Requirements Plan. In December 2012, the German Cabinet adopted a bill proposing a Federal Requirements

Planning Act [Bundesbedarfsplangesetz]. When the Federal Requirements Planning Act is passed by the legislature, the energy management requirement and the urgent need for grid expansion projects will be binding on the approval authority.

The annual iteration of the Network Development Plan provides a means of reacting to changing conditions.

The amendment of 14 December 2012 means that the sequence of grid connections to offshore wind power plants will in future be laid down in an 'Offshore Network Development Plan'. There is also a new compensation provision in the event of delays to offshore connections. The responsibility for planning in the 12 nautical mile zone will in future be transferred from the federal states to the Federal Network Agency. The responsibility for approving the plans still has to be assigned by Regulation, with the consent of the Bundesrat.

2.b.3. Renewable Energies Act 2012

Since the amended Renewable Energies Act [EEG] entered into force on 1 January 2012, feed-in management and the associated conditions for grid connections have been modified. It also calls for new plants to be located in more convenient places in terms of access to the grid. In order to accelerate the system integration of photovoltaic plants also, PV installations up to 100 kW nominal output must be technically equipped to enable them to be included in the network operators' feed-in management systems. Plants with an installed capacity of up to 100 kW commissioned from 1 January 2012 onwards were given until 1 January 2013 to install the technical equipment to govern their output. From 1 January 2013, the technical conditions had to be in place in order to incorporate these plants into the feed-in management system. As an alternative to inclusion in the feed-in management system, plants up to 30 kW can limit their maximum input to the grid to 70 %, which will also relieve the load on the grid by capping spikes in capacity. This measure also had to be implemented by 1 January 2013.

Output from EEG plants can be reduced while retaining the priority given to renewable energy (other plants must be capped first if the grid situation allows this). The TSOs must ensure that the largest possible quantity of electricity from renewable energy and cogeneration is taken up. Regardless of any compensation claims from EEG plant operators against network operators arising from breaches of their obligations to optimise, enhance and expand the networks, these EEG plant operators must be compensated for the income lost from governing their output. The compensation equals 95 % of the income, provided that the losses do not exceed 1 % in any given year (100 % compensation from that point onwards). This then creates an incentive to erect plants in places where there is less need to limit output.

The priority given to electricity from renewable energy (and mine gas) and from cogeneration is the same. The sequence in which generation plants cap their output, the calculation of compensation figures and the effects on network charges are

described in a **Federal Network Agency guide to feed-in management** published on 29 March 2011. Where output has to be capped for grid-related reasons, plants generating electricity from solar radiation will only be capped after the other renewable energy plants.

The EEG and the guide to feed-in management do not contain any other rules on the capping sequence between renewable energy sources and cogeneration. Cogeneration plants have the same entitlement to compensation in the event of capping as do renewable energy sources and mine gas. In general when it comes to capping output, the guide from the Federal Network Agency stipulates that grid and system safety aspects should be considered first, after which the greatest possible take-up of electricity from renewable energy, cogeneration and mine gas should be sought.

2.b.4 Grid Expansion Acceleration Act [NABEG]

The Grid Expansion Acceleration Act entered into force on 5 August 2011. The Act lays the foundation for the modernisation and faster expansion of the transmission network. This mainly concerns the planning and approval procedures and the preparations for them, but is also meant to increase public acceptance of the grid expansion work, as this assumes that the environment will be safeguarded. The new regulations provide for intensive public consultation at an early stage. There are fixed deadlines set for the different steps.

Since the amendment on 20 December 2012, the Act no longer applies only to the erection or modification of extra high voltage lines on land but also to connection lines from offshore wind farms to the grid connection points on shore. The implementation of the national plan for connection lines from offshore wind farm transformer facilities to the network connection points on shore must comply with the latest version of the Federal Sectoral Plan for offshore wind from the Federal Network Agency.

On application from a project owner, the Agency will determine route corridors for extra high voltage lines that cross federal state or national borders (Federal Sectoral Planning). The Federal Network Agency has published a guide, agreed with the federal state authorities, informing them of the procedures, review contents and methods used in the Federal Sectoral Planning process. It examines whether public or private interests stand in the way of a project in a route corridor and carries out a spatial and a strategic environmental impact assessment. The scope of the Federal Sectoral Plan is promptly established at an application meeting. The Federal Network Agency consults the general public, other authorities and public stakeholders in connection with the strategic environmental assessment. It produces an environmental report incorporating the feedback from those consulted. Once the decision on the Federal Sectoral Plan has been announced and published and any objections from the federal states have been addressed, the plan is binding for the

subsequent approval procedure. The route corridors defined in the Federal Sectoral Plan are incorporated into the annual Federal Network Plan. On completion of the Federal Sectoral Planning process, the Federal Network Agency may impose a freeze on further changes, prohibiting any projects or structural changes that stand in the way of the relevant power lines.

The planning approval procedure for the erection or operation of a line starts with the application from the project owner, whereupon the planning authority promptly holds an application meeting bringing together project owners and public stakeholders and other associations. The public is informed of the application meeting (by way of an official gazette, the approval authority's web site and local newspapers). The planning authority sets out the scope for planning approval on the basis of the application meeting. After consultations, the planning process concludes with a planning approval decision. The environmental impact analysis may be restricted to specific aspects, in light of the strategic environmental assessment carried out earlier (see above). It is planned to transfer the responsibility for running the planning approval process for extra high voltage lines across federal state and national borders to the Federal Network Agency.

There is no separate sectoral planning process at the federal state level for the erection or modification of extra high voltage lines for which corridors or specific routes have been designated in the Federal Network Plan.

In June 2012, the Federal Network Agency set up a Federal Sectoral Planning advisory board to advise it on fundamental issues affecting the Federal Sectoral Plan, the establishment of the Federal Network Plan and the approval process and to act as a link between the Agency, the Federal Government and the federal states.

2.b.5. System Services Regulation [SDLWindV]

The Regulation on System Services from Wind Energy Plants [SDLWindV], which entered into force in 2009, was last amended on 28 July 2011. The SDLWindV governs the requirements for better technical grid integration of wind energy plants. The recent amendment brings the SDLWindV into line with the latest state of the network connection rules for the medium-voltage grid.

2.b.6. Low Voltage Directive and System Stability Regulation ('50.2 Hz problem')

Compliance with the connection conditions for low-voltage generation plants in place at the time of connection to the grid, in combination with the rapid growth in photovoltaic installations in the low-voltage network, has given rise to a major risk to system stability – the '50.2 Hz problem'. The Low Voltage Directive provided for immediate disconnection of photovoltaic installations from the network if the frequency exceeded 50.2 Hz. Because of the high incidence of photovoltaic installations in specific parts of the grid, a situation in which this frequency was exceeded could now cause a large number of feeders to shut off simultaneously,

triggering serious instability in the system and possibly even a blackout. This necessitates a retrofit to most of the existing photovoltaic installations.

The Regulation to Guarantee the Technical Safety and Stability of the Electricity Supply Network (System Stability Regulation – SysStabV) has been in force since 26 July 2012, and governs the 50.2 Hz retrofitting of photovoltaic installations. The inverters in existing installations need to be modified so they do not all shut off at 50.2 Hz, but at different frequency levels. The operators of distribution networks are required to engage specialists to effect the necessary modifications within three years. The costs of conversion will be covered half by the network charges and half by the EEG levy to electricity consumers. The plant operators concerned are required by the amendment to the EEG to assist and cooperate with the modification. If they refuse, they will lose their entitlement to payments under the EEG

For new plants, the Network Technology/Network Operation Forum (FNN) within the VDE has drawn up the application rule 'VDE-AR-N 4105:2011-08: Generation plants in the low-voltage grid, minimum technical requirements for the connection and parallel running of generation facilities in the low-voltage grid', in order to improve the integration of local generation plants (particularly photovoltaic installations) into the grid and to maintain safe and reliable operation of the grid and associated systems with a high quality of supply. Among other things, the application rule describes requirements for frequency-driven control of output, mainly to safeguard system stability when the frequency threshold is exceeded. This VDE application rule has been in place for new plants since 1 August 2011. The following transitional periods are specified: The application rule has been binding on photovoltaic installations in the low-voltage grid since 1 January 2012, and on all other generation facilities on the low-voltage grid since 1 July 2012.

2.b.7 Regulation on Agreements on Interruptible Loads

The transition to a flexible overall system with a high proportion of fluctuating electricity production from renewable energy makes it necessary in the longer term to take greater account of the demand side in grid management (referred to as 'load management'). In December 2012, the German Government, with the approval of the Bundesrat, adopted the Regulation on Agreements on Interruptible Loads, which safeguards system stability. In critical situations, grid operators can take flexible industrial loads off the grid and so improve system stability. For this purpose, the TSOs will develop deployment plans and then put the necessary services out to tender. The industrial facilities participating in the tendering procedure must be technically equipped to disconnect from the grid for a few hours a month, either within a second when the system drops below a certain frequency or within 15 minutes by remote control. For the provision of interruptible output, the plant operators will receive a power price of EUR 2 500/MW with an additional labour charge in the event of actual interruptions. This amount will be determined in the tendering process, but will be between EUR 100–400/MWh. It will be financed by a levy on consumers.

The first calls for tender for interruptible loads from transmission system operators were issued on 24 and 25 June 2013 for July 2013. Contracts were signed for 247 MW of immediately interruptible and 593 MW of rapidly interruptible loads within the meaning of the Regulation on Agreements on Interruptible Loads. Monthly updates to the calls for tender and to the results and costs are provided by the transmission system operators on a shared internet platform at www.regelleistung.net.

2.b.8. ACER: Framework guidelines and network codes

The Federal Network Agency is affiliated to the European Agency for the Cooperation of Energy Regulators (ACER), which was established in 2009. The purpose of ACER includes drawing up general guidelines with standards for the network codes produced by the European Network of Transmission System Operators for Electricity (ENTSO-E).

ACER conducted consultations on the development of non-legally-binding guidelines for connection to the electricity grid. The results of the survey were published on 20 July 2011 and entitled 'Framework Guidelines on Electricity Grid Connections'. This is a step towards standardised European rules for connecting all kinds of significant grid users to the network. A 'significant grid user' is defined in the Framework Guidelines.

ACER adopted the Framework Guidelines on Electricity Balancing on 18 September 2012. The objectives of this are security of supply and improved competition from greater opportunities for cross-border exchanges of balancing energy.

ENTSO-E passed the 'Network Code on Capacity Allocation and Congestion Management' to ACER on 27 September 2012, and ACER confirmed that the network code is broadly in line with the Framework Guidelines.

The ACER 'Framework Guidelines on Electricity Grid Connections' were expected to give rise to three network codes:

- On 25 March 2013, ACER advised the Commission to accept the 'Network Code on Requirements for Grid Connection Applicable to all Generators'.
- The second network code is the 'Demand Connection Code', passed by ENTSO-E to ACER on 8 March 2013. ACER then confirmed its compatibility with the framework guidelines on 25 March 2013 and suggested further improvements|. The provisions in this are intended to help to meet the requirements arising from increased input of renewable energy, to safeguard system safety and to support further market integration in Europe.
- A third network code will deal with the connection of high voltage DC transmission systems.

2.b.9. Ten-Year Network Development Plan

In July 2012, the European Network of Transmission System Operators for Electricity (ENTSO-E) published the first legally valid Europe-wide Ten-Year Network Development Plan (TYNDP), containing grid expansion projects of European importance. It is not binding and is intended to create greater transparency over the necessary expansion of the whole EU transmission grid. Almost one-third of the expansion projects in the TYNDP 2012 concern Germany.

The planning principles behind the German NEP have been aligned with the European principles underlying the TYNDP and the relevant grid expansion plans of our European partners, as documented in the TYNDP, are taken into account in the NEP.

3 PLEASE DESCRIBE THE SUPPORT SCHEMES AND OTHER MEASURES CURRENTLY IN PLACE THAT ARE APPLIED TO PROMOTE ENERGY FROM RENEWABLE SOURCES AND REPORT ON ANY DEVELOPMENTS IN THE MEASURES USED COMPARED TO THOSE IN THE NATIONAL RENEWABLE ENERGY ACTION PLAN.

(Article 22(1)(b) of Directive 2009/28/EC)

A key goal of the energy transformation, along with the complete abandonment of nuclear power by the end of 2022, is the accelerated expansion of renewable energy. The proportion of renewable energy in electricity production should rise from 23.6 % of total consumption in 2012 to at least 35 % in 2020. The German Government is aiming to reach at least 50 % by 2030, 60 % by 2040 and 80 % by 2050. The decision on the energy transformation will flesh out the objectives of the Energy Concept of 28 September 2010 and cause them to be implemented faster.

The following points summarise the measures decided on in the 'energy transformation package' for the renewable energy sector and advances on key measures set out in the NREAP.

3.0 Support schemes

3.0.1. Renewable Energies European Law Adaptation Act

The Act implementing Directive 2009/28/EC on the promotion of the use of energy from renewable sources (the Renewable Energies European Law Adaptation Act – EAG EE) of 12 April 2011 brings about the following main changes:

- It enables the electronic issue, transmission and redemption of guarantees of origin for electricity from renewable sources. To this end, the EAG EE provides the basis in the EEG for establishing an electronic register of guarantees of origin. In future, the guarantees of origin will no longer be issued by environmental assessors but by the Federal Environment Agency [UBA], which will also be responsible for recognising, transferring and redeeming the guarantees. A power to enact Regulations has been inserted into the EEG to provide for further changes.
- Grid operators are required to provide those wishing to feed in energy with timetables for processing connection requests and establishing the connection to the grid and to supply details to help determine the network connection point and an estimate of the costs to be incurred by the plant operator for the grid connection.
- Amendment of the Renewable Energies Heat Act to ensure that renewable energy sources are used for heating and cooling when public buildings are thoroughly renovated, and that an example is set by this.

- The power to enact changes to the Biomass Electricity Sustainability Regulation [BioSt-NachV] will be reworded. This is mainly a matter of clarification.
- The degression rules for photovoltaic installations will be changed.
- The ‘green power privilege’ will be limited to 2 ct/kWh.

The major changes to the Renewable Energies Heat Act relate to the exemplary function of public buildings in Germany and abroad (requirement to use renewable energy in the case of thorough renovation). The definition of usable heat has also been expanded. In the new version, the term ‘cooling’ has been added to ‘heating’, so the types of use are more clearly stated. At least 15 % of the requirement for heating and cooling energy in new and thoroughly renovated public buildings must now be covered by renewable energy (exception where gaseous biomass used: 25 % for thorough renovation of public buildings, 30 % for new buildings).

3.0.2 Renewable Energies Act 2012

The amendment to the Renewable Energies Act [EEG] passed by the Bundestag with the approval of the Bundesrat entered into force on 1 January 2012. The German Government’s expansion targets for electricity production from renewable energy are set out here, whereby Germany has committed itself in law to bringing the share of renewable energy in electricity supplies up to at least 35 % by 2020, 50 % by 2030, 65 % by 2040 and 80 % by 2050. The Act also states that these targets are intended to support the attainment of the German mandatory target for renewable energy of 18 % of gross final consumption of energy.

To promote greater market integration, the EEG 2012 introduced an optional market premium in addition to the existing option of direct marketing with or without the use of the ‘green power privilege’. All EEG plant operators (of both new and existing plants) have the option of claiming the market premium instead of the fixed payment. The aim is to use direct marketing of electricity production on the exchange to match plant operation more closely to the price signals from the market. The market premium is the difference between the plant-specific EEG payment and the monthly ex-post calculation of the average exchange price. For electricity from wind energy and photovoltaic installations, the average exchange price is also adjusted with a technology-specific weighting factor reflecting the current market value of the electricity on the exchange. A market premium also covers the costs of admission to the exchange, the forecasting costs and forecasting errors etc.

As can be seen from the figure below, the new funding instrument of a ‘sliding market premium’ is very widely used. This is especially true of wind energy. Currently (June 2013), almost 80 % of the total installed capacity onshore and 100 % of offshore capacity is being directly marketed by operators claiming the market premium. The market premium has also been well-received in the biomass sector, with some 40 % of the installed biomass output being marketed in this way. Almost 10 % of

photovoltaic capacity also draws the market premium. With hydropower plants, part of the output previously marketed via the ‘green power privilege’ has evidently switched to the market premium, as it has with the other gases. The ‘green power privilege’ has declined in importance with direct marketing.

Figure 1: Use of direct marketing options under the EEG 2012 (as at June 2013).

