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REGERINGSKANSLIET

GOVERNMENT OFFICES OF SWEDEN

Sweden's second progress report on the development of renewable energy pursuant to Article 22 of Directive 2009/28/EC

Foreword

This report is Sweden's second progress report pursuant to Article 22 of Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (the Renewables Directive).

Article 22 of the Renewables Directive requires every Member State to submit a report to the Commission on their progress in the promotion and use of energy from renewable sources by 31 December 2011 and every two years thereafter.

As the basis for this report the state energy authority in Sweden (the Swedish Energy Agency) was entrusted, in the annual budgetary allocations for 2013, with the task of producing a draft national report on how the promotion and use of energy from renewable energy sources is being developed pursuant to Article 22 of the Renewables Directive. An account of the task was given on 31 October 2013 and subsequently supplemented with *inter alia* updated statistics for 2012. The forecasts and statistics included in this report comprise information belonging to the Swedish Energy Agency.

This report follows the template published by the European Commission in May 2011 as a guide for Member States' progress reports pursuant to Article 22.

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1 Second national progress report pursuant to Directive 2009/28/EC

Overall shares and actual consumption of energy from renewable sources in Sweden (point 1 in the template from the Commission)

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*).

Please fill in the actual shares and actual consumption of renewable energy ***for the preceding two years*** *in the suggested tables.*

The data in Tables 1–1d are based on the current version of the calculation tool (SHARES 2012) supplied by Eurostat for Member States to report renewable energy. The data are preliminary.

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

	2011	2012
RES-H&C[2] (%)	62.5 %	65.6 %
RES-E[3] (%)	59.9 %	60.0 %
RES-T[4] (%)	9.4 %	12.6 %
Overall RES share[5] (%)	48.8 %	51.0 %
Of which from cooperation mechanism[6] (%)	0.0 %	-0.1 %
Surplus for cooperation mechanism[7] (%)	7.3 %	9.3 %

[1] *Facilitates comparison with Table 3 and Table 4a of the NREAPs.*
[2] *Share of renewable energy in heating and cooling: gross final consumption of energy from renewable sources for heating and cooling (as defined in Articles Articles 5(1)(b) and 5(4) of Directive 2009/28/EC) divided by gross final consumption of energy for heating and cooling. The same methodology applies as in Table 3 of NREAPs.*
[3] *Share of renewable energy in electricity: gross final consumption of electricity from renewable sources for electricity (as defined in Articles Articles 5(1)(a) and 5(3) of Directive 2009/28/EC divided by total gross final consumption of electricity. The same methodology applies as in Table 3 of NREAPs.*
[4] *Share of renewable energy in transport: final energy from renewable sources consumed in transport (cf. Articles Articles 5(1)(c) and 5(5) of Directive 2009/28/EC) divided by the consumption in transport of: 1) petrol; 2) diesel; 3) biofuels used in road and rail transport; and 4) electricity in land transport (as reflected in row 3 of Table 1). The same methodology applies as in Table 3 of NREAPs.*
[5] *Share of renewable energy sources in gross final energy consumption. The same methodology applies as in Table 3 of NREAPs.*
[6] *In percentage points of overall RES share.*
[7] *In percentage points of overall RES share.*

There has been a general upward trend in the overall share of renewable energy. The increase seen over the past two years has partly been due to a higher contribution from heat pumps, following the introduction of new guidelines on calculation methods from the Commission. Before these guidelines were produced, the Swedish Energy Agency made a more conservative assessment of the contribution from heat pumps. The higher share from renewable energy in 2012 could be because more renewable energy was being used as a result of lower temperatures. Although biomass for district heating production saw the highest increase in 2012, the use of biofuel also increased in residential premises, etc. (this had an impact as only hydro and wind power are normalised — no adjustments are made for temperature).

Sweden established a joint electricity certificates market with Norway on 1 January 2012, creating a joint support scheme as defined in Article 11 of the Renewables Directive. The share of renewable energy for 2012 has therefore been adjusted in line with the notification that Sweden submitted to the European Commission on 25 March 2013 pursuant to Article 11(1)(b) and 11(2) outlining the distribution rule and the amount of energy that will be subject to the distribution rule. In accordance with the notification, 351.5 GWh has to be transferred to Norway. This amount has been deducted from the overall share of renewable energy in Table 1.