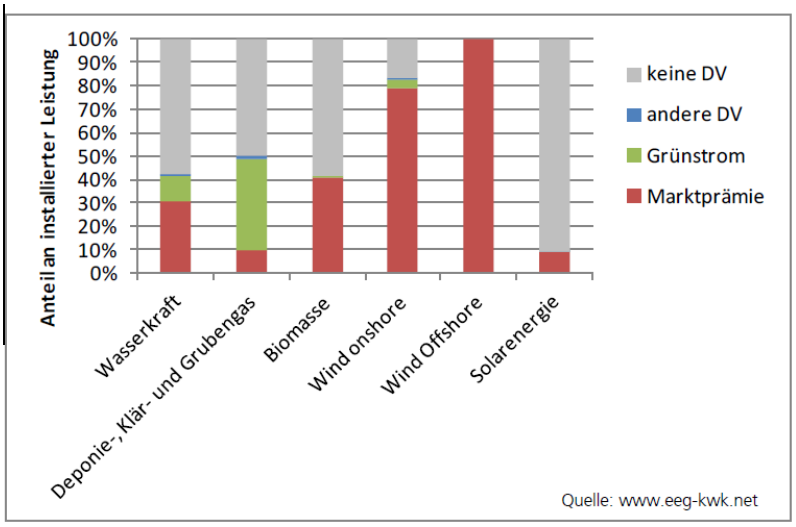
Market premium

- Wind
  - Onshore: 25 138 MW
  - Offshore: 378 MW
- Solar: 3 527 MW
- Biomass: 2 510 MW
- Water: 469 MW

Total: 32 127 MW

Green power privilege: 1 224 MW

Other DV: 138 MW



The unexpectedly widespread use of the market premium model, particularly by existing plants, suggested that the management premium of 1.2 ct/kWh for 2012, granted in addition to the market premium, was set too high. For this reason, the German Government exercised the option provided for in Section 64f EEG 2012 to adjust the management premium by way of a Regulation independently of the regular evaluation cycle for the Act. The resulting Management Premium Regulation entered into force upon publication on 7 November 2012. It makes a greater reduction in the management premium for electricity from fluctuating renewable energy (wind, solar radiation) marketed under the market premium in 2013 than was initially specified in the EEG 2012. According to Section 2 of the Management Premium Regulation, the management premium for electricity generated in 2013 will be 0.65 ct/kWh (EEG 2012: 1.00 ct/kWh), then 0.45 ct/kWh for electricity produced in 2014 (EEG 2012: 0.85 ct/kWh), and 0.30 ct/kWh from 2015 (EEG 2012: 0.70 ct/kWh). At the same time, the Management Premium Regulation ties the amount of the management premium from 2013 onwards to the possibility of remote control of the direct-marketed wind energy and photovoltaic installations. For remote-controlled plants, the management premium for electricity generated in 2013 is 0.75 ct/kWh, in 2014 0.60 ct/kWh and from 2015 0.50 cents per kilowatt-hour of electricity produced. This creates a greater incentive to equip plants with remote control technology for demand-driven provision of electricity, in the interests of improved integration of fluctuating renewable energy into the electricity market.

After the target growth in the photovoltaic sector of 2 500 to 3 500 MW (which also matches the trajectory documented in the NREAP) was surpassed by more than

double in 2011 for the second year in succession, the Federal Government decided to enact a fresh amendment to the EEG 2012 relating to photovoltaic energy, even though the latest EEG had only entered into force on 1 January 2012. After intensive discussion, the 'Act amending the legal framework for electricity from solar radiation with further changes to the law on renewable energy' (the 'PV reform') was published on 23 August 2012 with its entry into force back-dated to 1 April 2012. The main aim was to prevent a further uncontrolled rise in expansion costs caused by photovoltaic energy. The following amendments were made to the EEG:

1. Redefinition of payment classes and size limit:

The division into installations in or on buildings or noise barriers (referred to below simply as 'roof-top installations') and ground-mounted installations is unchanged. For roof-top installations, four payment classes have been introduced:

Plants with installed capacity up to 10 kW, up to 40 kW, up to 1 000 kW and over 1 000 kW. Ground-mounted installations receive a standard payment. All PV installations whose installed capacity exceeds 10 MW are only entitled to payment for the portion up to 10 MW. To prevent fraudulent splitting into multiple 10 MW installations, installations are considered as a single plant if they are commissioned within 24 months within a radius of 2 km in the same municipality.

Section 64g also introduced into the EEG 2012 a power to enact Regulations on payment conditions in conversion areas, to allow payment rates to be defined if necessary for plants in conversion areas even if they are over 10 MW.

2. One-off decrease:

The new six-monthly degression introduced in the EEG 2012 (amount to be determined on the basis of growth) had brought about a 15 % decrease in the payment rates by 1 July 2012. This payment reduction was brought forward by the PV reform and also added to by a special degression. From 1 April 2012, the payment rates shown in the table below applied.

Table 3a: Payment rates for PV installations from 1 April 2012

Installed plant capacity, roof-top installations				Ground-mounted installations
up to 10 kW	up to 40 kW	up to 1 000 kW	up to 10 MW	up to 10 MW
19.5 ct/kWh	18.5 ct/kWh	16.5 ct/kWh	13.5 ct/kWh	13.5 ct/kWh

For roof-top installations there is still a tiered payment based on output thresholds, i.e. the payment for plants whose output extends over more than one tier is calculated pro rata.

For the protection of legitimate expectations, the following transitional provisions were passed for this rule.

a. For ground-mounted installations, the old payment rates remained in place if a planning procedure started before 01 March 2012 (preliminary planning consent or planning approval procedure) and the plant was technically commissioned by 30 June 2012.

b. For ground-mounted installations in conversion areas, the commissioning deadline was extended to 30 September 2012 but the payment decreased by 15 % from 1 July 2012, as also provided for in the EEG.

c. For roof-top installations for which a grid connection request had been made to the network operator before 24 February 2012, the old payment rates remained in place if the plants were commissioned by 30 June 2012.

3. Constant degression:

In order to limit the costs more effectively and to promote more constant growth, the degression cycle has been shortened from six months to one month. In the base case, i.e. where the expansion falls within the target corridor, the payment rates have been reduced by 1 % a month since 1 May 2012. This represents an annual degression in payments of approx. 11.4 % (base degression).

4. Expansion corridor and overall expansion target:

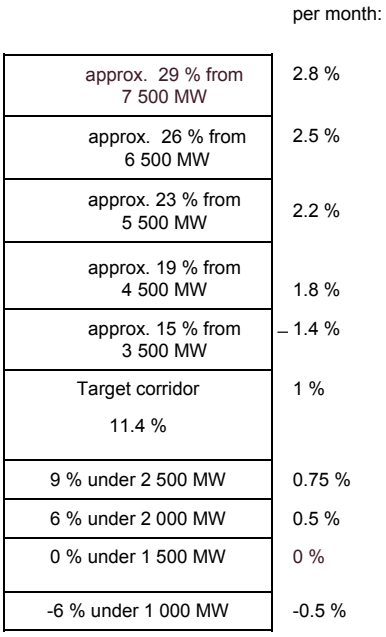
Funding for photovoltaic expansion in the EEG 2012 was limited by the PV reform to an installed capacity of 52 GW, i.e. only those plants that are connected to the grid before the 52 GW threshold is reached will be entitled to receive the EEG payment. The aim of this rule is to cap the absolute expansion costs and hence to limit the EEG levy to be borne by electricity customers via the EEG 'rolling' mechanism. Plants constructed after the 52 GW threshold has been reached must survive in the electricity market without any funding, although they can still benefit from feed-in priority as this also applies to new plants built after the upper limit for funding of 52 GW has been reached. The expansion target of 52 GW within the EEG funding rules is compatible with the expansion target for photovoltaic energy for 2020 set out in the NREAP. The annual expansion corridor of 2 500–3 500 MW is retained without any reduction. Compliance with the target corridor is still used as a criterion for setting the level of monthly degression. The German Government has also undertaken to present a proposal for a connection provision or a redefinition of the rules well before the 52 GW threshold is reached.

5. Expansion-driven control ('breathing cap'):

The amount of degression of the payment rates for photovoltaic installations is still based on the increase in capacity in Germany. In contrast to the previous rules, the payment rates are reduced in monthly degression steps (see above). The PV reform also implements a change to the degression amount at quarterly intervals, in order to react flexibly and promptly to any dynamic changes in the market. From May to October 2012 the payment fell by 1 % at the beginning of each month. The first expansion-driven adjustment was made on 1 November 2012. The amount was based on the expansion in the months from July to September 2012, projected over twelve months. In order to smooth out seasonal fluctuations, the reference period used to calculate the degression is therefore increased: the basis for calculating the degression from 1 February 2013 is the expansion from July to December 2012, again projected over twelve months. The basis for calculating the degression from 1 May 2013 is the expansion from July 2012 to March 2013, again projected over twelve months. The payment rates were reduced retrospectively from November 2012 to January 2013 by 2.5 % at the beginning of each month, from February to April 2013 by 2.2 % a month and from May to July 2013 by 1.8 % a month. The expansion corridor has thus been clearly exceeded, although the expansion volume shows an overall downward trend since the autumn of 2012. To calculate the degression from 1 August 2013, a full year – from 1 July 2012 to 30 June 2013 – can be used as a benchmark for the first time.

After this, the preceding twelve months will be used to calculate the degression. One month is also needed as a buffer to allow the Federal Network Agency to calculate the expansion and the new payment rates. However, the 'breathing cap' takes effect not only when the upper limit of the expansion corridor is exceeded but also when the lower limit is not reached. In this case, the degression is suspended, i.e. the payment rates are raised once more (see Figure).

Figure 2: Schematic view of the way degression rates are calculated from the expansion volume



6. Market integration model:

In order to give a greater impetus to market integration for photovoltaic installations also, the 'PV reform' implemented the 'market integration model'. For photovoltaic installations with an output between 10 kW and 1 000 kW, this means that only 90 % of the total electricity produced in a year will now qualify for an EEG payment. The unfunded electricity can be consumed internally, direct-marketed or offered for sale on the exchange by the grid operator. If the plant operators opt for direct marketing and claim the market premium, they receive the market premium for the whole of the marketed electricity.

For small roof-top installations up to 10 MW and ground-mounted and other installations also up to 10 MW, payment is made for 100 % of the electricity produced. With small installations, the cost of any additional marketing of the electricity seems too great and there is anyway a trend towards internal consumption in this segment. Ground-mounted installations do not generally have the option of internal consumption, and this segment potentially has to face a negative impact on financing and hence rising costs.

However, the provision for the relevant installations between 10 and 1 000 kW commissioned from 1 April 2012 will only apply from 1 January 2014. For the period to 31 December 2013, these plants will thus receive payment for 100 % of the electricity produced.

7. Installation on non-residential buildings in rural areas:

Photovoltaic installations in rural areas only receive the payment for installations in or on buildings if they are placed on houses or stables or associated with new farm buildings. In the past, buildings were often seen to be constructed for the main purpose of generating electricity from solar energy. Although they were used for agricultural purposes (e.g. as barns or storage for farm machinery), their construction was not driven by any such need. The new change limits the windfall gains in this area. Individual financial interests are here curtailed for the benefit of the collective, to prevent any imbalance arising. This is especially true as, in rural areas, the network to connect the installations to the grid usually has to be enhanced, incurring additional costs. For photovoltaic installations erected on existing buildings, the payment rates for roof-top installations continue to apply.

8. Narrower interpretation of 'commissioning':

In addition to the other changes, the concept of commissioning has been more narrowly defined for photovoltaic installations. Since 1 April 2012 it is no longer sufficient for a module to have generated electricity for the first time and fed it into the public supply network; it must be fixed in its specified location and fitted with an inverter, as well as producing electricity and feeding it into the supply network (technical commissioning). This applies to all new installations from 1 April 2012 regardless of the type of set up and any transitional provisions that may apply.

9. Exemption of energy stores from the EEG levy:

Another part of the EEG reform, but not photovoltaic-specific, is the new provision whereby stored electricity is no longer liable for the EEG levy. This prevents it from being charged twice, when it is fed in and when it is drawn off. As the development of storage technologies has a major role to play in supporting the expansion of fluctuating renewable energy sources in the future, the implementation of this provision is an accompanying measure to the expansion of renewable electricity production.

Table 3b: Payment for electricity generation from hydropower plants as at 1 January 2013.

Hydropower plants according to Section 23 EEG 2012	
Plant capacity	**Payment rates as at 1.1.2013**
up to 500 kW	12.57 ct/kWh
up to 2 MW	8.22 ct/kWh
up to 5 MW	6.24 ct/kWh
up to 10 MW	5.45 ct/kWh
up to 20 MW	5.25 ct/kWh
up to 50 MW	4.16 ct/kWh
from 50 MW	3.37 ct/kWh
Degression: 1 % per year **Payment period: 20 years plus start-up year**	

Table 3c: Payment for electricity generation from landfill, sewage treatment and mine gas at 1 January 2013.

Landfill gas plants according to Section 24 EEG 2012	
Plant capacity	**Payment rates as at 1.1.2013**
up to 500 kWel	8.47 ct/kWh
up to 5 MWel	5.80 ct/kWh
Sewage gas plants according to Section 25 EEG 2012	
Plant capacity	**Payment rates as at 1.1.2013**
up to 500 kWel	6.69 ct/kWh
up to 5 MWel	5.80 ct/kWh
Mine gas plants according to Section 26 EEG 2012	
Plant capacity	**Payment rates as at 1.1.2013**
up to 1 MWel	6.74 ct/kWh
up to 5 MWel	4.86 ct/kWh
from 5 MWel	3.92 ct/kWh
Bonuses for landfill and sewage gas plants	
For gas production in plants up to 5 MW rated capacity (Annex I)	**Bonus amount as at 01.01.2013**
Max. Nominal output 700 Nm^3/h	2.96 ct/kWh
Max. Nominal output 1 000 Nm^3/hr	1.97 ct/kWh
Max. Nominal output 1 400 Nm^3/hr	0.99 ct/kWh
Degression: 1.5 % per year on basic payment and bonuses Payment period: 20 years plus start-up year	

Biomass can only be deployed if it is used within the meaning of the Regulation on the Production of Electricity from Biomass [BiomasseV] in the version in force from 1 January 2012.

Table 3d: Payment for electricity generation from biomass as at 1 January 2013

Biomass plants according to Sections 27, 27a, 27b EEG 2012	
Basic payment	
Portion of output	**Payment level as at 1.1.2013**
up to 150 kW_{el}	14.01 ct/kWh
up to 500 kW_{el}	12.05 ct/kWh
up to 750 kW_{el}	10.78 ct/kWh
up to 5 MW_{el}	10.78 ct/kWh
up to 20 MW_{el}	5.88 ct/kWh
Fuel payment class I [1)]	
Portion of output	**Payment level as at 1.1.2013**
up to 150 kW_{el}	6.00 ct/kWh
up to 500 kW_{el}	6.00 ct/kWh
up to 750 kW_{el}	5.00 ct/kWh
up to 5 MW_{el}	4.00 ct/kWh
up to 20 MW_{el}	-

[1)] Over 500 kW up to 5 000 kW, only 2.5 ct/kWh for electricity from bark and forestry waste.

Fuel payment class II [2)]	
Portion of output	**Payment level as at 1.1.2013**
up to 150 kWel	8.00 ct/kWh
up to 500 kWel	8.00 ct/kWh
up to 750 kWel	6.00/8.00[3)] ct/kWh
up to 5 MWel	6.00/8.00[3)] ct/kWh
up to 20 MWel	-

[2)] Only for selected, ecologically desirable fuels.

[3)] Over 500 kW up to 5 000 kW, only 6 ct/kWh for electricity from slurry (only nos 3, 9, 11 to 15 of Annex 3 to the BiomasseV).

Biowaste fermentation plants [4] (Section 27a)	
Portion of output	**Payment level as at 1.1.2013**
up to 500 kW_{el}	15.68 ct/kWh
up to 20 MW_{el}	13.72 ct/kWh

[4] Applies only to biogas plants which ferment certain types of biowaste (as per Section 27a(1)) and are directly connected to a facility to rot the solid residues from fermentation. The rotted residues must be recycled. The payment can only be combined with the gas preparation bonus.

Small slurry plants [5] (Section 27b)	
Portion of output	**Payment level as at 1.1.2013**
up to 75 kW_{el}	24.50 ct/kWh

[5] Special category for slurry biogas plants up to 75 kW installed capacity at the location of the biogas production facility; cannot be combined (i.e. no additional basic or fuel payment or gas preparation bonus).

Gas preparation bonus (Section 27c(2))	
For gas production in plants up to 5 MW rated capacity (Annex I)	**Bonus amount as at 01.01.2013**
Max. Nominal output 700 Nm^3/h	2.94 ct/kWh
Max. Nominal output 1 000 Nm^3/hr	1.96 ct/kWh
Max. Nominal output 1 400 Nm^3/hr	0.98 ct/kWh

Degression: 2 % per year on the basic payment (Section 27(1)), the payment for biowaste fermentation plants (Section 27a) and small slurry plants (Section 27b), and the gas preparation bonus (Section 27c(2)).

The fuel-based additional payments for fuel class I or II are not subject to degression.

Payment period: 20 years plus start-up year

Table 3e: Payment for electricity generation from geothermal plants as at 1 January 2013.

Geothermal plants according to Section 28 EEG 2012	
Plant capacity	**Payment rates as at 1.1.2013**
all plants	25.00 ct/kWh
Technology bonus	**Payment level as at 1.1.2013**
up to 10 MW_{el}, where petrothermal technology used	5.00 ct/kWh
Degression: 5 % per year on payment and bonuses, starting with 2018 **Payment period: 20 years plus start-up year**	

Table 3f: Payment for electricity generation from wind energy plants on land as at 01 January 2013.

Wind energy plants (Sections 29, 30 EEG 2012)	
	Payment rates as at 1.1.2013
Basic payment	0.99 ct/kWh
Increased initial payment [1)]	0.99 ct/kWh
Small wind plants up to 50 kW [2)]	0.99 ct/kWh

[1)] The increased initial payment is granted for five years. Under Section 29(2), it is extended by two months for every 0.75 % of the reference amount by which the revenue from the plant falls short of 150 % of the reference amount.

[2)] For small wind energy plants up to and including 50 kW, the reference revenue calculation in Section 29(3) does not apply. For these plants a reference revenue of 60 % is assumed. They then receive the increased initial payment for the whole payment period.

Bonuses for onshore wind energy plants	
System service bonus	**Payment level as at 1.1.2013**
The system service bonus is paid for new plants according to Section 29(2) for the period of the increased initial payment, provided that the plants are commissioned before 31.1.2015. The requirements of Section 6(5) EEG must be shown to be satisfied.	0.47 ct/kWh
Repowering bonus	**Payment level as at 1.1.2013**
The repowering bonus pursuant to Section 30 for replacing existing wind energy plants at the same or neighbouring locations is granted for the period of the increased initial payment, provided that the plants being replaced were commissioned before 1.1.2002.	0.49 ct/kWh
Degression: 1.5 % per year on payment and bonuses **Payment period: 20 years plus start-up year**	

Table 3g: Payment for electricity generation from offshore wind energy plants as at 1 January 2013

Offshore wind energy plants according to Section 31 EEG 2012	
	Payment rates as at 1.1.2013
Basic payment	3.50 ct/kWh
Increased initial payment [1)]	15.00 ct/kWh
Increased initial payment in the compression model [2)]	19.00 ct/kWh

[1)] The increased initial payment is granted for the first 12 months after commissioning of the plant. It is extended for 0.5 months for every full nautical mile over 12 nautical miles and by 1.7 months for every full metre by which the depth of water exceeds 20 metres.

[2)] In the case of the compression model, the same payment is made in the extension period resulting from the distance from shore and the depth of water as in the 'normal' payment option (Section 31(3) second sentence).

Degression: 7 % per year on payment, starting with 2018 **Payment period: 20 years plus start-up year**

Table 3h: Payment for electricity generation from photovoltaic installations as at 01 January 2013.

Photovoltaic installations (Sections 32, 33 EEG 2012)		
Installations in and on buildings		
Portion of output	**Eligible portion of the revenue from electricity**	**Payment level up to 1.1.2013 (1.7.2013)**
up to 10 kW_{el}	100 %	17.02 ct/kWh (15.07 ct/kWh)
up to 40 kW_{el}	90 %	16.14 ct/kWh (14.30 ct/kWh)
up to 1 kW_{el}	90 %	14.40 ct/kWh (12.75 ct/kWh)
up to 10 MW_{el}	100 %	11.78 ct/kWh (10.44 ct/kWh)
Ground-mounted installations		
Portion of output	**Eligible portion of the revenue from electricity**	**Payment level up to 1.1.2013 (1.7.2013)**
up to 10 MW_{el}	100 %	11.78 ct/kWh (10.44 ct/kWh)

Degression: monthly depending on expansion; basic degression 1 % per month **Payment period: 20 years plus start-up year**

Payments, differential costs and EEG levy:

In parallel with the growth in the volumes of electricity covered by the EEG, the associated payments rose also. Where they totalled EUR 10.8 billion in 2009 according to the EEG annual accounts, they increased to EUR 13.2 billion in 2010 and to almost EUR 16.8 billion in 2011 (ignoring grid charges no longer payable). The resulting average EEG payment was 13.9 ct/kWh in 2009, 15.9 ct/kWh in 2010

and 18.4 ct/kWh in 2011. The constant rise in the average payment is mainly attributable to the continued dynamic growth in photovoltaic energy and the higher payments for biomass plants. Because of the sharp decrease in payment rates (max. 15.07 ct/kWh in July 2013; see Table 3h), there will be no further increase in the average payment caused by photovoltaic. In fact a continued expansion of photovoltaic will in itself have the effect of reducing the average payment. Based on the absolute level of the installed capacity, the proportion of PV in the EEG costs will also increase further.

The resulting costs re allocated to final energy consumption in the form of the EEG levy. Electricity customers thus cover the funding to expand the use of renewable energy as part of the electricity price, where the EEG levy is passed on by the suppliers to the electricity customers (which regularly happens). To calculate the EEG levy, the value of the electricity generated from renewable energy in the form of marketing revenue is subtracted from these payments, as the electricity is taken by the transmission system operator and marketed on the energy exchange, and the result, allowing for a liquidity reserve and the current balance on the account and taking account of the privileged electricity, is divided by the amount of electricity consumed. Based on forecasts from the TSOs tasked with marketing the EEG electricity, an EEG levy of 3.53 ct/kWh was collected in 2011. For the first time, the EEG 2012 allowed the transmission network operators to maintain a liquidity reserve of up to 10 % of the levy amount. To determine the EEG levy for 2012, this liquidity reserve was set at 3 % of the allocation amount. This meant that the EEG levy increased slightly from 2011 to 2012 (to 3.59 ct/kWh).

The increase in the EEG levy to 3.592 ct/kWh in 2012 subsequently proved to be much too small. This needs to be made up in the EEG levy for 2013. The expansion of renewable energy use was also much more dynamic than was assumed in the transmission system operators' forecasts for 2012, so higher payments had to be made than originally calculated. At the same time, falling wholesale prices meant that the marketing revenues on the energy exchange were much less than forecast, which affected the EEG account and had to be offset in the new levy forecast. In order to avoid very negative account balances, the liquidity reserve was increased from the previous year to 10 %. Altogether, these factors produced a clear increase in the EEG levy for 2013, to 5.277 cents per kilowatt-hour, and hence a generally increased charge to electricity consumers. This is an increase of almost 47 % over the previous year's level.

Whereas 603 particularly energy-intensive undertakings in manufacturing industry and railways made use of the special equalisation rule under the EEG in 2011, which largely exempted them from the EEG levy, the number of beneficiaries rose to 734 in 2012. The privileged volume of electricity increased from 75.9 TWh in 2011 to 85.4 TWh in 2012.

Because of the marketing method specified in the EEG 2012 (direct sales of electricity produced on the energy exchange by the TSOs), the increasing production of renewable energy is leading to the displacement of expensive power plants with high marginal costs from the merit order (the 'merit order effect'). Renewable energy thus influences prices on the energy exchange, because renewable electricity with close to zero marginal costs is increasingly replacing conventional power generation, causing exchange prices generally to fall. Electricity consumers can benefit from this as long as the reduced wholesale prices are passed on to them, which has not yet happened, however, at least with domestic customers. Large customers who purchase their electricity directly on the exchange benefit directly, however, and industrial consumers saw at least some of this effect passed on in the tariffs in 2012. The development of wholesale prices was not however reflected in the tariffs for private household customers. This is especially true of tariffs for basic supplies. According to studies carried out for the BMU the dampening effect on the wholesale electricity price from generation funded under the EEG was around 0.87 ct/kWh. Applied to the total volume of electricity traded on the spot market in 2011 (314 TWh), this amounts to around EUR 2.7 billion.

3.0.3 Renewable Energies Act 2014

On 27 June 2014, the Bundestag adopted an Act to bring about a thoroughgoing reform of the Renewable Energies Act, which entered into force on 1 August 2014. Although the German Government does not regard any of the provisions of the EEG as State aid, the reform already incorporates most of the provisions of the new environmental and energy aid guidelines published by the European Commission in April 2014, in the interests of legal certainty.

The new Act will further advance the integration of renewable energy into the electricity market by making direct marketing compulsory for all new plants (introduction in two stages: from August 2014, compulsory direct marketing for plants from 500 kW upwards; from January 2016, from 100 kW upwards). In order to break down the cost barriers, the continued expansion of renewable energy will focus more strongly on economical technologies. At the same time, cost-effectiveness will be improved by eliminating over-funding, removing bonuses and applying an ambitious degression.

Binding expansion corridors will also be laid down for the first time. This is intended to make the pace of expansion more controlled and consistent, and to bring greater predictability and reliability to the energy transformation for all the operators. To this end, a statutory expansion path of 2 500 MW per year will be established for onshore wind energy. In order to meet the expansion targets, new instruments to control the volumes will be introduced. For example, the 'breathing cap' for photovoltaic plants will initially be transferred to other technologies. This principle of automatic tariff degression based on the amount of new building has proved its worth in the photovoltaic sector.

By 2017 at the latest, the amount of financial support for renewable energy will also be determined by competitive technology-specific tendering procedures. In order to gather experience of this system change by way of tendering procedures, pilot requests for tender will be published in the coming years in the field of ground-mounted photovoltaic installations. Part of this RfT will also be open to plants from neighbouring countries in Europe, provided that there is a cooperation agreement to this effect, that the aid embodies the principle of reciprocity and that the physical import of the electricity into Germany can be documented.

The new Act will also maintain the existing exceptions in the EEG 2012 for energy-intensive industry that is exposed to international competition, taking account of legal developments at the European level, particularly the new environmental and energy aid guidelines. It will thus help to safeguard Germany's economic and industrial competitiveness.

3.0.4. Renewable Energies Heat Act

The Renewable Energies Heat Act (EEWärmeG), which entered into force in 2009 and was amended at the beginning of 2011 on the basis of the EAG EE, was evaluated over the period 2009 to 2012 in accordance with Section 18 of the Act ('Status report'). This focussed on the growth in the use of renewable energy in the heating and cooling sector, the quantities of fossil energy saved through the Act, the market and cost trends for the technologies, the enforcement of the Act and its implementation in the federal states. Recommendations were also made with regard to technological development, enforcement issues, the inclusion of the existing building stock and the future shape of the EEWärmeG.

3.0.5. Market Incentive Programme for the use of renewable energies in the heating market

The Market Incentive Programme (MAP) has been a key instrument used by the German Government to promote the use of renewable energy in the heating sector for over a decade. In 2012, a total of EUR 301 million was spent under the MAP, triggering investments worth EUR 1.33 billion. Specifically, investment grants amounting to EUR 144 million were made under the MAP in 2012 for 75 000 renewable energy heating plants, mainly to private individuals in single and two-family houses. Redemption grants totalling EUR 131 million were also made to enable low-interest loans for large plants and heat networks and stores to be paid off early, mainly to industrial and municipal investors, and further expenditure of EUR 26 million was also granted. The MAP is continuously adapted as and when necessary to reflect the state of the technology and changes in the market. The funding guidelines for the MAP ('Guidelines for the funding of measures for the use of renewable energy in the heat market') were last amended with effect from 15.8.2012 and have applied since then with the following content:

- New minimum funding contributions were introduced for solar collectors up to 40 m^2 in area (thermal use of solar energy) and biomass boilers and heat pumps with a nominal output up to 100 kW. These benefit plants that are generally installed in single and two-family houses, which are paid up to EUR 400 more. The basic funding rates which are granted according to the size of the plant are unchanged. Only plants in existing buildings receive funding.
- The bonus funding, which rewards especially innovative technologies or combinations of technologies deserving of funding, was increased: the construction of a biomass plant or a heat pump together with a solar collector facility to produce hot water and/or supplement the heating system will in future attract a bonus of EUR 500. There is also a new efficiency bonus for the use of heat pumps in well-insulated buildings. Heat pumps attract additional funding of EUR 500 per installation if they have a new buffer store of a specified minimum size.
- Innovation funding for new solar energy plants (from 20 m^2) in apartment blocks and non-residential buildings is also available for new buildings.
- The funding for solar collector systems to provide process heat will be increased to up to 50 % of the net investment costs. Funding may now also be provided in the form of a one-off grant up to an area of 1 000 m^2.
- The construction or retrofitting of components to reduce emissions and/or improve efficiency in biomass plants in existing buildings will be supported to the tune of EUR 750 per plant.
- The redemption grants for large solar energy plants (from 40 m^2) will cover up to 50 % (previously 30 %) of the investment costs (for process heat or solar cooling).
- Large heat pumps from 100 kW upwards are also eligible for funding in new buildings.
- Biogas pipes may be funded once more in some applications (biogas generation under the EEG 2012).
- The possibilities of funding for deep geothermal energy have been extended: in future this will cover not only plants for thermal use but also to a small extent electricity generating systems.

In the future, no more MAP funding is earmarked for heat networks and stores that benefit from the improved funding under the amended Cogeneration Act (in force since July 2012).

3.0.6. KfW support programmes for energy-efficient construction and renovation

Some of the requirements have changed. The KfW programmes were modified from 1 July 2010 in line with the EnEV 2009. Significant changes are:

- Removal of funding for KfW 130 (renovation) and KfW 85 (newbuild).
- Funding for ‘Effizienzhaus 40’.

Funding for individual measures was withdrawn from 1 September 2010.

3.0.7. Notice of funding for research and development for climate-efficient optimisation of biomass use for energy production

The funding programme was first published on 16 June 2008 and was extended to 17 August 2011.
The funding focuses on climate protection effects, efficiency improvement and profitability when testing and validating technologies, and process and procedural optimisation measures of a demonstration and pilot character. These particularly include research and development projects for the practical enhancement of innovative and competitive technologies, flexible plant concepts and products to sustainably and efficiently generate electricity and heat from biomass and biogenic wastes and residues.

3.0.8. Energy Saving Regulation

The amendment to the Energy Saving Regulation (EnEV) 2012 introduces the *climate-neutral building* level for new buildings up to 2020, rated on the basis of primary energy indicators. The renovation roadmap for the existing building stock, based around this indicator, starts in 2020 and progresses in steps towards a target reduction in primary energy demand of 80 % by 2050. The existing profitability standard must be maintained.

Issues that trigger a need for action are:

- The introduction of the ‘nearly zero-energy building’ standard for all new buildings from the beginning of 2021 (for public administration buildings, two years earlier);
- Expansion of the requirement to display energy certificates (particularly to some private buildings and smaller public administration buildings frequented by the public);
- The stipulation that, in future, property ads in commercial media for the sale or lease of buildings or homes must include an energy indicator where there is an energy performance certificate available; and
- The introduction of quality controls for energy performance certificates.

It was not possible to comply with the time limits for implementation laid down in the Directive. However, the Regulation entered into force on 1 May 2014.

3.0.9. Measures under town and country planning law – amendment to the Federal Building Code

During the reporting period, Germany has made still more provision for climate protection in planning law. To increase the use of onshore wind energy, the Government's energy concept of 28 September 2010 proposes necessary and appropriate provisions in town and country planning law to support repowering, i.e. replacing old wind power plants with new ones. The Government's white paper of 6 June 2011 on the energy transformation also provides for an amendment to planning law to improve the possibility of replacing old wind energy plants with new, more powerful and more efficient installations (repowering). It will also make it easier to place photovoltaic installations on buildings.

The Act to Promote Climate Protection in Urban and Municipal Development of 22 July 2011 entered into force on 30 July 2011. Article 1 covers amendments to the Federal Building Code [Baugesetzbuch – BauGB], particularly:

- Incorporation of a climate protection clause as an explicit matter for consideration in construction planning (Section 1a(5) BauGB),
- Explicit option to present and approve plans for plants or sites with reference to climate protection, particularly for local and central generation, distribution, use or storage of electricity, heat or cooling in the form of renewable energy or cogeneration in land-use plans (Section 5(2) no 2 BauGB) and development plans (Section 9(1) no 12 BauGB), facilities for local and central generation, distribution, use or storage of electricity, heat or cooling from renewable energy or cogeneration as a possible extended object of urban development contracts (Section 11(1) no 4 BauGB),
- Specification of the permissible combustion heat output of privileged plants in rural areas for the energy-related use of biomass at 2 megawatts and of the capacity of a plant to generate biogas at max. 2.3 million standard cubic metres of biogas per year (Section 35(1) no 6 BauGB)
- Privileged treatment of plants to use solar radiation energy in and on roofs and outside walls of buildings allowed to be used for this, where the installation is subsidiary to the building (Section 35(1) no 8 BauGB), climate protection as an explicit objective of urban regeneration measures (Section 171a BauGB),
- Provision in planning law for later measures to existing buildings for the purpose of energy savings (cf. Section 248 BauGB), and
- Special provision to include wind energy in construction planning, particularly for repowering, and allocation of further areas for the use of wind energy (Section 249 BauGB).

In 2013, an 'Act to strengthen internal development in towns and municipalities and to enhance town planning law' formed the second part of the reform of the Federal

Building Code while also amending the Building Use Regulation [Baunutzungsverordnung].

Federal-Länder initiative on wind energy

In its energy concept, the German Government has decided to work with the federal states to launch an initiative to earmark new sites for wind energy plants by way of modifications to land-use plans, to identify and develop approaches that enable the use of wind energy to be expanded while safeguarding nature and the environment, and to gain acceptance from the population. Since May 2011, representatives from central government and the federal states have therefore been meeting regularly within the Federal-Länder initiative on wind energy to exchange information and experience. Current problems associated with the expansion of onshore wind energy are addressed, and possible solutions discussed.

3.0.10. Grid Expansion Acceleration Act [NABEG] and Energy Management Act [EnWG]

The conversion and expansion of the grid infrastructure is essential to transporting electricity from renewable energy plants to consumers. The aim of the 'NABEG' (see also 2.1.2) is to speed up the approval process – over and above the Energy Transmission Expansion Act [Energieleitungsausbaugesetz].

Federal Sectoral Planning and Federal Network Plan

Given the national importance of grid expansion, the 'patchwork' of approval procedures arising out of regional autonomy has been largely abolished by law. A uniform nationwide approval process has been instituted. This simplifies the procedures and removes unnecessary bureaucracy. In future, there will be a **Federal Sectoral Plan.** This will be implemented by the Federal Network Agency assisted by the federal states concerned and by the general public and other stakeholders. The outcome of the Federal Sectoral Planning process is the **Federal Network Plan:** this designates the necessary route corridors throughout the country and reserves them where necessary for the erection of extra high voltage lines. It guarantees early involvement of the public. The responsibility for consent and planning approval is largely concentrated in a central federal authority, the Federal Network Agency.

Financial compensation mechanisms, greater participation and transparency

Financial compensation mechanisms, greater participation and transparency help to gain acceptance and hence to speed up the process and ultimately to advance the expansion of the grid. There is a possible financial compensation mechanism for disadvantages suffered by municipalities erecting transmission lines in the public interest. The compensation accompanies citizens' rights to participate in the

procedure at an early stage (in the Scenario Framework, the Network Development Plan and the application meetings). An information campaign run by the Government together with grid operators and environmental associations also promotes communication and transparency in relation to grid expansion.

Network development for offshore wind energy

The rapid and economically efficient connection of offshore wind farms will advance the spread of offshore wind energy. The shared connection of offshore wind farms is laid down in law. The annual Federal Sectoral Plan for offshore wind in the Exclusive Economic Zone (EEZ) identifies offshore projects that are suitable for shared connections. It also includes the necessary routes for the shared connections, locations for the converter platforms and cross-border power lines, and descriptions of possible interconnections.