When calculating the share of renewable energy for transport (RES-T), some biofuel has been double-counted in accordance with the directive.

Table 1a: **Calculation table for the renewable energy contribution of each sector to final energy consumption (ktoe)[8]**

	2011	2012
a) Gross final consumption of RES for heating and cooling	9 156	9 661
b) Gross final consumption of electricity from RES	7 232	7 443
c) Gross final consumption of energy from RES in transport	607	736
d) Gross total RES consumption[9]	16 994	17 840
e) Transfer of RES to other Member States	0	0
f) Transfer of RES from other Member States and third countries.	0	0
RES consumption adjusted for target (D) – (E) + (F)	16 994	17 810

[8] *Facilitates comparison with Table 4a of the NREAPs.*

[9] *According to Article 5(1) of Directive 2009/28/EC gas, electricity and hydrogen from renewable energy sources shall only be considered once. No double-counting is allowed.*

Table 1.b: **Total actual contribution (installed capacity, gross electricity production) from each renewable energy technology in Sweden to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in electricity.[10]**

	2011		2012	
	MW	**GWh**	**MW**	**GWh**
Hydro:[11]	16577	68509	16414	68506
non pumped	16478	66419	16315	78915
*<1MW**	174	600	186	799
*1 MW – 10 MW**	782	3000	767	3500
*>10MW**	15522	62819	15362	74566
Pumped	99	122	99	126
mixed[12]	0	0	0	0
Geothermal	0	0	0	0
Solar:	12	11	24	19
Photovoltaic	12	11	24	19
concentrated solar power	0	0	0	0
Tide, wave, ocean	0	0	0	0
Wind:	2769	5591	3607	7348
*onshore**	2605	5590	3443	6700
*offshore**	163	490	163	460
Biomass:[13]	3401	9674	4055	10527
solid biomass	3397	9641	3522	10507
biogas	4	33	5	20
bioliquids	0	0	528	0
Waste**		1860		1662
TOTAL**	22759	85645	24100	88062
*of which in CHP***		11536		12194

*Unlike the total fields for hydropower, the division of hydropower by the output of the power station has not been normalised, as statistics are not available for the entire period (15 years) required for normalisation. This is also the case for the division of onshore/offshore wind power.

** The original template does not include the waste item. Only the renewable share of waste is included in the table.

[10] *Facilitates comparison with Table 10a of the NREAPs.*
[11] *Normalised in accordance with Directive 2009/28/EC and Eurostat methodology.*
[12] *In accordance with new Eurostat methodology.*
[13] *Takes into account only those complying with applicable sustainability criteria, cf. Article 5(1) of Directive 2009/28/EC last subparagraph.*

Table 1c: **Total actual contribution (final energy consumption[14]) from each renewable energy technology in Sweden to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in heating and cooling (ktoe)[15]**

	2011	2012
Geothermal (excluding low temperature geothermal heat in heat pump applications)	0	0
Solar	11	11
Biomass[16]:	7 525	7 964
solid biomass	7 485	7 921
biogas	40	43
bioliquids	0	0
Waste*	456	509
Renewable energy from heat pumps:	1 163	1 177
- of which aerothermal	245	245
- of which geothermal**	786	786
- of which hydrothermal		
TOTAL*	8 700	9 152
*Of which DH[17]**	2 582	3 050
Of which biomass in households[18]	1 170	1 189

* The original template does not include the waste item. Only the renewable share of waste is included in the table.

** Including hydrothermal (water-borne) heat.

In Table 1c only the contribution from large heat pumps in the district heating network is included in the total fields for heat pumps. The sub-categories for heat pumps in the table only include contributions from small heat pumps. The estimated amount of energy from the small heat pumps has been calculated in accordance with the Commission's guidelines.[19] The data for 2011 for small heat pumps have also been used for 2012 as more recent statistics were not available.