Compensation and liability provisions for offshore wind

The ‘Third Act to reform energy management regulations’ introduced new compensation and liability provisions for offshore wind energy. To create security of investment for offshore wind farms, a plant operator can claim compensation if the facility is connected to the grid later than planned. The costs of compensation for delays for which they are not responsible can be passed on by the TSOs by way of a levy to consumers (up to 0.25 ct/KWh), minus an excess amount.

Funding for cross-border power lines

European grid expansion needs to be brought forward in order for electricity trading to work. There will be clear legal rules for the construction of cross-border power lines, especially with regard to the costs and conditions for connection to the transmission network. This will create incentives for integration within the internal market for electricity – to the advantage of consumers.

Reduced bureaucracy by reducing the load on the planning authorities

The authorities should be relieved of bureaucratic procedures and formalities. Following the example of the Building Code, the authorities will be able to engage private project managers in formalised procedures. This will free up resources in the authorities for their core tasks.

Simplified authorisation procedure

Previously different approval formats will be simplified. Standardised approval procedures will be established for overhead lines and underground cables at the 110 kV level. This will enable prompt completion of the approval procedure.

Since August 2011, under Section 43h EnWG in conjunction with the amended Section 23 of the Regulation on Incentive Regulation [ARegV], high-voltage lines on new routes with a nominal voltage of 110 kV or less have to be laid as underground cables, provided that the total costs of laying and operating the cable do not exceed the total costs of a technically comparable overhead line by a factor of 2.75 and nature conservation and other public concerns do not stand in the way.

3.0.11. Energy Management Act

The 'Act to Reform Energy Management Regulations' of 26 July 2011, announced in the Federal Law Gazette on 3 August 2011, amends the Energy Management Act [EnWG] as from 4 August 2011.

In particular, this reform implements the specifications of European law introduced by the third internal market package for energy (comprising Directives 2009/72/EC and 2009/73/EC and Regulations (EC) No 714/2009, No 715/2009 and No 713/2009). The legislative purpose now also reflects the fact that the proportion of renewable energy in the energy mix is set to increase and that the energy supply networks are also expected to establish the conditions for an expansion of renewable energy. Amendments especially concern the unbundling of transmission, long-distance and distribution network operators (particularly operators of transport networks and storage facilities, and a separate market presence for distribution network operators), a reform of so-called object networks (or 'closed distribution networks'), the regulation of gas storage plants, the introduction of further consumer protection rights and the independence of the regulatory authorities.

Financial incentives will be created for interruptible loads in distribution networks, for example, as an aspect of 'smart grids'. A reduced network charge will be imposed on suppliers and final consumers for fully interruptible consumer installations, including electric cars. The reduction in the network charge will be stipulated in a statutory regulation which has still to be enacted.

Operators of electricity distribution networks with more than 10 000 customers have to present a report on network status and expansion plans at the request of the regulatory authority. Operators of high-voltage networks (110 kV) have to produce an annual report on network status and the effects of the expansion of renewable energy, and produce network development plans where necessary.

Operators of electricity distribution networks are required to support measures by the operators of transmission networks (or higher-level distribution networks) where this is required to maintain network safety, at the least possible expense.

Storage facilities erected after 31 December 2008 and up to 4 August 2026 are exempt from network charges for 20 years after commissioning. This applies to storage facilities that store electricity from the public supply grid and feed it back into the grid after a time delay, and to plants to generate hydrogen by electrolysis of water. Existing pumped storage power plants will be exempt from network charges for 10 years if they increase their pump or turbine capacity by at least 15 % and their energy storage capacity by at least 5 % after 4 August 2011.

3.0.12. Interruptible Loads Regulation

The Interruptible Loads Regulation was passed in 2012 on the basis of Section 13(4a) EnWG. It obliges transmission system operators to purchase a total of 3 000 MW of interruptible loads in a non-discriminatory and transparent tendering procedure. The prequalification conditions and the tendering procedure are determined by the operators. Energy-intensive undertakings have been participating in the monthly tendering procedures since mid-2013. A maximum of 1 500 MW of rapidly interruptible loads and 1 500 MW of immediately interruptible loads are contracted for. The Regulation contributes to system security as the transmission system operators maintain reserves of interruptible power that can be called off.

3.0.13. Biofuel Quota Act

The key funding instrument for biofuels is the biofuel quota. Anyone who places biofuels into circulation in Germany must ensure by the end of 2014 that he also markets 6.25 % relative to the energy content of biofuels. From 2015, this requirement will be changed to a reduction in greenhouse gases.

As already announced in the NREAP, biofuels placed in circulation since January 2011 to meet the biofuel quota must satisfy the sustainability requirements under the Biofuel Sustainability Regulation [Biokraft-NachV].

3.0.14. Other measures to promote renewable energy

'Renewable Energies' platform

The former BMU and the BMWi established the 'Renewable Energies' platform in April 2012. The aim is to work with stakeholders from politics, business and society to develop solutions to meet the challenges faced in expanding the use of renewable energy. The platform consists of a steering group and three working groups which submit proposals to the steering group. The working groups are concerned with the market and system integration of renewable energies (working group 1), the interplay between network expansion and the increased use of renewable energy (working group 2) and the relationship between renewable and conventional energy and the demand side (working group 3). An initial report was presented to the Federal Chancellor and the Prime Ministers of the federal states in November 2012 (see also http://www.bmwi.de/BMWi/Redaktion/PDF/B/bericht-der-plattform-erneuerbare-energien,property=pdf,bereich=bmwi2012,sprache=de,rwb=true.pdf). Working group 3 also produced a report in October 2013 for the steering group, the Federal Chancellor and the Prime Ministers of the federal states (for details of the platform, see http://www.bmwi.de/BMWi/Redaktion/PDF/S-T/struktur-und-konzept-der-plattform-erneuerbare-energien,property=pdf,bereich=bmwi2012,sprache=de,rwb=true.pdf). The 'Renewable Energies' platform is part of the 'Electricity Market' platform (see outlook below).

'Electricity Market' platform

The new 'Electricity Market' platform is one of five energy transformation platforms[45] and held its launch event on 1 July 2014. It will combine existing discussion platforms (the 'Power Plant Forum', the 'Renewable Energy' platform and the 'Storage' working group within the 'Network' platform) and take an overarching approach. The high-level aim is to develop an electricity market which guarantees security of supply, supports system conversion while considering the overall economic costs, takes account of European concerns and enables an energy transformation-specific overall approach in which conventional power stations, renewable energy plants and demand management and network expansion can all be incorporated. The aim is to produce a green paper for discussion as early as the autumn of 2014.

[45] Along with the continuing 'Energy Networks' platform, an 'Efficiency' platform and a 'Buildings' platform are set to start work in July 2014. A 'Research and Innovation' platform will be established at a later date.

‘Sustainable energy networks’ platform

In mid-2010, the BMWi in collaboration with the former BMU launched the ‘Sustainable Energy Networks’ platform, or ‘Network platform’ for short. This brings together the key players – grid operators, national and regional institutions and associations – with the aim of identifying challenges to the expansion and modernisation of the electricity networks at an early stage and cooperating on proposed solutions. The priority issues are: social acceptance of network expansion, planning and approval procedures, regulatory conditions for investment in networks, connecting offshore wind farms to the grid, funding and testing of new technologies, development of smart networks and meters, maintenance of safe network operation, uses of stores for system stability and network development plans.

The recommendations are adopted by the regular plenary sessions. These are supported by the nine issue-specific working groups and an advisory board of representatives from politics, academe and society. The office of the ‘Network’ platform is located within the BMWi (see also http://www.bmwi.de/DE/Themen/Energie/Netzausbau/plattform-energienetze.html.

‘Energy transformation’ research forum

The ‘Energy transformation’ research forum is a dialogue platform in which representatives from central government, the federal states, universities and other academic bodies, and business and society discuss key issues relating to the energy transformation. The options and proposals drawn up in the research world are evaluated and recommendations and further research needs are derived from these (see also http://www.bmbf.de/de/12337.php.

Approval, certification and licensing procedures

In Germany, plants based on renewable energy (RE plants) have to be approved, some of them under immission control law and some under planning law only. The following changes have been made to the BImSchG compared to the details given in the NREAP:

- **Amendment of 21 July 2011:**

  The obligations of operators of plants subject to approval were aligned with the new version of the Greenhouse Gas Emissions Trading Act [TEHG].

- **Amendment of 1 April 2011:**

  The Act Amending the Energy and Electricity Tax Act made textual changes to the BImSchG to align it with the new 10th BImSchV.

National Platform for Electro-Mobility and Energy Research

Alongside the information on the use of renewable energy set out in the NREAP, the Federal Ministry of Economics and Technology (BMWi), together with the Federal Ministry of Transport, Building and Urban Development (BMVBS), set up a Joint Agency for Electric Mobility (GGEMO) on 1 February 2010 to provide a single point of contact with the Federal Government for the business and academic worlds and to consolidate activities in this area. The National Platform for Electro-Mobility (NPE) was also set up in 2010. Representatives from industry, research and politics work closely together in this forum. Concrete implementation steps are defined, with the aim of establishing Germany as the leading market for and the leading provider of electro-mobility. The German automotive industry is also expected to create highly innovative products to maintain its top global position in electro-mobility. The NPE consists of a steering group and seven working groups with some 20 members each (See also http://www.bmwi.de/DE/Themen/Industrie/Industrie-und-Umwelt/elektromobilitaet,did=491862.html and http://www.bmwi.de/BMWi/Redaktion/PDF/nationale-plattform-elektromobilitaet-vorsitz-mitglieder-des-leitungskreises,property=pdf,bereich=bmwi2012,sprache=de,rwb=true.pdf).

The NPE presented its first interim report in 2010, which took stock of developments to date in electro-mobility in Germany. The second report in 2011 discussed opportunities for German business in the field of electro-mobility and the efforts that the NPE considered necessary for the country to become both a leading market and a leading provider. If electro-mobility in Germany is driven forward by all the players acting together, the NPE also sees a potential for it to create around 30 000 new jobs by 2020.

The third report, published in May 2012, stresses the importance of the showcase projects and the research and development that are needed in the market preparation phase. The Government's Electro-Mobility programme (May 2011), which may be seen as a response to the NPE report, had picked up key recommendations from the NPE report and started work on implementing them, the report says. The NPE also boasts that the flagship R&D initiatives defined in the second report have since turned into actual funding projects. It is emphasised that Germany has laid the foundations to become the leading provider of electro-mobility by 2020. However, it is also noted that the funding measures proposed by the NPE have to be implemented as there could otherwise be a distinct reduction in revenue growth.

There have been no relevant changes in the other measures described in the NREAP under 4.2. which are not covered in the progress report, either under their own headings or related topics, since the NREAP was produced.

3.1. Please provide the information on how supported electricity is allocated to final customers for the purposes of Article 3(9) of Directive 2009/72/EC.

(Article 22(1)(b) of Directive 2009/28/EC)

The electricity from renewable energy supported through the EEG by fixed feed-in prices and market premiums is marketed on the energy exchange by the TSOs or directly by the producers. The difference between the marketing proceeds on the one hand and the payments and market premiums on the other is passed on in the form of the EEG levy (Section 37(2) EEG 2012) in such a way that each supply company bears the same costs per kilowatt-hour of electricity supplied to non-privileged end-consumers. Whether electricity supply companies pass the costs on the final consumers and, if so, in what amount, is not a matter for the EEG but is subject to the individual contracts concluded under private law, which generally involve passing the costs on to the end-consumers.

The law only defines how electricity supply companies can display the EEG levy to final consumers (Section 53 EEG) and how the electricity funded under the EEG must be shown on electricity bills, on the internet and in advertising to end-consumers (Section 42 EnWG, Section 54 EEG). Depending on the levy that they pay, electricity supply companies inform final consumers of a proportion of electricity from 'renewable energy, funded under the Renewable Energies Act' on their electricity bills, on the internet and in advertising material (Section 42(1) EnWG, Section 54 EEG).

The electricity supply company also has to tell the final consumer of the other components of the electricity mix on the electricity bill, on the internet and in advertising material 'in a consumer-friendly manner and in a graphic format of an appropriate size' (Section 42(3) EnWG, as amended by the EnWG Amendment Act of 26 July 2011). The electricity supply company has to add the average values for the electricity mix in Germany. The electricity mix from the energy providers includes nuclear power, coal, natural gas, other fossil fuels, renewable energy sources funded under the Renewable Energies Act, and other types of renewable energy.

4 PLEASE PROVIDE INFORMATION ON HOW, WHERE APPLICABLE, THE SUPPORT SCHEMES HAVE BEEN STRUCTURED TO TAKE INTO ACCOUNT RES APPLICATIONS THAT GIVE ADDITIONAL BENEFITS, BUT MAY ALSO HAVE HIGHER COSTS, INCLUDING BIOFUELS MADE FROM WASTES, RESIDUES, NON-FOOD CELLULOSIC MATERIAL, AND LIGNO-CELLULOSIC MATERIAL.

(Article 22(1)(c) of Directive 2009/28/EC)

4.1. Provisions in the EEG

The EEG includes additional provisions in the compensation rates to promote the use of renewable energy technologies. Along with banded compensation rates, the payment for electricity from biomass is also helped by the introduction of a pro-rata fuel payment (i.e. option to mix the fuel payment classes), to encourage the use of ecologically beneficial substrates such as slurry, wild plant mixtures and landscape conservation material. For the production of electricity from biogas, a limit of 60 % (by weight) has been introduced for the use of maize and grain. This is intended to prevent excessive cultivation of maize and foster greater diversification of arable substrates. In the EEG 2012, for example, a bonus is paid for preparation of biogas of natural gas quality. The EEG 2012 also introduces a separate payment category for the production of biogas from biowaste.

The **use of heat in biomass plants** is now laid down in Section 27 EEG 2012 as a legal requirement (previously a bonus provision). At least 25 % of the electricity generated in the plant in the first calendar year and at least 60 % in each subsequent calendar year must be produced by cogeneration, in accordance with Annex 2 to the Act. In the case of electricity production from biogas, the heat equivalent to 25 percentage points of the electricity generated by cogeneration must be used to heat the fermenter. As an alternative to the provision on heat use, biogas plants may show that slurry accounts for 60 % of the fuel used.

According to Annex 2, cogeneration is defined in terms of the use of heat according to a positive list or the replacement of fossil fuels with an energy equivalent shown to be comparable to the scale of fossil heat use (to be demonstrated by expert report). A negative list sets out further types of heat use that are not eligible for funding.

For the use of some ecologically desirable fuels for electricity generation from biomass which have limited other uses and can contribute to climate protection but can generally only be deployed at higher cost, the feed-in payments in the EEG are increased. A condition for this is that the electricity must be generated in line with the raw material energy yield from fuels listed in Annex 3 to the Biomass Regulation.

4.2. Cogeneration (combined heat and power)

Along with the provisions in the EEG on the use of heat (see previous section) and in the MAP (below), the Cogeneration Act [KWKG] of 19 March 2002, last amended in 2011, supports cogeneration or combined heat and power (CHP) plants.

The KWKG promotes the construction and modernisation of high-efficiency CHP plants with no limit as to size, initially independently of whether they are run on renewable or other energy sources, with a grant paid for the electricity produced according to the size and age of the plant. The construction and expansion of heat networks is funded with an investment grant. The expansion of cogeneration is supported with funding totalling up to EUR 750 million per year. Of this, up to EUR 150 million is earmarked for developing heat networks. The CHP reform passed in August 2012 built on the changes made in the summer of 2011 (extension of the funding period from 2016 to 2020 and removal of the previous dual cap with a limit of six years' operation, or four for industrial CHP plants, plus a maximum of 30 000 hours at full capacity) to improve support still further. The payment for all plants was thus increased by 0.3 ct/kWh. Plants covered by emissions trading receive an additional 0.3 ct/kWh. An additional payment band (50 kW to 250 kW at 4 ct/kWh) was also introduced and the eligibility requirements for plant modernisation projects were modified. Other changes are the addition of heating and cooling stores in cooling networks and CHP retrofitting in condensation plants, improved funding conditions for heating and cooling networks with small nominal ranges and simplified procedures for heat networks and small CHP plants.

The MAP (KfW premium section) also supports biomass plants for combined heat and power (CHP) production with an installed nominal heat capacity of more than 100 kW and up to 2 000 kW, provided that they are strictly heat-driven. The funding is granted to compensate for optimising operation for heat use. The erection and expansion of plants for combined heat and power (CHP) generation using deep geothermal energy (from a drilling depth of 400 m and a thermal fluid temperature of at least 20 °C with a geothermal heat output of at least 0.3 MW_{th}) is also eligible. Heat-driven plants are funded where the average electricity-heat ratio does not exceed 0.15 kW_{el}/kW_{th}.

The 'Guideline on funding for CHP plants up to 20 kW_{el}' from the former BMU, which includes support for the construction of fossil and renewable CHP plants up to 20 kW_{el} in existing facilities, entered into force on 17 January 2012. Various requirements have to be met in order to obtain funding (including minimum sizes for integrated heat stores, minimum primary energy savings, conclusion of a full maintenance contract, installation of an integrated energy meter, and existence of an interface for external performance standards).

4.3. Amendment to the Biomass Regulation

Within the scope of the remuneration rules in the EEG, the Biomass Regulation [BiomasseV] governs which materials are recognised as biomass for the purpose of compensation, which technical methods of electricity production from biomass fall within the scope of the EEG, and what environmental requirements have to be met in the generation of electricity from biomass.

EEG plants commissioned up to 31 December 2011 are covered by the Biomass Regulation in the version in force from 18 August 2005 (for electricity generation from scrap wood and the use of vegetable oil methyl ester in some existing plants, different transitional provisions apply under the EEG 2012).