[14] *Direct use and district heating as defined in Article 5(4) of Directive 2009/28/EC.*
[15] *Facilitates comparison with Table 11 of the NREAPs.*
[16] *Takes into account only those complying with applicable sustainability criteria, cf. Article 5(1) of Directive 2009/28/EC last subparagraph.*
[17] *District heating and /or cooling from total renewable heating and cooling consumption (RES- DH).*
[18] *From the total renewable heating and cooling consumption.*
[19] 2013/114/EU

Table 1d: **Total actual contribution from each renewable energy technology in Sweden to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in the transport sector (ktoe)[20],[21]**

	2011	2012
Bioethanol/ bio-ETBE (ethyl tertiary butyl ether)	197	197
Of which biofuels[22] Article 21(2)	7	3
Of which imported[23]		
Biodiesel	215	331
Of which biofuels[24] Article 21(2)	28	102
Of which imported[25]		
Hydrogen from renewables		
Renewable electricity	132	129
Of which road transport	n/a*	n/a*
Of which non-road transport	132	129
Others (biogas, vegetable oils, etc.) – specified	62 (biogas)	79 (biogas, DME)
Of which biofuels[26] Article 21(2)	61	78
TOTAL	607	736

*There are a few electric vehicles in the road transport system in Sweden. In 2011 and 2012, the number of vehicles was 366 and 603 respectively (excluding electric hybrids and plug-in hybrids).

Table 1d only includes sustainable amounts of biofuel that have been verified. Section 8 provides more information about the biofuels described in Article 21(2) of the Directive (the biofuel produced from wastes, residues, non-food cellulosic material, and ligno-cellulosic material) and which may therefore be double-counted when calculating the share of renewable energy in transport (RES-T).

[20] *For biofuels take into account only those compliant with the sustainability criteria, cf. Article 5(1) last subparagraph.*
[21] *Facilitates comparison with Table 12 of the NREAPs.*
[22] *Biofuels that are included in Article 21(2) of Directive 2009/28/EC.*
[23] *From the whole amount of bioethanol/bio-ETBE.*
[24] *Biofuels that are included in Article 21(2) of Directive 2009/28/EC.*
[25] *From the whole amount of biodiesel.*
[26] *Biofuels that are included in Article 21(2) of Directive 2009/28/EC.*

Instruments and measures for energy from renewable sources (points 2–5 in the template)

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) of Directive 2009/28/EC*).

Note that Table 2 only includes changes in the last two years in the measures listed in Table 5 in Sweden's National Renewable Energy Action Plan, and measures added in the last two years. Measures that have been in place for more than two years and which have not changed in 2011 or 2012 can be found in the national progress report that was reported in December 2011.

Table 2: Overview of instruments and measures that have been changed or added in the past two years. For other instruments, refer to Sweden's National Renewable Energy Action Plan and the progress report that was reported in December 2011.

Name and reference of the measure	Type of measure*	Expected result**	Targeted group and or activity***	Existing or planned****	Start and end dates of the measure
1. Changed levels of energy taxes. Energy Tax Act *[Lag om skatt på energi]* (SFS 1994:1776)	Financial	Fiscal and steering tax designed primarily to reduce energy consumption but also to guide the choice of energy carrier	All activities	Complements existing.	2011–
2. Changed levels in carbon taxes. Energy Tax Act (SFS 1994:1776)	Financial	Environmental tax	All activities	Complements existing.	2011– Most recent change came into force in 2013
3. Changed rules for energy and carbon tax exemption for renewable fuels. Energy Tax Act (SFS 1994:1776)	Financial	Promotes the use of bioenergy	All activities	Complements existing.	Requirements for sustainability certificate since 1 February 2012. New provisions for tax exemption levels from 1 February 2013
4. Joint electricity certificate system with Norway. Act on an electricity certificates system with Norway *[Lag om elcertifikatsystem med Norge]* (SFS 2011:1200) and the bilateral agreement.[27]	Financial Regulatory	25 TWh of new renewable electricity production by 2020 compared with 2002 and an additional 13.2 TWh of renewable electricity between 2012 and 2020.	Quota-bound electricity suppliers/consumers and producers of renewable electricity.	Complements existing.	2012–2035 (Electricity Certificates System introduced in 2003.)
5. EU-ETS. Emissions Trading Act *[Lag om handel med utsläppsrätter]* (SFS 2004:1199)	Financial Regulatory	Fuel conversions to renewable energy	Plants within the ETS.	Complements existing.	New period from 2013