The reform of the EEG adopted by the Bundestag on 30 June 2011 and approved by the Bundesrat on 8 July 2011 also made extensive changes to the Biomass Regulation [BiomasseV] with effect from 1 January 2012. From 2012, in addition to its existing scope of regulation, the amended BiomasseV, within the scope of the EEG, also governs which materials qualify for an additional fuel-based payment, which energy-related reference values should be used to calculate this payment and how the fuel-based payment should be calculated.

4.4. Amendment to the 36th Regulation implementing the Federal Immission Control Act

According to the Federal Immission Control Act, undertakings that place petrol or diesel fuels in circulation must also distribute a statutory minimum percentage of biofuel (the biofuel quota) under the biofuel quota scheme. Since 1 January 2011, the proportion of some biofuels has carried twice the weighting of others, where they are made from the following substances:

- Waste covered by the Closed Cycle Waste Act [Kreislaufwirtschafts- und Abfallgesetz] (except for vegetable fats and oils used to roast or fry food)
- Residues (crude glycerine, tall oil pitch, slurry, dung and straw)
- Cellulosic non-food material, or
- Ligno-cellulosic material.

The German Government adopted the Regulation amending the Regulation implementing the rules for the biofuel quota and the Biofuel Sustainability Regulation on 7 November 2012. With effect from 1 January 2013, this altered the procedure for monitoring the option of double-weighting that existed at that time and laid down certification as the method of documentation.

4.5. Biofuels attracting special funding under the Energy Tax Act

Synthetic hydrocarbons or synthetic hydrocarbon mixtures obtained from the thermochemical conversion of biomass (‘biomass-to-liquid’, or BtL fuels) and alcohols produced by biotechnological processes to break down cellulose are biofuels qualifying for special funding. These biofuels can be made completely tax-exempt until the end of 2015 both as components of mixtures with fossil fuels and in their pure form (Section 50 EnergieStG). As well as the tax relief, they can be counted towards the German biofuel quota. Until the end of 2015, there is also a possibility of tax relief on the bioethanol portion of fuels with a bioethanol content of at least 70 % by volume (e.g. E85).

4.6. Accompanying measures

The use of the materials mentioned above is also supported by ‘accompanying actions’ such as investment support for individual plants and the funding of know-how (studies, knowledge transfer).

Examples of investment support include funding for individual plants (‘beacon projects’), regional funding, all the way to large-scale aid for research issues (BtL, wood distillation).

5 PLEASE PROVIDE INFORMATION ON THE FUNCTIONING OF THE SYSTEM OF GUARANTEES OF ORIGIN FOR ELECTRICITY AND HEATING AND COOLING FROM RES, AND THE MEASURES TAKEN TO ENSURE RELIABILITY AND PROTECTION AGAINST FRAUD OF THE SYSTEM.

(Article 22(1)(d) of Directive 2009/28/EC)

The specifications of Directive 2009/28/EC were implemented in the Renewable Energies European Law Adaptation Act within the EEG (Section 3 no 4c and Section 55 EEG 2012) and the subsidiary Regulations based on this Act:

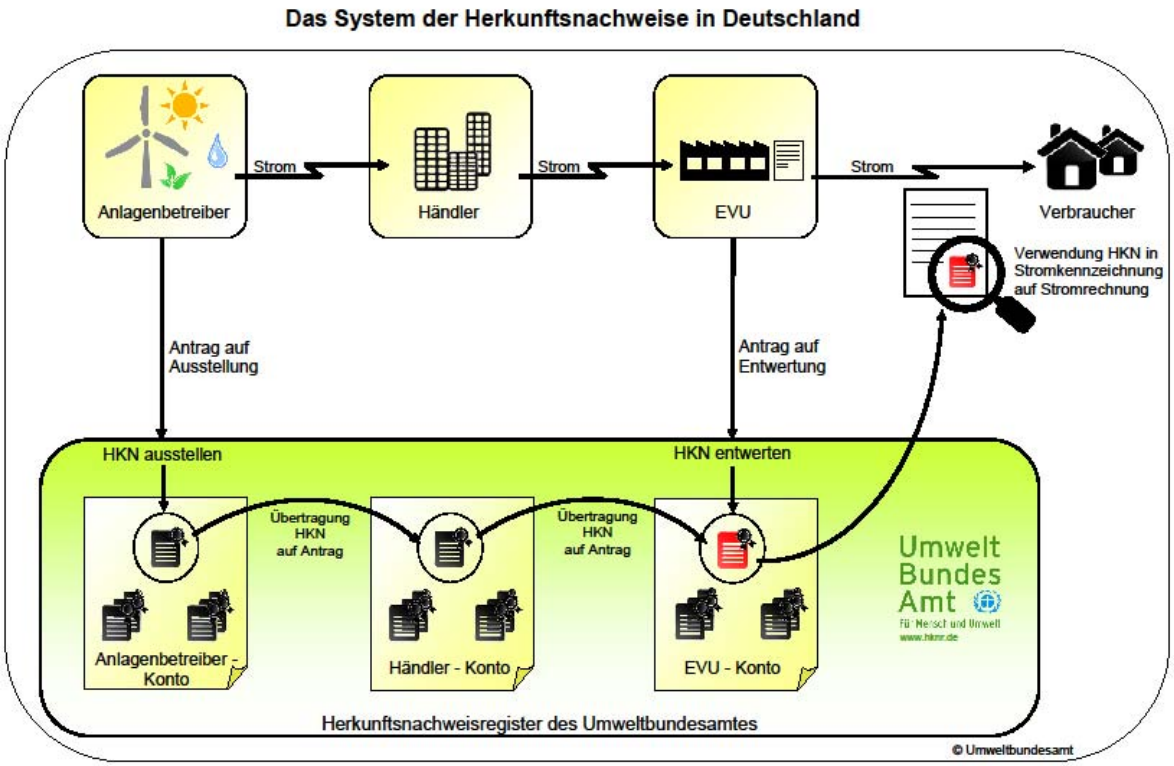
- the Guarantee of Origin Regulation of 28 November 2011, which establishes a framework for guarantees of origin,
- the Guarantee of Origin Implementing Regulation of 15 October 2012, which governs the details of issuing, transferring and redeeming guarantees of origin, and
- the Guarantee of Origin Charges Regulation of 17 December 2012.

These legal bases stipulate that, from 1 January 2013, the Federal Environment Agency (UBA) should act as the central government office for the Guarantee of Origin register (HKNR) for Germany. Based on these regulations, the UBA issues guarantees of origin on application, redeems them, transfers them within Germany and abroad and recognises foreign guarantees of origin. For this purpose, the Agency has set up an electronic database (the Guarantee of Origin Register), which records the issue, transfer and redemption of guarantees of origin.

The HKNR works like an online banking system: operators of plants that produce electricity from renewable energy can register themselves and their plants in the HKNR. For every megawatt-hour of electricity, a guarantee of origin is placed in their account. The grid operator notifies the UBA of the volumes of electricity produced as an independent and expert third party. The guarantees of origin are tradable. The Federal Environmental Agency is responsible for checking the data and the system. An electronic control system safeguards the reliability of the system.

Under Section 42(5) EnWG, electricity supply companies are legally required to redeem guarantees of origin for any product that they sell which contains direct-marketed electricity from renewable energy that is not funded by the market premium. Under Section 42(7) EnWG, the Federal Environmental Agency is given access to the electricity supply companies' data on electricity labelling, so it can compare this with the guarantees of origin issued and redeemed and so monitor the trade in guarantees of origin to pick up any fraud or abuse. Only an electricity supply company can redeem the guarantees of origin.

Figure 3: The system of guarantees of origin in Germany



For international trade, the UBA uses the electronic interface of the Association of Issuing Bodies (AIB). This enhances the reliability of the German system and of the European market in guarantees of origin.

The UBA lays down a number of rules to make the HKNR system in Germany fraud-proof and reliable. These include: identity checks on the participating operators in the HKNR using the PostIdent process from Deutsche Post AG or by checking the IDs of foreign participants; checking the authorisation of registrants; issuing a user name and password and use of Captcha; roles and rights scheme; entry of VAT identification number to assist in detecting possible VAT fraud; encrypted electronic communication; use of environmental experts to verify plant data and volumes of electricity.

For heating and cooling, Germany has not made use of the option in Article 15(2) second sentence of Directive 2009/28/EG to issue guarantees of origin to producers of heating and cooling from renewable energy sources.

6 PLEASE DESCRIBE THE DEVELOPMENTS IN THE PRECEDING TWO YEARS IN THE AVAILABILITY AND USE OF BIOMASS RESOURCES FOR ENERGY PURPOSES.

(Article 22(1)(g) of Directive 2009/28/EC)

The availability of biomass resources depends on the quantities that can be provided subject to technical, economic and ecological restrictions and the effect of competing demands for their use. Bottlenecks in availability and shortage may be statistically invisible if some market operators switch to other raw materials or shift use to other times. That is why estimates of the availability of biomass are fraught with uncertainty.

This section describes their use based on the categories defined in the progress report template document and, where possible, estimates availability.

The energy-related use of biomass is captured in the RE statistics for Germany as (gross) final energy provision broken down by supply type (electricity, heat, fuels), biogenic energy source (solid, gaseous, liquid) and sector (households, trade and services, transport, industry, transformation sector (electricity, district heat)). The total (gross) final energy provision from biomass including the biogenic element in waste was 16 291 ktoe in 2011 and 17 633 ktoe in 2012 (cf. BMU, 2013b). The energy-related use of biomass has therefore increased by 10 % since the previous progress report.

The official energy statistics that form the principal basis for the balance-sheet of energy-related biomass use only allow a limited breakdown by type (e.g. logs, wood chips, pellets) and particularly by origin of the different biomass components (forestry and landscape conservation wood). This information is however picked up by regular surveys in support of expert opinions. For example, the DBFZ has been engaged by the former BMU to examine the nature and origin of the solid biofuels used for EEG electricity production in biomass plants and the substrates used for EEG electricity generation in biogas plants (DBFZ, 2012; DBFZ, 2013). The occasional expert opinions on the development of the wood raw material balance-sheet, based mainly on surveys of plant operators, also collect and report the type of wood used to produce energy alongside other forestry and landscape conservation wood (cf. Mantau, 2012). In an expert opinion from the AGEE-Stat based on Mantau (2012), the figures were extrapolated to produce estimates for the reporting period (cf. Mantau, 2013).

Particularly in view of the uncertainties in capturing the very varied and decentralised energy-related use of biomass, a comparison between the renewable energy statistics from the AGEE-Stat and the aggregated figures in the expert reports mentioned above produces a sufficiently good match. The findings of these reports will therefore be quoted in various places below.

6.1 Biomass to generate heat and electricity

Wood biomass, total. In the reporting period, an annual volume of around 34 million $tonnes_{dw}$ of wood biomass (including scrap wood; see 6.1.5) was used for energy production. Private households are the biggest users. There was an increase of approx. 10 % over the 2009–2010 reporting period. Since 2010, the proportion of wood used for energy production has actually exceeded the use of wood as a material, albeit only slightly, at 50.6 % (Mantau, 2012).

Imports and exports. There is significant foreign trade associated with the use of wood for energy production, particularly in scrap wood but also in by-products from sawmills and wood pellets (ÖKO/IFEU, 2010). On the other hand, logs have only a very minor place in international trade. There are no reliable figures on foreign trade in wood types used for energy production, mainly because the foreign trade statistics do not distinguish the type of use of the different categories.

Merchantable wood[46]**.** In 2011 and 2012, merchantable wood in the order of 9.2 million $tonnes_{dw}$ was used in various ways in the production of energy (but mainly in domestic fires) (Mantau, 2013). Compared to the previous reporting period (2009 and 2010), the consumption of merchantable wood for energy production increased significantly in the present period.

Residues from tree-felling (crowns, twigs, bark). In the reporting period, some 6 million $tonnes_{dw}$ of forestry waste[47] and bark were used to produce energy, mainly in biomass CHP plants (Mantau, 2013). This is an increase of 10–20 % over the previous reporting period. Given a further increase in use in the future, ecologically negative consequences endangering normal biotope development, and the need to safeguard productivity and balanced nutrient stocks, would need to be considered if the rules for sustainable natural forest management were not complied with.

Residues from landscape management and conservation. In both 2011 and 2012, around 2.8 million $tonnes_{dw}$ of wood from landscape management and conservation were used in energy production (Mantau, 2013). About half of this came from mainly municipal cuttings and wood from landscape conservation efforts, which was predominantly used in biomass CHP plants. The other half is mainly made up of log-type wood from domestic gardens, mostly used for energy production by private households. The scale of use increased by some 15 % from the previous reporting period.

6.1.1 Use of indirectly available wood biomass

Residues from wood processing and pulp production. In the reporting period, around 5 million $tonnes_{dw}$ of sawmill waste and other industrial waste wood (including

[46] Merchantable wood: generally wood with diameter > 7cm

[47] Forestry waste: mainly wood of diameter < 7 cm, plus rejected merchantable wood

scrap from the woodworking industry) were used for energy production in biomass CHP plants. A further 1.4 million $tonnes_{dw}$ of black liquor from pulp production were also used as an element of internal energy supplies (Mantau, 2013).

6.1.2 Biomass from farmland

Common arable crops for heat and electricity

Biogas. Most energy production from biogas for heat and electricity is based on regenerating raw materials. In each of the two reporting years, around 80 % of the biogas was obtained by fermenting common arable crops. In both years, the biggest contribution (approx. 60 %) came from maize silage. This was followed, some way behind, by grass silage (approx. 8 %) and grain and whole cereal plant silage (together approx. 9 %). Other crops such as beets played a lesser role in the reporting period (DBFZ, 2012; DBFZ, 2013).

Vegetable oil. Vegetable oils were used for energy production almost exclusively in different sizes of district heating plants for combined heat and power generation. Refined palm oil (approx. 95 %) was the main fuel used in the reporting period, with a small amount of rapeseed oil (5 %) (DBFZ, 2013). Their use is limited to existing district heating plants. Funding under the EEG was withdrawn for plants commissioned from 1 January 2012 onwards. Compared to the use of vegetable oils in the fuel sector, the quantity used in stationary energy plants is very small.

Energy crops. Crops used exclusively for heat and electricity have not so far been grown on a significant scale. In a few places, the cultivation of willows and poplars in short rotation and of Miscanthus has been tested for the production of solid fuels; also of Jerusalem artichokes, Silphium perfoliatum and mixed wild plants for biogas extraction. Miscanthus is currently grown on around 2 700 ha (FNR, unpublished). The area under fast-growing wood (KUP) in the reporting period was around 4 900 ha (FNR, unpublished). The energy content of the solid biomass harvested each year in the reporting period was only of the order of 24 ktoe.

6.1.3 By-products and residues from agriculture and fishing

The biggest contribution in this segment comes from animal manure. About 14 % of the total biogas produced was obtained in this way in 2011 and 2012. Agricultural and industrial residues each contributed around 1 % to the total volume of biogas in both years (DBFZ, 2012; DBFZ, 2013).

6.1.4 Biomass from waste

Waste biomass was used in different ways in the reporting period; burnt in combustion plants, fermented into biogas or used as a raw material for fuel production. The incineration of biogenic waste, both in pure form (e.g. scrap wood) and as a mixture (e.g. household waste) was by far the most important element.

Biogenic content of waste. Final energy provision (electricity and heat) from the biogenic content of waste, mainly in waste incineration plants, totalled 1 167 ktoe in 2011 and approx. 1 270 ktoe in 2012 (BMU, 2013b), a rise of 18 % over the previous reporting period.

Landfill gas. The biogenic waste deposited in landfill sites in the past produces landfill gas that can be used to produce energy, mainly to be turned into electricity. The corresponding final energy provision (electricity and heat) ran to 64 ktoe in 2011 and 54 ktoe in 2012 (BMU, 2013b).

Sewage treatment gas. Final energy provision from sewage treatment gas totalled 263 ktoe in both 2011 and 2012 (BMU, 2013b).

Biogas from biogenic waste. Biogas production from biogenic waste contributed some 4 % to the total production of biogas in the reporting period, coming mainly from the fermentation of biowaste collected separately (biowaste containers) (DBFZ 2013).

Scrap wood. Figures from surveys of operators used to derive the wood raw material balance showed that a total of approx. 6 million $tonnes_{dw}$ of scrap wood are used each year for energy production (Mantau, 2013). According to studies by the DBFZ, also based on information from operators, the use of scrap wood in EEG-funded power stations and CHP plants came to around 4.4 million $tonnes_{dw}$ in 2012 (DBFZ, 2013). Whereas the power stations built before 2006 used exclusively or mainly scrap wood (classes A I to A II or A IV), the later plants are hardly based on scrap wood at all. This is particularly because only a limited quantity of scrap wood was available on the market, contrasting with an increased demand which drove prices upwards. In line with this, the funding under the EEG was gradually withdrawn (DBFZ, 2012; DBFZ, 2013).

The available quantity of scrap wood in Germany in 2010 was estimated at 8 million tonnes. Since around 2003, more scrap wood has been imported than exported. Net imports in the reporting period were between 2.5 and 3 million tonnes (Mantau, 2012).

6.2. Biomass for the transport sector

6.2.1. Arable crops

As before, the dominant raw material for domestic **biodiesel** production in the reporting period was rapeseed oil, with an annual volume of around 2 300 kt (approx. 80 % of total biodiesel production) in 2011 and 1 900 kt (71 %) in 2012. Other arable crop-based raw materials used in domestic biodiesel production were palm oil, at 14 kt (2011) and 50 kt (2012) and soya oil, at around 70 kt in both years (VDB, 2012; DESTATIS, 2013f).

According to figures from producers, a total of 1.4 million tonnes of cereals and around 0.3 million tonnes of sugar beet-based raw materials were used in Germany in 2011 to produce **bioethanol**. In 2012 the use of sugar beet-based raw materials rose to almost 0.5 million tonnes, while the use of cereals declined slightly to about 1.2 million tonnes (BDBE, unpublished).

The **biomethane** used as fuel is based on by-products and waste and on the fermentation of established arable crops, overwhelmingly dominated by silo maize as a biogas substrate, as it is in biogas-based electricity and heat production (see 6.1.3). In 2011, some 130 GWh (11 ktoe) and in 2012, 59 GWh (5 ktoe) of biomethane based on biomass from crops were used for transport purposes (BMU, 2013b; BMF, 2013). This sharp decrease, despite a rapidly growing market, is a result of the greatly increased competition between biomethane from waste and residues, which represents twice the share of the biofuel quota that biomethane from crop biomass does. For the latter, improved marketing conditions arose in 2012 in connection with CHP-based electricity generation.

6.2.2. Energy crops

No biofuels have so far been produced in Germany from exclusive energy crops such as grasses or fast-growing trees.

6.2.3. Wastes and residues

Partly favoured by the possibility of counting double towards the biofuel quota, the use of vegetable-based used oils and fats in biofuel production increased sharply compared to the previous reporting period. Around 395 000 tonnes of plant-based waste were processed into biodiesel in 2011, and approx. 532 000 tonnes in 2012 (DESTATIS, 2013f).

There is as yet no commercial production of bioliquids from straw. Such methods are currently still at the pilot stage in Germany.

Table B: Use of biomass to produce biofuels

	Quantity of raw materials used in Germany	
	2011	**2012**
Raw materials from common arable crops	4 233 000 tonnes	4 023 000 tonnes
Plant waste	395 000 tonnes	532 000 tonnes

Source: VDB, 2012; BDBE, unpublished;, DESTATIS, 2013f

6.3. Land use for production of crops dedicated to energy production, total

Table 4: ***Agricultural land used for domestic cultivation of energy crops***

Land use	**Area (ha)**			
	2009	**2010**	**2011**	**2012**
1. **Total used for common arable crops**, including:	**1 698 000**	**1 830 000**	**2 051 000**	**2 147 400**
Rapeseed for biodiesel				
Plants for bioethanol	942 000	940 000	910 000	786 000
Plants for biogas	226 000	240 000	240 000	201 000
	530 000	650 000	900 000	1 158 000
2. Land used for short rotation trees	**1 700**	**1 900**	**4 000**	**4 900**
3. Land used for other energy crops (Miscanthus and Silphium)	**1 800**	**2 100**	**2 000**	**3. 000**
Energy use, total	**1 701 500**	**1 834 000**	**2 057 000**	**2 155 300**

Source: FNR, unpublished

7 PLEASE PROVIDE INFORMATION ON ANY CHANGES IN COMMODITY PRICES AND LAND USE WITHIN YOUR MEMBER STATE IN THE PRECEDING TWO YEARS ASSOCIATED WITH INCREASED USE OF BIOMASS AND OTHER FORMS OF ENERGY FROM RENEWABLE SOURCES. PLEASE PROVIDE, WHERE AVAILABLE, REFERENCES TO RELEVANT DOCUMENTATION ON THESE IMPACTS.

(Article 22(1)(h) of Directive 2009/28/EC)

7.1. Land use for renewable energies:

Land for the production of regenerative energy is mainly used to cultivate biomass for energy-related use, and to a much lesser extent for wind energy plants and ground-mounted photovoltaic installations. The amount of land used for geothermal energy and hydropower is insignificant.

7.1.1 Bioenergy

It can be seen from Table 3 that the land area used to produce biofuels has declined slightly. The effects of this are discussed in Chapter 9. On the other hand, the land used to produce biogas substrates has increased substantially, as in the preceding years. Between 2010 and 2012, the cultivation of plants to produce biogas expanded from 650 000 ha (2010) to 900 000 ha (2011) and then 1 158 000 ha (2012) (FNR, 2013a).

Of the biogas substrates, maize (834 000 ha in 2012) accounts for by far the greatest area (FNR, 2013, unpublished). The area under maize for biogas plants more than

doubled from 2009 to 2012 and now represents some 31 % of the total arable land sown to maize, while the area of maize grown for consumption has been more or less constant (DBFZ, 2013).

Environmental impact. In some regions where high livestock numbers coincide with a high incidence of biogas, maize is increasingly grown as a matter of course (the 'Vermaisung', or maize monoculture problem). In the Weser-Ems region, for example, maize occupies well over half of the agricultural land in some municipalities (Lower Saxony Ministry of Agriculture, 2012). In practice, a high proportion of maize in the crop rotation cycle is often associated with high levels of ammonia in the air and nitrates in the groundwater, a negative humus balance and an increased risk of attack by pests (particularly corn borer and corn rootworm), an impoverishment of agricultural biodiversity and an adverse effect on the look of the landscape (KLU, 2013; TAB 2010; BfN, 2010a).

Rents and land prices. There are also reports from some regions with a high density of biogas plants, whose catchment area for the regenerative raw material substrates is seldom more than 10 km wide, that the increased demand for land is affecting rents. The price level for new leases in particular is well above average. This affects livestock rearing regions in the west of Lower Saxony, for instance, in which rents are already above average (Lower Saxony Ministry of Agriculture, 2012). In these extreme cases, the high rents are mainly attributable to the stocking density. Biogas plants could further aggravate this problem. The Lower Saxony Ministry of Agriculture reports:

> 'In the districts of Cloppenburg, Vechta and Emsland farmers are paying more than EUR 500 per hectare if we include all rented land. In the more expensive districts in the west of Lower Saxony, there is increasing competition for land. On the one hand, they form the centre of the finishing business with large populations of pigs and poultry. At the same time, most of the biogas plants in Lower Saxony are located here. In these districts, the proportion of maize may be over 40 % of the agricultural land, while the proportion of grassland is small, at less than 15 %.' (LSKN, 2011)

Loss of grassland. With the increasing need for biomass for energy-related use, the quality of permanent grassland affected by this in Germany is being compromised by more intensive use, while sometimes valuable areas are being lost as grassland is ploughed up. Ploughing up grassland produces high CO_2 emissions because of the breakdown of humus and is generally unhelpful in terms of safeguarding biodiversity and soil and water quality. A recent study in the ploughing up of grassland indicates that this is happening more in establishments with no biogas production than in establishments with such production. The loss of grassland is a continuing trend throughout Germany, but there has been a levelling off in the rate of loss. In 2011 the area of grassland was 10 700 ha less than the previous year; in 2012 the loss was 13 200 ha compared to 2011 (DESTATIS, 2013a). According to an analysis of IACS

data, about half of the ploughed up area is used to grow maize (vTI, 2009). Until 2010, the federal states with a rapid growth in biogas plants (e.g. Bavaria, Lower Saxony and Schleswig-Holstein) reported grassland being ploughed up at above-average rates. In response to the increase in ploughing of grassland, some federal states then prohibited reuse. There was then a slight decrease in the decline of grassland in the period 2010 to 2012.

Increasing intensity of use. The use of permanent grassland to obtain substrates to operate biogas plants continues to increase slightly. Despite the decreasing area, there was an increase in harvests from 28 500 tonnes to 30 200 tonnes (+6 %) in the period 2010–2012. One of the reasons adduced for this is the use of biomass for energy production (DESTATIS, 2013c). Increasing intensity of use may have a negative effect on biodiversity.

Biodiversity. Other effects on biodiversity may come from the loss of agricultural micro-structures such as hedges, uncultivated field edges and other border areas and the ploughing of areas of great importance to biodiversity such as fallow and low-input land (directly or as a result of relocation processes in Germany and abroad). These also affect participation in agri-environmental measures and create difficulty in assigning and maintaining nature conservation areas because of the increased pressure on the land.

Water volume. There is as yet no indication that the availability of water in Germany is being adversely affected by the cultivation of energy plants.

Water quality. Based on current knowledge, only 18 % of the bodies of surface water and 64 % of the groundwater reservoirs in Germany are likely to meet the targets of the Water Framework Directive and achieve a ‘good state’ by 2015. Nitrate and phosphate use and profound changes in hydromorphology make agriculture on of the main reasons why a ‘good state’ cannot be achieved. The increase in the area of land used to produce bioenergy could aggravate the impact of agriculture on groundwater, not least by ploughing up areas of permanent grassland.

Soil quality. The effects of bioenergy production on soil quality that may arise where other conditions remain constant are:

- Change in the level of organic soil content from changes in crop rotation sequences, land use and intensity of farming,
- Increased risk of erosion by wind and water,
- Increased risk of compaction.

There has been no nationwide study of changes in the ecological state of the soil in agriculturally used areas in Germany, so no definitive conclusions can be drawn.

7.1.2 Photovoltaic

In 2011, 5 200 ha were used to install ground-mounted photovoltaic systems; in 2012, the figure was 6 800 ha. Estimates suggest that, by the end of 2012, some 20 000 ha were taken up with ground-mounted photovoltaic installations. Of this, approx. 13 500 ha were in conversion/sealed zones or industrial areas, approx. 6 000 ha on arable land and approx. 1 000 to 1 500 ha on the verges of roads and railways (ZSW, 2013b). The use of arable land is restricted to existing installations. Since 1 July 2010, funding for photovoltaic facilities on arable land has been completely discontinued. Exceptions are photovoltaic installations on verges within 110 metres of motorways and railway lines.

7.1.3 Onshore wind energy

The exact amount of land taken up by wind energy plants in Germany is unknown. Based on a rough estimate of around 0.4 ha reserved area per wind energy plant, it can be assumed that around 9 200 ha were occupied by wind energy plants at the end of 2012. The land taken up by onshore wind energy plants is not insignificant, but the areas between the individual installations are still usable, albeit mainly limited to agriculture and forestry.

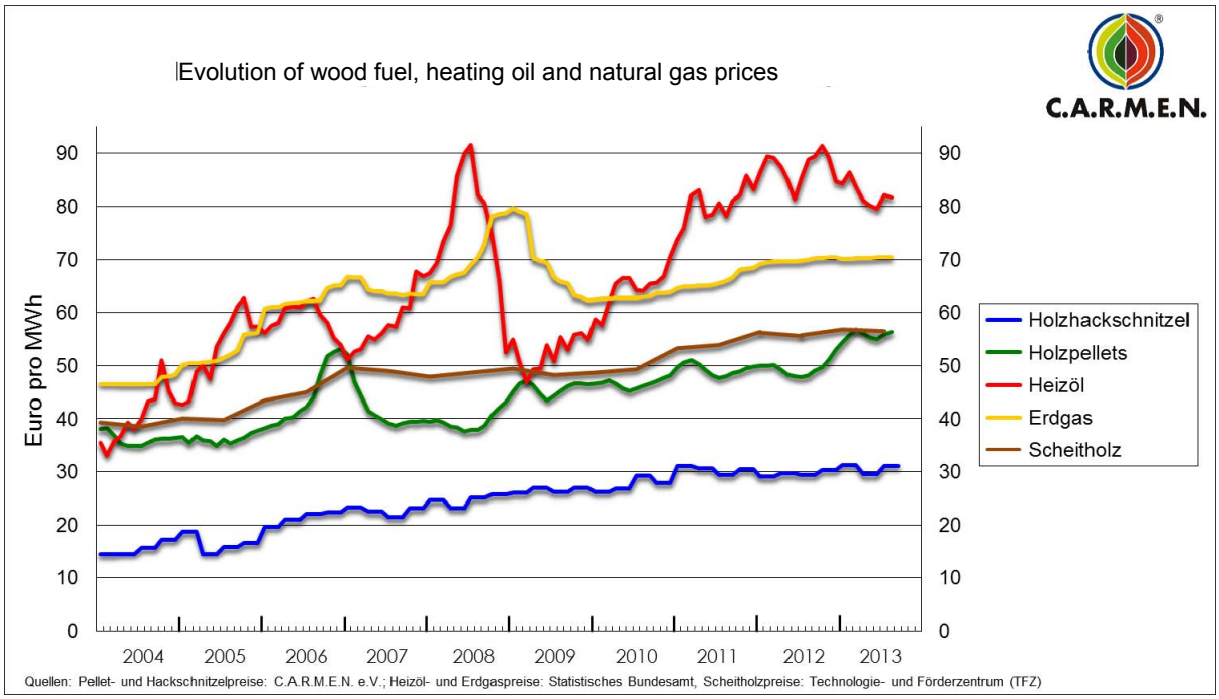
7.2. Price evolution:

The next few subsections present the trend in prices of the relevant raw materials used to produce bioenergy in Germany, which are at most partly attributable to bioenergy use.

Wood-like biomass

The rising demand for wood has been reflected in a corresponding increase in wood prices in recent years. Demand for wood as a material is only slowly recovering from the economic downturn in 2009, but the long-term upward trend is continuing. Demand for energy-related use is also increasing constantly and, since 2010, it has surpassed the demand for wood as a material. Many players expect to see a continued rise in solid fuel prices.

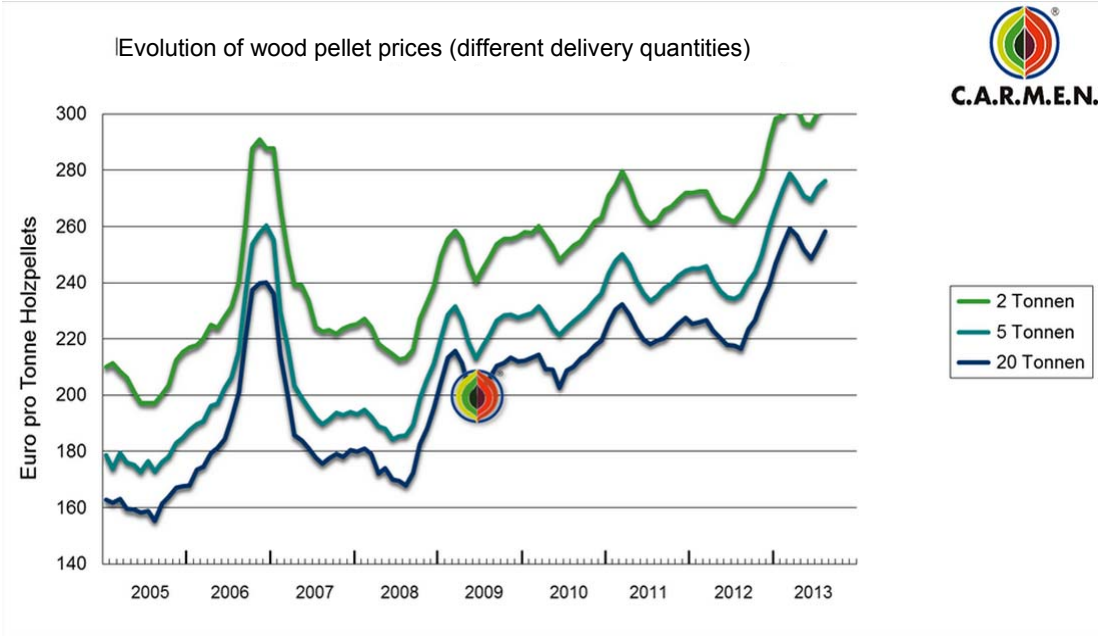
Figure 4: Evolution of fuel prices



Wood pellets. The prices for wood pellets have increased recently in Germany because of higher raw material costs. Although domestic production still exceeds domestic demand, more and more pellets are being imported, mainly from Eastern Europe and North America.

The growing demand for pellets reflects the clear growth in pellet-fired plants in Germany. Although 89 % of pellets and around 81 % of briquettes are still produced from sawmill by-products, industrial wood, merchantable wood and forestry waste are gaining in importance (Mantau, 2012).

Figure 5: Evolution of wood pellet prices

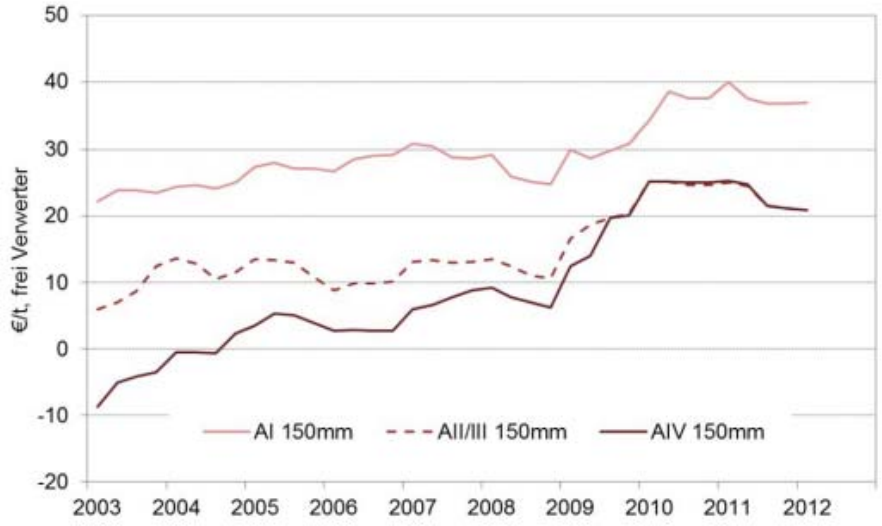


Wood chips. The price of wood chips has doubled since 2003. In 2011 and 2012, the price stayed at a relatively constant high level with only minor fluctuations.

Logs. A rising trend may be observed for logs also. At the regional level, demand clearly outstrips supply.

Scrap wood Since about 2003, more scrap wood has been imported than exported (Mantau, 2012). Scrap wood is used in significant quantities in biomass cogeneration plants. As shown in Figure 5, prices are rising, which is why the majority of the plants being built now use untreated wood (DBFZ, 2013).