[27] http://www.regeringen.se/content/1/c6/17/18/81/4a715640.pdf

Name and reference of the measure	Type of measure*	Expected result**	Targeted group and or activity***	Existing or planned****	Start and end dates of the measure
6. Investment aid for solar photovoltaic cells connected to the grid. Ordinance on state aid for solar photovoltaic cells *[Förordning om statligt stöd till solceller]* (SFS 2009:689)	Financial	Target is that the number of players will increase in Sweden, that the system costs will fall and that electricity from solar photovoltaic cells will increase by 2.5 GWh during the period.	Companies, public and private organisations, as well as private individuals. Refers to solar photovoltaic cell systems connected to the electricity grid (also entitled to electricity certificates).	Complements existing. Supplemented with more funding.	1 July 2009− (previously 31 December 2011), extension to 2016.
7. Vehicle tax exemption for green cars. The Road Traffic Tax Act *[Vägtrafikskattelagen]* (SFS 2006:228)	Financial	Promotes certain green cars	Vehicle owners, the automotive industry	Complements existing, new stricter definition of green cars.	From 1 January 2013
8. Reduced taxable benefit value for certain green cars. Income Tax Act *[Inkomstskattelagen]* (SFS 1999:1229)	Financial	Promotes certain green cars	Company car sector, vehicle owners and the automotive industry	Complements existing.	From 1 January 2012 to 31 December 2016
9. Investment aid for biogas and other renewable gases, Ordinance on state aid for measures for the production, distribution and use of biogas and other renewable gases *[Förordning om statligt stöd till åtgärder för produktion, distribution och användning av biogas och andra förnybara gaser]* (SFS 2009:938)	Financial	Aid to projects that contribute to increased production, distribution and use of renewable gases.	Producers, distributors and users of biogas and other renewable gases.	Complements existing.	From 2009. New funds allocated up to 2016.
10. Aid for climate and renewable energy projects, special funds allocated within the Swedish Rural Development Programme *[Landsbygdsprogrammet]*, Ordinance on aid for rural development measures *[Förordning om stöd för landsbygds-utvecklingsåtgärder]* (SFS 2007:481)	Financial	Reduced environmental impact from rural businesses and increased production and use of renewable energy in rural areas.	Business and project aid	Existing (has not been changed since the Action Plan, but is included as there is no description in the Action Plan).	2010–2013
11. Implementation of the sustainability criteria of the Renewables Directive Act on sustainability criteria for biofuels and bioliquids *[Lag om hållbarhetskriterier för biodrivmedel och flytande biobränslen]* (SFS 2010:598).	Regulatory[28]	An increase in the use of biofuels and bioliquids, which fulfil the sustainability criteria of the Renewables Directive.	This law targets suppliers and users of biofuels and bioliquids.	Complements existing.	Changes came into force on 1 November 2011. The tax exemption for certain biofuels is conditional on the companies holding a sustainability certificate from 1 February 2012 (but already in 2011, the Swedish Government's decision on tax exemption for biofuels was conditional on them fulfilling the sustainability criteria).

[28] This can also be considered to be a condition for financial instruments, as no state aid may be awarded for non-sustainable biofuels.

Name and reference of the measure	Type of measure*	Expected result**	Targeted group and or activity***	Existing or planned****	Start and end dates of the measure
12. New law concerning the environmental requirements when purchasing vehicles and contracting public transport. Act on environmental requirements in the procurement of vehicles and certain public passenger transport services *[Lag om miljökrav vid upphandling av bilar och vissa kollektivtrafiktjänster]* (SFS 2011:846)	Regulatory	The promotion of clean and energy-efficient road transport vehicles	Authorities	New. Replaces existing.	1 July 2011
13. Changed rules of procedure for accounting of alternative fuels. Energy Tax Act (1994:1776)	Financial Regulatory	Promotion of renewable fuels	Companies	New	1 January 2011
14. New law on fuels. Fuels Act *[Drivmedelslag]* (SFS 2011:319)	Regulatory	Reduced emissions of greenhouse gases	Fuel suppliers	New	1 May 2011
15. Super green car premium. Ordinance on super green car premium (SFS 2011:1590)	Financial	Increase the sales and the use of new cars with a low climate impact.	Vehicle owners, the automotive industry	New	1 January 2012 – 2014
16. Implementation of Article 14 of the Renewables Directive: Certification of Installers of Certain Heating Systems Act *[Lag om certifiering av installatörer av vissa värmesystem]* (SFS 2012:838)	Regulatory Voluntary	Contribute to better installation of heating systems and increase the use of renewable energy in small houses, small premises and small apartment blocks.	Installers of wood-burning stoves, pellet stoves, chimneys, solar thermal systems, solar photovoltaic units to produce own electricity, as well as heat pumps and geothermal heat.	New. Existing (came into force on 31 December 2012)	2012–
17. Network for Wind Power	Soft (financial)	Promote the expansion of wind power	Officers in municipalities, and county administrative boards, teachers and researchers in the wind power sector, municipal economic development offices and local business, etc.	Existing. Annual call for applications of project funding	2008–
18. Energy and climate advice services	Soft (financial)	Increase awareness of energy and climate issues	Companies and private individuals	Existing. New call for applications for grants for energy and climate advice services in November 2012. Valid for 2013–2014). Extension to 2017 proposed in the Budget Bill (prop. 2013/14:1)	1997–