Figure 6: Evolution of scrap wood prices 2003–2012

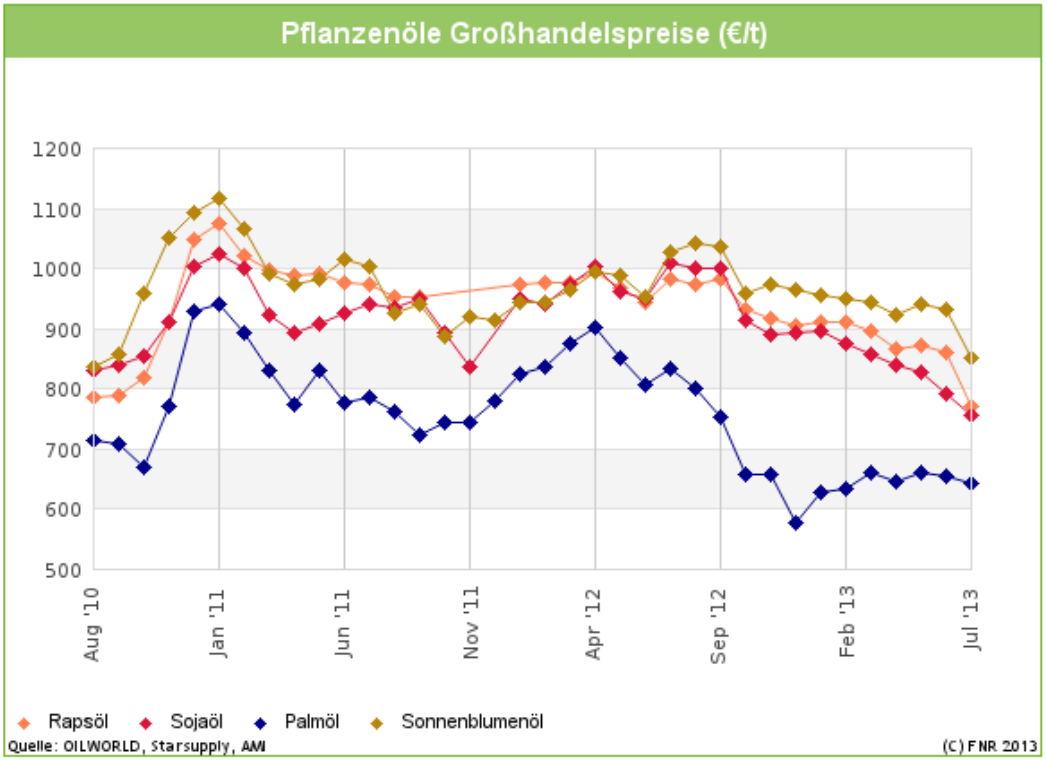


Source: EUWID Neue Energie, 2012 quoted in (DBFZ, 2012)

7.2.2. Vegetable oils

Oilseeds and vegetable oils obtained from them are used as energy sources both in the transport sector and in district heating plants. Their prices are largely determined by the situation on the world market.

Figure 7: Evolution of vegetable oil prices 2010–2013 in Germany



Source: Fachagentur Nachwachsende Rohstoffe e.V. (FNR, 2013b)

7.2.3. Substrates for biogas generation

The prices for the majority of substrates used to produce biogas are less dependent on the world market as their high water content means they are only transported short distances (from 6 to 25 km). The range of substrate costs obtained from surveys of operators is therefore relatively wide. In 2012, according to figures from the operators, the cost of maize silage from an operator's own farms averaged EUR 36/tonne$_{FM}$ while purchased maize silage cost EUR 38/tonne$_{FM}$. The position regarding the use of grain is different as its prices are tied to the world market because of its cheap transport costs. Here there has been a distinct rise during the reporting period (DBFZ, 2013).

7.2.4. Producer prices for agricultural and forestry products

Agricultural products. The producer price index for agricultural products (excl. VAT) was 12.9 % higher in 2011 than in 2010. This clear increase could be seen both with animal products (+12 %) and plant products (+14.1 %). After the sharp fall in prices in 2009 (-19.0 %), there has thus been a very big price increase for two years in a row

after 2010 (+14.1 %). (DESTATIS, 2013d). In 2012, the price increase dropped to 4.7 %. This increase is mainly attributable to plant products (+7.6 %; for comparison, animal products rose by +2.6 %).

Forestry products. The producer price index for forestry products displays a similar picture. Compared to the previous year, prices rose by 16.3 % in 2011. The increase was almost equally down to logs (+17.2 %) and industrial wood (+16.6 %) (DESTATIS, 2013g). In 2012, prices increased by 2.4 % overall. The prices for logs rose (+2.2 %) while those of industrial wood decreased (-4.7 %).

8 **PLEASE DESCRIBE THE DEVELOPMENT AND SHARE OF BIOFUELS MADE FROM WASTES, RESIDUES, NON-FOOD CELLULOSIC MATERIAL, AND LIGNO-CELLULOSIC MATERIAL.**

(Article 22(1)(i) of Directive 2009/28/EC))

According to the official survey of biofuels and other sources in Germany, some 261 ktoe of biofuels covered by Article 21(2) of Directive 2009/28/EC were produced in 2011, and approx. 371 ktoe in 2012 (DESTATIS, 2013f; BMF, 2013). The total quantity was mainly determined by biodiesel production (98 % of total production in 2011 and 93 % in 2012).

The consumption of biofuels covered by Article 21(2) of Directive 2009/28/EC shows a similar picture to production. Here too, biodiesel is especially relevant, with an 89 % share in 2011 and 93 % in 2012. The big difference between production and consumption of biodiesel in 2011 arises from the double-counting of biofuels from plant waste under the biofuel quota scheme, which was only introduced during 2011.

The production of biofuels from wastes and residues not listed in Table 5, and from cellulosic or ligno-cellulosic material, is still at the research and development stage and is still very limited. The use of these biofuels is equally limited.

The total proportion of biofuels covered by Article 21(2) of Directive 2009/28/EC in the consumption of renewable energy sources (including RE electricity) in the transport sector was around 2 % in 2011, increasing to approx. 13 % in 2012.

Table 5: Production and consumption of Article 21(2) biofuels (ktoe)

Biofuels according to Article 21(2)	**2011**	**2012**
FAME generation	255	344
Biogas generation	5	25
Methanol generation	-	2
Production of biofuels according to Article 21(2), total	261	371
Consumption of FAME	40	365
Consumption of biogas	5	25
Consumption of methanol	-	2
Consumption of biofuels according to Article 21(2), total	45	392
Share of fuels under Article 21(2) as a % of renewable energy sources in transport	2	13

9 PLEASE PROVIDE INFORMATION ON THE ESTIMATED IMPACTS OF THE PRODUCTION OF BIOFUELS AND BIOLIQUIDS ON BIODIVERSITY, WATER RESOURCES, WATER QUALITY AND SOIL QUALITY WITHIN YOUR COUNTRY IN THE PRECEDING 2 YEARS. PLEASE PROVIDE INFORMATION ON HOW THESE IMPACTS WERE ASSESSED, WITH REFERENCES TO RELEVANT DOCUMENTATION.

(Article 22(1)(j) of Directive 2009/28/EC))

As agricultural production in general is dependent on various factors, of which the demand for biofuels is just one, it is hard to make an empirically robust monocausal 'allocation' of the impact on agricultural production to the factor 'biofuel production'. This is particularly true given that the German agricultural market is closely tied to the global markets. In the wake of the general increase in demand for agricultural products and the accompanying rise in raw material prices, agriculture in Germany has become more intensive, which could then impact biodiversity, water resources and water and soil quality (see also section 7).In the past few years, however, the area of land in Germany used to grow raw materials for biofuel production has decreased slightly (see Table 4a).

The cultivation of rapeseed could have the following effects on the regional diversity of species and water quality:

Crop-specific risks. There are differences in the impact of different crop types on the regional species inventory. Rape, for example, which as we have seen accounts for most of the land used for biofuel production, is often less beneficial if compared directly with other crops such as sunflowers and winter wheat (SRU, 2007) (BfN, 2010b), so we may expect the observed decline in rape cultivation to have a positive impact.

Water quality. The cultivation of rape also often causes an excess of nitrogen on the land and, because this crop is susceptible to insect damage and fungal infections, it is associated with a relatively heavy use of pesticides ((vTI, 2010) (EEA, 2007)). So the decrease in the area under rape potentially reduces groundwater contamination, unless cultivation methods were previously optimised to take account of these risks (TAB, 2010). There is no empirical data on this.

10 **PLEASE ESTIMATE THE NET GREENHOUSE GAS EMISSION SAVINGS DUE TO THE USE OF ENERGY FROM RENEWABLE SOURCES.**

(Article 22(1)(k) of Directive 2009/28/EC)

Table 6: Estimated GHG emission savings from the use of renewable energy (million tonnes CO_2eq)

Environmental aspects	2011	2012
Total estimated net GHG emission saving from using renewable energy[48]	***129***	***145***
- Estimated net GHG saving from the use of renewable electricity	89	102
- Estimated net GHG saving from the use of renewable energy in heating and cooling	35	37
- Estimated net GHG saving from the use of renewable energy in transport	5	6

In 2011, the use of renewable energy sources produced a net saving on greenhouse gas emissions of 129 million tonnes of CO_2 equivalent (CO_2eq). The vast bulk of this reduction, 89 million tonnes CO_2eq, was achieved by generating electricity from renewable energy. The consumption of renewable energy sources to provide heating and cooling produced greenhouse gas emissions 35 million tonnes CO_2eq lower than production based on a mix of fossil energy sources. The consumption of biofuels reduced greenhouse gas emissions by 4.5 million tonnes CO_2eq in 2011 (note:. not counting the biofuels promoted by quotas and tax breaks, which made use of the 'old plants' provision).

The increased consumption of renewable energy in 2012 compared to 2011 led to more greenhouse gas emissions being prevented. A total of 102 million tonnes CO_2eq was averted in the electricity sector; for the 'heating and cooling' sector, the figure was 37 million tonnes CO_2eq and in transport, around 4.5 million tonnes CO_2eq (see note in previous paragraph), making 145 million tonnes CO_2eq altogether.

This calculation of greenhouse gas emissions avoided is based on the actual, non-normalised (gross) final energy consumption of renewable energy.49 The

[48] The contribution of gas, electricity and hydrogen from renewable energy sources should be reported depending on the final use (electricity, heating and cooling or transport) and should only be counted once towards the total estimated net GHG savings.

[49] To estimate the savings in greenhouse gas emissions in 2011 and 2012, the gross final consumption of energy from renewable sources to provide electricity, heating and cooling and the final consumption of energy from biofuels in the transport sector were used. Unlike the tables in Chapter 1, the actual electricity production from wind energy and hydropower, the total final consumption of energy from liquid biomass to pro-

methodology, the data sources used, and the technology-specific results with respect to *greenhouse gas avoidance* through renewable energy are described in detail in UBA (2013).

vide electricity and heating, and calorific values for biofuels that differ from the defaults in Directive 2009/28/EC were used. However, the resulting differences from the calculation rules in Chapter 1 are very small overall.

11 **PLEASE REPORT ON (FOR THE PRECEDING TWO YEARS) AND ESTIMATE (FOR THE FOLLOWING YEARS UP TO 2020) THE EXCESS/DEFICIT PRODUCTION OF ENERGY FROM RENEWABLE SOURCES COMPARED TO THE INDICATIVE TRAJECTORY WHICH COULD BE TRANSFERRED TO/IMPORTED FROM OTHER MEMBER STATES AND/OR THIRD COUNTRIES, AS WELL AS ESTIMATED POTENTIAL FOR JOINT PROJECTS UNTIL 2020. DETAILS OF ESTIMATED POTENTIAL FOR PROJECTS UP TO 2020.**

(Article 22(1)(l) and (m) of Directive 2009/28/EC)

For the current 2011/2012 reporting period, the indicative trajectory for Germany according to Directive 2009/28/EC provides for a minimum share of renewable energy in gross final consumption of energy of 8.24 %. As shown in Table 1, the actual share of renewable energy in the GFCE was 11.6 % in 2011 and 12.4 % in 2012, and hence well above the indicative trajectory in both years.

The values for gross final consumption of energy in the reporting period given in Table A (2011: 216 666 ktoe, 2012: 220 492 ktoe) produce a minimum consumption of energy from renewable sources needed to achieve the trajectory of 17 853 ktoe for 2011 and 18 169 ktoe for 2012. The actual consumption of 25 077 ktoe in 2011 and 27 331 ktoe in 2012, as shown in Table 1a, thus results in a surplus of 7 224 ktoe for 2011 and 9 162 ktoe for 2012 (Table 7).

At 12.4 %, the proportion of renewable energy in Germany in 2012 was already well above the minimum values for the reporting periods 2013/2014 (9.46 %) and 2015/2016 (11.29 %). We can therefore assume that, at least for the periods covered by the next two progress reports (2013/2014 and 2015/2016), Germany will achieve renewable energy surpluses over the indicative trajectory, which can perhaps be made available for statistical transfer and joint projects.

The mandatory expansion corridor in the electricity sector of a 40 to 45 % share of renewable energy in gross electricity consumption in 2025, first stipulated in the amended EEG 2014, is compatible with the objectives of the energy concept and the German NREAP. The specified expansion corridor is in the same order of magnitude as the expansion achieved in the last five years, with an average level of 11 TWh per year. The expansion should provide for greater consistency and predictability and in particular avoid incidents of ‘overheating’ as observed in recent years in the photovoltaic sector. The expansion is especially concentrated on the cheaper technologies such as onshore wind and photovoltaic. Specifically, the expansion of onshore wind energy will rise from an average of some 2 000 MW per year in the last few years to 2 500 MW, and the annual growth in photovoltaic installations will revert from the very high level of recent years to an expansion rate of 2 500 MW per year, in line with the corridor.

***Table 7: Actual and estimated excess and/or deficit (-) production of renewable energy compared to the indicative trajectory which could be transferred to/from other Member States and/or third countries (ktoe)*[50,51]**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Actual/estimated excess or deficit production[52]			**7 224**	**9 162**	*5 507*	*7 105*	*4 761*	*6 453*	*4 130*	*5 976*		*3 065*

The figures for the period 2013 to 2020 shown in italics in Table 7 are identical with the equivalent values in Table 9 in the NREAP and Table 7 in the first progress report, as the estimates from the NREAP have not changed. In particular, it should be noted that the 'EFF' scenario in the NREAP, on which the estimated surpluses for 2013–2020 are based, is broadly in line with the quantitative targets set in the German Government's energy concept (RE share of GFCE or gross electricity consumption, reduced consumption for transport and heating, electro-mobility).

The extent to which Germany can actually use any potential surplus for statistical transfer or joint projects will be determined on a case-by-case basis.

11.1. Please provide details of statistical transfers, joint projects and joint support scheme decision rules.

Unfortunately, no actual cooperation project was run during the reporting period. However, the German Government has worked hard to develop plans in this area and has had intensive discussions with other Member States, e.g. in the 'concerted action' on the Renewables Directive and in developed together at ground level. Findings on the concrete wording of contracts have been drawn up together with some Member States. Far-reaching conceptual insights have been gained, especially in the very specific efforts to implement the 'Desertec' project to import electricity from renewable energy from North Africa and in the 'Helios' project initiated by the then Greek Government to expert electricity from Greece to Central Europe.

The thoroughgoing reform of the Renewable Energies Act in 2014 will lay particular stress on the importance of the cooperation mechanisms under the Renewable Energy Directive (cf. Section 2 EEG 2014). In future requests for tender, 5 % of the now installed output must also be opened up to foreign projects, provided that there is a cooperation agreement to this effect, that the aid embodies the principle of reciprocity and the physical import of the electricity into Germany can be

[50] *Please use actual figures to report on the excess production in the two years preceding submission of the report, and estimates for the following years up 2020. In each report, Member States may correct the data of the previous reports.*

[51] *When filling in the table, for deficit production please mark the shortage of production using negative numbers (e.g. –x ktoe).*

[52] (Please distinguish per type of renewable energy and per origin/destination of import/export)

documented. This is the aim of the imminent pilot tendering procedures for ground-mounted photovoltaic installations.

12 **PLEASE PROVIDE INFORMATION ON HOW THE SHARE FOR BIODEGRADABLE WASTE IN WASTE USED FOR PRODUCING ENERGY HAS BEEN ESTIMATED, AND WHAT STEPS HAVE BEEN TAKEN TO IMPROVE AND VERIFY SUCH ESTIMATES.**

(Article 22(1)(n) of Directive 2009/28/EC)

To determine the contribution of biodegradable waste to electricity and heat production, it is generally[53] assumed that 50 % of the waste processed in waste incineration plants is biodegradable. This value comes from a study (UBA 2011) which examines the waste flows from selected treatment methods in detail. These include municipal household waste (landfill, bulk waste, biowaste, cardboard, paper, packaging, small containers, scrap wood and sewage sludge) and similar industrial waste. The proportion of biodegradable material in each category was determined. The quantities for the different waste categories can be used to calculate the average energy-related biogenic portion of all the waste used for incineration. The methods of determining the biogenic portion (e.g. C14 method or sorting analyses etc.) are being constantly improved and tested for practical viability.

[53] In the HKNR, the Federal Environmental Agency uses differentiated values: http://www.umweltbundesamt.de/sites/default/files/medien/372/dokumente/nutzungsbedingungen_fuer_das_herkunftsnachweisregister.pdf, section 9.4.

Reporting outside the progress report template

13 Report pursuant to the Biomass Electricity and Biofuel Sustainability Regulations (Biomass Sustainability Regulations)

In its Sustainability Regulations for biomass (Section 64 of the Biofuel Sustainability Regulation [Biokraft-NachV] and Section 72 of the Biomass Electricity Sustainability Regulation [BioSt-NachV]), Germany has stipulated that the progress report to the European Commission should report on the fulfilment of the requirements laid down in the Biomass Sustainability Regulations and the impact on sustainability of producing the bioliquids used in Germany to generate electricity and of the biofuels placed in circulation in Germany. The report must assess whether the use of bioliquids to generate electricity and the use of biofuels is socially acceptable. The report is based on the evaluation and progress reports from the Federal Agency for Agriculture and Food (BLE) for 2011 and 2012 (BLE 2012, 2013).