Name and reference of the measure	Type of measure*	Expected result**	Targeted group and or activity***	Existing or planned****	Start and end dates of the measure
19. Aid to regional energy offices	Soft (financial)	Increased use of renewable energy and more efficient use of energy at a regional level	Energy and climate advisers, etc.	Existing. New call for applications for grants for regional energy offices in November 2012. Valid for 2013–2014.	2002–
20. Conditional loans for seed companies working in energy	Financial	Contribute to increasing the share of renewable energy and energy efficiency, as well as growth and competitiveness	Seed companies in the energy sector that are in a close-to-market but pre-commercial stage and have the capacity to contribute to the increase in the share of renewable energy and/or the increase in energy efficiency.	Existing	2006–

* *Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).*
*** Is the expected result behavioural change, installed capacity (MW, t/year), energy generated (ktoe)?*
**** Who are the targeted persons: investors, end users, public administration, planners, architects, installers, etc.? What is the targeted activity/sector: biofuel production, use of animal manure for energy, etc.?*
***** Does this measure replace or complement measures contained in Table 5 of the NREAP?*

Description of changes during the past two years

Numbering according to Table 2.

1. Changed levels of energy taxes

and

2. Changed levels of carbon taxes

The energy and carbon taxes are described in general terms in Sweden's National Renewable Energy Action Plan in the section 'Introduction to Sections 4(3), 4 (4) and 4(5)'. On 1 January 2011, an energy tax was introduced on fossil fuels at 30 % of the general level in sectors where the energy tax had previously been zero, namely industry, agriculture, forestry and aquaculture, and heat production in combined heat and power plants. At the same time, industries included in the Emissions Trading System (EU ETS) and heat production used for industrial production in the trading system were completely exempted from the carbon tax, after having had a carbon tax of 15 % of the general carbon tax level.[29] From this date, the sections of the manufacturing industry that are outside the EU's Emissions Trading System, and forestry, agriculture and aquaculture pay 30 % of the general energy tax and carbon tax levels, compared with 21 % of the carbon tax before this date and no energy tax on fuel consumption used for heating purposes.[30] On 1 January 2011, the energy tax on diesel oil increased by SEK 0.20 per litre, followed by another increase of SEK 0.20 per litre on 1 January 2013. On 1 January 2011, the reduction of the carbon tax for natural gas and LPG as fuel fell from 59 % and 52 %, respectively, to 70 % of the general level, followed by a further reduction to 80 % on 1 January 2013. The repayment of the carbon tax for work vehicles used in agriculture and forestry fell on 1 January 2011 from SEK 2.38 to SEK 2.10 per litre and to SEK 1.70 per litre from 1 January 2013.

3. Changed rules for energy and carbon tax exemption for renewable fuels

In 2012, changes were introduced into the Energy Tax Act (SFS 1994:1776), which set the tax exemption level of ethanol in petrol and biodiesel in diesel at a maximum of 5 % by volume on average from 1 February 2013. All ethanol and biodiesel in low biofuel blends over and above these levels are taxed as petrol and diesel respectively. When the new provisions in the Energy Tax Act came into force on 1 February 2013, the reduction of energy tax for biofuel became dependent on the type of fuel. For example, a reduction of 89 % of the general energy tax level is made for ethanol, and 84 % for RME/FAME. From 1 January ,2011 the general tax exemption for biogas is applied through a right of deduction in the tax declaration of the taxpayer, rather than through a tax exemption, as used to be the case. In February 2013, the option of the Swedish Government deciding to grant tax relief for biofuel was also abolished; the new provisions are regulated direct in the Energy Tax Act. Since 1 February 2012, deductions for energy and carbon taxes can only be made if the biofuel is covered by a sustainability certificate pursuant to the Act on the Sustainability Criteria for Biofuel and Bioliquids. This right of deduction only applies to tax on the share of the fuel produced from biomass.[31]

4. Joint electricity certificates system with Norway

The electricity certificates system is a market-based support scheme for the expansion of electricity production from renewable energy sources and peat in Sweden. Producers of electricity whose electricity production meets the requirements in Sweden's Electricity Certificates Act (SFS 2003:113) receive one electricity certificate for each megawatt hour (MWh) of electricity they produce. Demand for electricity certificates is created because all electricity suppliers and some electricity consumers are obliged to purchase electricity certificates equivalent to a certain percentage (quota) of their electricity sales/consumption. The quantity of electricity certificates that electricity suppliers have to purchase increases from year to year in pace with the quota gradually rising, which results in rising demand for electricity certificates. Through their sales of electricity certificates, the producers of renewable electricity thereby get an extra source of income in addition to their income from electricity sales. In this manner, the system stimulates the expansion of renewable electricity production. A new act, a new ordinance and

[29] skatteverket.se: Changes to the taxation of fuel and electrical power, which came into force on 1 January 2011
[30] skatteverket.se: Changes to the taxation of fuel and electrical power, which came into force on 1 January 2011
[31] skatterverket.se: Changes to the provisions on tax exemption for biofuel

new regulations on the electricity certificates system came into force on 1 January 2012, which *inter alia* paved the way for a joint electricity certificates system with other states, provided that an international agreement is signed between the countries involved. Sweden and Norway entered into and issued a bilateral agreement in June 2011 for a joint electricity certificates market.[32]

Since 1 January 2012, Sweden and Norway have had a joint electricity certificates system. The two countries now have a joint target: the electricity certificates system will contribute to 26.4 TWh of renewable electricity production by the end of 2020. Although they have to finance half each, it is up to the market to determine where and when new production will take place. This joint electricity certificates market is the first example of a joint support scheme as described in Article 11 of the Renewables Directive.

The electricity certificates system is evaluated regularly through check points. The most recent evaluation took place in 2009–2010, while work started on the next check point in 2013. In accordance with the agreement between Sweden and Norway, the next check point will be at the end of 2015 at the latest.

5. EU ETS: Emissions Trading System

The third trading period in the EU's Emissions Trading System (EU ETS) started on 1 January 2013. EU ETS can indirectly promote the development of renewable energy.

Swedish plants that are included in the scheme will receive a free allocation of approximately 28.9 million emission allowances in 2013, which will gradually be scaled down to approximately 19.9 million in 2020, based on calculations in accordance with Sweden's preliminary allocation and Commission Decision 2013/448/EU. Between 2008 and 2012, the average annual allocation was around 22 million emission allowances. No free allocation was given to existing plants in the electricity and district heating sector in Sweden between 2008 and 2012. However, the joint EU allocation rules for 2013–2020 mean that district heating production will receive a free allocation based on a heat benchmark.

The revised regulations for EU ETS also include a provision stating that the profits from the sale of 300 million emission allowances held in the New Entrants Reserve (the NER 300) are to be given to those who invest in new technology for renewable energy or carbon capture. Three of Sweden's NER 300 projects were accepted in the first call, so Sweden has met its country quota of a maximum of three projects per Member State. In a second call in April–July 2013, the focus was therefore on transnational projects. The three projects that have already been accepted include one that aims to produce pyrolysis oil from forest residues (such as tops, branches and stubs); the second aims to build a plant that will produce approximately 100 MW of biomethane through the gasification of residues from the forest; while the third will establish a wind farm with a total output of 225 MW with turbines that are adapted for a cold climate.