13.1. Fulfilment of the requirements of the Biomass Sustainability Regulations

The Biomass Sustainability Regulations mainly entered into force at the end of 2009 and are applicable without any restrictions from 1 January 2011 onwards.

The Biomass Sustainability Regulations stipulate that evidence of compliance with the sustainability requirements (sustainability certificates) must be provided with the aid of private certification systems and certifying bodies. In the transitional phase (up to 31 December 2011), evidence could be provided by environmental assessors.

The Biomass Sustainability Regulations are generally enforced by the Federal Agency for Agriculture and Food (BLE). The BLE recognised two certification systems (ISCC DE and REDcert DE) as early as 2010, so economic operators could join these certification systems at an early date in order to produce the sustainability certificate required in Germany from 1 January 2011. One application for recognition of a certification system was rejected and one permit was withdrawn.

By the effective date of 31 December 2012, 26 more certifying bodies were recognised by the BLE. A total of 43 applications for recognition were submitted, of which six were rejected and eleven permits were withdrawn or cancelled because the certifying bodies ceased to operate. The BLE conducts an annual ‘office audit’ on the premises of each certifying body. This checks a sample of cases handled by the certifying body. Depending on the results, office audits may take place at shorter intervals. Also, depending on a risk assessment of the certifying body, the BLE carried out two to ten ‘witness audits’, where the BLE accompanies the auditors to the various interface points and observes their procedure (‘checking the checkers’). Once a year, the certifying bodies have to report to the BLE on their experience with the certification systems that they use. Along with comments on the feasibility of the system specifications, this report also contains facts relevant to the assessment as to

whether the certification systems are calculated to meet the legal requirements. The certificates issued in 2012 contrast with 35 certificates that have been withdrawn.

In 2011, 1 419 establishments around the world were certified by the BLE certifying bodies, 1 287 of them in the European Union and 132 in third countries. In 2012 the number of establishments certified fell back slightly to 1 259 (86 in third countries). The certificates issued in 2012 contrast with 35 certificates that have been withdrawn.

The BLE remains responsible for managing data on the sustainability of biofuels and bioliquids through the web-based national 'Sustainable Biomass Systems' database (Nabisy). The figures for the sustainability biofuels and bioliquids that are relevant to the German market have to be entered into Nabisy by the economic operators concerned. They are then documented and validated by Nabisy. The German main customs offices and the biofuel quota office have direct access to Nabisy, along with the relevant competent authorities in other Member States of the EU. The exchange of data on sustainability between the competent authorities in the Member States is necessary to prevent the economic operators from claiming unlawful relief in multiple Member States for the same goods. Nabisy provides the necessary institutional basis for this exchange, and the BLE is currently driving the exchange with other Member States in order to establish the required data reconciliation.

An analysis commissioned by the European Commission into the implementation of the RE Directive in the Member States of the EU found that the implementation of the sustainability criteria in Germany was more effective than the average for the other Member States. The study also concludes that Germany is the only Member State to have implemented the sustainability requirements of the RE Directive completely and correctly, and on time (Ecofys, IEEP 2012).

13.2 Impact on sustainability of the production of bioliquids used in Germany to generate electricity and of biofuels brought into circulation

In application of the RE Directive, the Biomass Sustainability Regulations cover aspects of sustainable biomass production in the form of minimum ecological criteria that have to be met (13.2.1). Other sustainability aspects are not covered by the Regulations (13.2.2).

13.2.1. Sustainability aspects addressed by the Biomass Sustainability Regulations

Conservation areas. The Biomass Sustainability Regulations contain requirements to protect areas of great importance to biodiversity[54], to protect areas with high stocks of carbon[55] and to protect peat bogs. If the certification is applied effectively

[54] Areas of great importance to biodiversity are a) wooded areas, b) nature conservation areas, and c) highly bio-diverse grassland.

[55] Areas with high stocks of carbon are a) wetlands and b) continuously forested areas.

and the areas are properly defined, it will largely prevent the direct conversion of conservation areas to be used to produce biofuels and bioliquids.

Agricultural operations within the EU. To address any negative impact from agricultural activities on arable land, particularly more intensive cultivation, the Biomass Sustainability Regulations reference the rules on direct payments under the Common Agricultural Policy *(cross-compliance)* and the minimum requirements for good agricultural and ecological conditions for land in the Member States of the European Union. Evidence of compliance must be provided by documentation of agricultural aid received.

Greenhouse gas emissions. Using the method specified in the RE Directive produces a theoretical saving of around 4.5 million tonnes CO_{2eq} in 2011, achieved through the use of biofuels and bioliquids promoted by quotas and tax breaks rather than fossil energy sources. This takes in all direct greenhouse gas emissions from growing the raw materials, including those from known changes in land use and from transport and processing. Emissions attributable to relocation effects are not however included (see 13.2.3), so the effects in terms of climate protection cannot be definitively assessed.

13.2.2. Sustainability aspects not addressed by the Biomass Sustainability Regulations

Indirect effects. The production of biofuels and bioliquids does not only have a direct effect on the cultivated land itself. Rather, this concrete demand element is one factor among many that influence global land-use as a whole. Hence, even if the sustainability requirements are met, the use of biofuels and bioliquids may still lead indirectly to changes of land-use and the associated emissions, ploughing up of conservation areas, drainage of marshland etc. At present, however, it is hard to empirically assess and quantify the global impact of a given partial demand, such as the demand for bioliquids for electricity production or for biofuels in Germany, although it is necessary in order to assess this impact fully. We do not currently have any data for this.

Effects on food prices. Fluctuations in global and local food prices are caused by a complex set of factors. This complexity makes it hard to quantify exactly the effect of producing the biofuels and bioliquids on global and local food prices and hence on food security. According to estimates from the Commission of the effects on food prices the demand for biofuel in the EU had a global price effect of 1-2 % for cereals (bioethanol) in the period 2010/2011 and 4 % for rapeseed, soya and palm oil (biodiesel) in the years 2008 and 2010 (European Commission, 2013).

Respect for land use rights. Various publications make a connection between the growing need for biomass, some of it for energy-related use, and so-called *land grabbing*. Ethical concerns are raised by the oft-documented expulsion of the farmers who have been cultivating the land but do not possess any rights of use (Goeser, 2011). The huge socio-economic risk associated with such transactions, particularly

in the developing countries, thus lies in the withdrawal of access to land, water and other natural resources from the local population, which in turn increases the risk of famine and poverty (Ecofys, 2012b).

With the current state of the data, direct or indirect connections between the global phenomenon of 'land grabbing' and promotion of biofuels and bioliquids in Germany and in the EU are hard to identify. Ecofys (2012b) states that, subject to many uncertainties, its analysis indicates that between 50 000 and 160 000 hectares of socio-economically problematic 'land grabs' may be linked to the promotion of biofuel in the EU. It should be noted, however, that these are just the areas acquired directly for the production of biofuels and bioliquids for the European market. The effect triggered by the additional pressure on the land is not included.

As large-scale land grabs are a real and relevant problem fraught with serious consequences and high socio-economic risk, and given the lack of transparency and unsatisfactory data, there would appear to be a need for further research.

Workers' rights and child labour. Based on the available data, it is impossible to make any definite statement on the situation in the countries that provide the raw materials to satisfy Germany's need for biofuels and bioliquids.

At the EU level, a report has been presented on compliance with eight international Conventions adopted by the International Labour Organization (ILO)[56,57] in the main exporting countries (Ecofys, 2013). The report presented to the European Commission finds that there has been no significant change with regard to ratification of the Conventions on workers' rights in the main exporting countries in the last few years. The vast majority of the countries that export biofuels and bioliquids to the EU have ratified the fundamental Conventions, but enforcement is weak, especially in the developing and emerging countries.

Agricultural operations outside the EU. Imports of biofuels and bioliquids from outside Europe are not covered by the requirements of European agricultural policy. The environmental acceptability of cultivating these raw materials therefore depends mainly on the farming rules and practice in place in the exporting country and on the specific requirements of the certification system for the agricultural stage.[58]

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[56] The International Labour Organization is an organ of the United Nations tasked with improving workers' rights and working conditions all over the world.

[57] Conventions on: Forced or Compulsory Labour (No 29), Freedom of Association and Protection of the Right to Organise (No 87), Application of the Principles of the Right to Organise and to Bargain Collectively (No 98), Equal Remuneration of Men and Women Workers for Work of Equal Value (No 100), Abolition of Forced Labour (No 105), Discrimination in Respect of Employment and Occupation (No 111), Minimum Age for Admission to Employment (No 138), Prohibition and Immediate Action for the Elimination of the Worst Forms of Child Labour (No 182).

[58] As most EU certification systems recognise sustainability certificates from participants in other EU certification systems, all or part of the upstream chain may be certified by different systems than the end-product.

There is as yet no empirical basis for assessing the impact of raw material production in non-EU countries. It might help here to draw in experience from 'voluntary schemes', some of which contain requirements for protecting the soil, water and air that go beyond the RE Directive. Here too, there are currently no publicly available empirical findings, so an empirical assessment of the impact is not possible at this time (GIZ, 2011).

Global Bioenergy Partnership. The German Government plays a part in various international bodies addressing known sustainability problems with biofuels and bioenergy as a whole. This particularly includes the Global Bioenergy Partnership (GBEP). Germany's contribution focuses particularly on developing skills and applying a set of sustainability indicators developed by the GBEP[59] in the individual countries. Through its 23 member countries, 14 international partner organisations and 39 observers (countries and organisations), the partnership mainly addresses the level of country-specific political planning for sustainable bioenergy production.

13.3 Is the use of bioliquids to generate electricity and the use of biofuels socially acceptable?

Crucial to determining whether the use of biofuels and bioliquids is defensible from a socio-ethical standpoint is a judgment of the risks and benefits for present and future generations that are associated with this use. If biofuels and bioliquids are manufactured from raw materials produced in the EU, it must be assumed the social requirements have been met. Other benefits and risks to be considered here are particularly the effects on food supplies in endangered countries or vulnerable regions, combatting poverty by generating additional income, displacing traditional uses of the land (e.g. by expanding areas under cultivation), and the external effects of more intensive production.

The nature, scale and likelihood of the risks and benefits associated with the use of such fuels are heavily dependent on the raw materials used, the scale on which they are used and the context surrounding this use. This includes the regulations applicable to land use and the protection of traditional rights to the land in the countries of origin, and also changes in per capita resource usage and interaction with other sectors of demand (see 13.2). Where biomass is grown for energy-related use, particularly in some third countries, the established sustainability certification in the EU cannot currently prevent the potential risks from occurring. Similarly, the potential benefits are not certain to come out of EU provisions. Indirect effects in particular pose diverse and potentially high risks from the use of biofuels and

[59] Eight indicators for each of the three pillars – environmental, social and economic – with descriptors and a full account of the methods used; see http://www.globalbioenergy.org/programmeofwork/task-force-on-sustainability/gbep-report-on-sustainability-indicators-for-bioenergy/en/.

bioliquids based on biomass from agricultural production. These arguments support the increased use of residues and waste materials to generate biofuels.

There is no expansion in the use of bioliquids, as funding under the EEG was discontinued for plants commissioned from 1 January 2012 onwards, so their use is restricted exclusively to existing district heating plants and the use of bioliquids is already much reduced.

Annex

14.1. List of abbreviations

ACER: European Agency for the Cooperation of Energy Regulators

AGEB: Working Group on Energy Balances *[Arbeitsgemeinschaft Energiebilanzen]*

AGEE-Stat: Working Group on Renewable Energy Statistics *[Arbeitsgruppe Erneuerbare Energien-Statistik]*

ARegV: Regulation on Incentive Regulation *[Anreizregulierungsverordnung]*

AUM: Agri-environmental measures *[Agrarumweltmaßnahmen]*

EEZ: Exclusive economic zone *[ausschliessliche Wirtschaftszone– AWZ]*

BauBG: Federal Building Code *[Baugesetzbuch]*

GFCE: Gross final consumption of energy

BfN: Federal Agency for Nature Conservation

BImschG: Federal Immission Control Act *[Bundesimmissionsschutzgesetz]*

BImschV: Federal Immission Control Regulation *[Bundesimmissionsschutzverordnung]*

Biokraft-NachV: Biofuel Sustainability Regulation *[Biokraftstoff-Nachhaltigkeitsverordnung]*

BiomasseV: Biomass regulation *[Biomasseverordnung]*

BioSt-NachV: Biomass Electricity Sustainability Regulation *[Biomassestrom-Nachhaltigkeitsverordnung]*

BLE: Federal Office for Agriculture and Food *[Bundesanstalt für Landwirtschaft und Ernährung]*

BMA: Biomass plant *[Biomasseanlage]*

BMU: Federal Ministry of the Environment, Nature Conservation and Reactor Safety

BMUB: Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

BMWi: Federal Ministry for Economic Affairs and Energy *[Bundesministerium für Wirtschaft und Energie]*

BtL: Biomass-to-liquid

CO_2: Carbon dioxide

$CO_{2,eq}$: CO_2 equivalent

ct: eurocent (EUR 0.01)

DV: Direct marketing *[Direktvermarktung]*

EAG EE: Renewable Energies European Law Adaptation Act *[Europarechtsanpassungsgesetz Erneuerbare Energien]*

RE Directive: EU Directive 2009/28/EC

EEG: Renewable Energies Act *[Erneuerbare-Energien-Gesetz]*

EEWärmeG: Renewable Energies Heat Act *[Erneuerbare-Energien-Wärmegesetz]*

EFF: Scenario 'with further energy efficiency measures' in the NREAP

EKFG-AndG: Act (amending the Act) to establish a special Energy and Climate Fund *[Gesetz (zur Änderung des Gesetzes) zur Errichtung eines Sondervermögens 'Energie- und Klimafonds']*

EnergieStG: Energy Tax Act *[Energiesteuergesetz]*

EnWG: Energy Management Act *[Energiewirtschaftsgesetz]*

EnEV: Energy Saving Regulation *[Energieeinsparverordnung]*

ENTSO-E: European Network of Transmission System Operators for Electricity

EU: European Union

EVU: Energy supply undertaking *[Energieversorgungsunternehmen]*

R&D: Research and development

FNR: Agency for renewable raw materials *[Fachagentur Nachwachsende Rohstoffe]*

FNN: Network Technology / Network Operations Forum *[Forum Netztechnik/Netzbetrieb]*

GasNZV: Gas Network Access Regulation *[Gasnetzzugangsverordnung]*

GBEP: Global Bioenergy Partnership

GGEMO: Joint Agency for Electro-Mobility *[Gemeinsame Geschäftsstelle Elektromobilität]*

GW: Gigawatt (10^9 watts)

GWh: Gigawatt-hours (10^9 watt-hours)

ha: Hectares

HGÜ: High-voltage DC transmission *[Hochspannungsgleichstromübertragung]*

HKN: Guarantee of origin *[Herkunftsnachweis]*

HKNR: Guarantee of origin register *[Herkunftsnachweisregister – HKNR]*

HVO: Hydrated vegetable oil

Hz: Hertz

ILO: International Labour Organization

JAZ: Annual coefficient of performance (CoP) *[Jahresarbeitszahl]*

ktoe: Kilotonnes crude oil equivalent (ktoe)

KfW: Reconstruction Loan Corporation *[Kreditanstalt für Wiederaufbau]*

KUP: Short rotation plantation [Kurzumtriebsplantage]

kV: Kilovolt (10^3 volts)

kW: Kilowatt (10^3 watts),

kW_{el}: Electrical output

kW_{th}: Thermal output

CHP: Cogeneration (combined heat and power)

KWKG: Cogeneration Act *[Kraft-Wärme-Kopplungsgesetz]*

kWh: Kilowatt-hours (10^6 watt-hours)

LF: Agricultural land *[landwirtschaftliche Fläche]*

LKW: Truck/HGV *[Lastkraftwagen]*

m^2: Square metres

m^3: Cubic metres

MAP: Market incentive programme *[Marktanreizprogramm]*

m: Million

MJ: Megajoule (10^6 joules)

MW: Megawatt (10^6 watts)

NABEG: Grid Expansion Acceleration Act *[Netzausbaubeschleunigungsgesetz]*

Nabisy: Database of sustainable biomass systems *[Nachhaltige-Biomasse-Systeme]*

NEP: Network development plan *[Netzentwicklungsplan]*

NPE: National Platform for Electro-Mobility

NREAP: National Renewable Energy Action Plan

PJ: Petajoule (10^{15} joules)

PKW: Passenger car *[Personenkraftwagen]*

PV: Photovoltaic

SDLWindV: Regulation on System Services from Wind Energy Plants *[Systemdienstleistungsverordnung Windenergieanlagen]*

SysStabV: System Stability Regulation *[Systemsabilitätsverordnung]*

t: Tonne (10^6 grams)

t_{dw}: Tonnes dry weight

TEHG: Greenhouse Gas Emissions Trading Act *[Treibhausgas-Emmissionhandelgesetz]*

THG: Greenhouse gas *[Treibhausgas]*

TWh: Terawatt-hours (10^{12} watt-hours)

TYNDP: Ten-Year Network Development Plan

UBA: Federal Environment Agency *[Umweltbundesamt]*

ÜNB: Transmission system operator *[Übertragungsnetzbetreiber]*

VDE: Association for Electrical, Electronic & Information Technologies *[Verband der Elektrotechnik]*

14.2 Lists of figures and tables

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No table of figures entries found.

14.3. References

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