6. Change in investment aid for solar photovoltaic cells connected to the grid

From 1 July 2009, companies have been able to apply for investment aid for solar photovoltaic cells that are connected to the electricity grid and a new ordinance on state aid for solar photovoltaic cells came into force in February 2013. The total amount that was allocated for these subsidies was SEK 100 million in 2009; SEK 50 million in 2010, and SEK 60 million in both 2011 and 2012. For 2013–2016, the Swedish Government has allocated SEK 210 million in aid for solar photovoltaic cells to help transform the energy system and promote business development in energy technology.

Table A Investment aid earmarked for solar photovoltaic cells that are connected to the electricity grid 2009–2016

Year	2009	2010	2011	2012	2013–2016

[32] http://www.regeringen.se/content/1/c6/17/19/33/e83058ae.pdf

Amount (SEK million)	100	50	60	60	210

This aid covers all kinds of solar photovoltaic cells that are connected to the electricity grid. The level of aid will change from 1 February 2013, which means that the amount received may now only represent a maximum of 35 % of the investment cost, compared with 45 % in 2012. The ceiling for aid per solar photovoltaic cell system is SEK 1.2 million (the rules used to allow a ceiling of SEK 2 million per building), while the eligible costs are a maximum of SEK 37 000 plus VAT per installed kilowatt of electrical peak output.

For solar electricity/solar thermal hybrid systems, the eligible costs are a maximum of SEK 90 000 plus VAT per installed kilowatt of electrical peak output.

Aid for the projects that will have ended by 31 January 2013 will be paid in accordance with the old conditions. Aid for the projects that end after 1 February 2013 will be paid in accordance with the new, changed conditions.

7. Vehicle tax exemption for green cars and a new green car definition

In its 2011 Budget Bill (prop. 2010:1:1, expenditure area 22, page 46), the Swedish Government stated *inter alia* that the main target of road transport is to have a system in place that is independent of fossil fuels by 2030, and that a stricter definition of a green car represents part of a major investment in climate measures for the automotive sector. In its 2011 Spring Fiscal Policy Bill (prop. 2010:11:100, page 59) the Swedish Government stated that a new, stricter green car definition, based on Regulation No 443/2009 of the European Parliament and of the Council setting emission performance standards for new passenger cars, should be introduced on 1 January 2013. A new stricter green car definition has been implemented by introducing tougher requirements to be included in the five-year exemption from vehicle tax for cars with better environmental performance standards, and requirements for weight-based carbon dioxide emissions also being introduced, which will come into force on 1 January 2013.

Passenger cars, camper vans, light goods vehicles and light buses that meet the requirements to be included in the tax exemption for cars with better environmental performance standards are exempt from vehicle tax for the first five years. The new provisions mean that a vehicle *inter alia* must meet requirements for weight-based carbon dioxide emissions to be included in the tax exemption. The tax exemption also needs to be expanded to include not only passenger cars, but also camper vans, light goods vehicles and light buses. The requirements for weight-based carbon dioxide emissions mean that a vehicle may not emit more carbon dioxide than a specific value, representing the highest permitted carbon emissions in relation to the car's weight.

The calculation used to determine whether a vehicle can be included in the tax exemption is as follows. 1 372 is subtracted from the curb weight of the car in kilograms. The difference is then multiplied by 0.0457. Finally, 95 is added to the product. If the car is fitted with technology enabling it to be run on ethanol fuel or a gas fuel (other than LPG), 150 is added to the product instead. If the car's carbon dioxide emissions, based on the data in the road traffic register, are not higher than the maximum permitted carbon dioxide emissions, the car will meet the carbon dioxide emission requirements. If it is an electric car or plug-in hybrid, the electrical energy consumption may be a maximum of 37 kilowatt hours per 100 kilometres when the car is being driven. Tax exemption is intended to be an incentive to encourage the purchase of energy-efficient cars with low carbon dioxide emissions.

8. Reduced taxable benefit value for certain vehicles

In its 2012 Budget Bill (2011:12:1), the Swedish Government proposed an extension of the temporary reduction of the taxable benefit value of cars fitted with the latest and best technology to be run on electricity or gas (other than LPG). This change was implemented in the Changes to the Income Tax Act *[Lag om ändring i inkomstskattelagen]* (SFS 2011:1271), which resulted in the reduction being extended to 31 December 2013. In accordance with the new regulations, only electric cars and plug-in hybrids, which can be recharged from the electricity grid, and gas-fuelled cars (not LPG) can receive a 40 % reduction of the taxable benefit value up to a maximum of SEK 16 000. Ethanol cars, electric hybrid vehicles that cannot be charged from the electricity grid, and cars that can be run on LPG, rapeseed methyl ester and other kinds of eco-friendly fuels are only adjusted down to comparable conventional cars. According to the 2014 Budget Bill, these regulations will be extended until the end of 2016.

9. Continued investment aid for biogas and other renewable gases

Since 2010, the Swedish Government has allocated funding on an annual basis to promote the launch to market of new technology and new solutions that improve the profitability of biogas and help to increase its production. The purpose of this aid is to promote energy technology that is climate-friendly but not yet commercially competitive. It is intended to promote more efficient and expanded production, distribution and use of biogas and other renewable gases. In 2010 and 2011, the Swedish Energy Agency allocated SEK 168 million for biogas projects. The call for 2013 funding is open until 3 May, and more than SEK 100 million is available for innovative biogas projects. Funds are available until 2016.

10. Aid for climate and renewable energy projects, special funds allocated within the Swedish Rural Development Programme

Farmers and other businesses in rural areas that invest in producing or processing biogas can receive up to 30 % in investment aid. In northern Sweden, this aid can be as high as 50 % in some cases.[33] As well as aid for biogas investments, aid can also be given to plant energy forests on arable land.[34] In the Rural Development Programme, the project aid is primarily related to knowledge and skills development and preliminary studies in climate and renewable energy in rural areas and can, for example, be given to biogas projects. The projects are intended to reduce the impact of rural enterprises on the climate, and to support development and cooperation within renewable energy in rural areas through, for example, the development of new products, processes or technologies. Project aid is given within the framework of the budget for the Swedish Rural Development Programme 2007–2013. Proposals for a new Rural Development Programme for 2014–2020 are currently being prepared and will be sent to the Commission in the first half of 2014.

11. Change to the implementation of the Renewables Directive's sustainability criteria

Sweden's Act on sustainability criteria for biofuels and bioliquids (SFS 2010:598) came into force on 1 August 2010 in order to implement the Directive's provisions concerning sustainability criteria. On 1 November 2011, a change in the law came into force which meant that the reporting obligation is linked to the tax liability for biofuels and bioliquids, and also gives companies that have a reporting obligation the opportunity to apply for a sustainability certificate from the Swedish Energy Agency. From 1 February 2012, the tax exemption for biofuels and bioliquids has been conditional upon the

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http://jordbruksverket.se/amnesomraden/miljoklimat/begransadklimatpaverkan/fornybarenergi/stodforbiogas.106.6f9b86741329df6fab480004347.html

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http://jordbruksverket.se/amnesomraden/miljoklimat/begransadklimatpaverkan/fornybarenergi/stodforbiogas.106.6f9b86741329df6fab480004346.html

presentation of a valid sustainability certificate. However, it should be noted that in 2011, decisions issued by the Swedish Government concerning tax exemptions for biofuels were already conditional upon the fuel meeting the sustainability criteria in the Renewables Directive. The Directive's provisions concerning sustainability criteria also mean certain changes to the Electricity Certificates Act (SFS 2011:1200). The act, ordinance and regulations have been adopted and are published in Swedish on the website of the Swedish Energy Agency.[35]

12. New environmental requirements when purchasing vehicles

The new Act on Environmental Requirements in the Procurement of Vehicles and Certain Public Passenger Transport Services (SFS 2011:846) came into force on 1 July 2011. This legislation intends to implement Directive 2009/33/EC of 23 April 2009 of the European Parliament and of the Council on the promotion of clean and energy-efficient road transport vehicles. Public authorities who purchase cars or lease them for at least one year are to take into account the car's energy and environmental impact throughout the entire life of the car in the procurement process. The energy and environmental impact can be specified in monetary terms and is to be included in the evaluation of tenders; if this method is used, the calculation of the costs, which are linked to the life of the vehicle, must comply with the rules stipulated in the directive.

13. Changed rules of procedure for accounting of alternative fuels

On 1 January 2011, new rules for accounting of alternative fuels were changed in the excise duty declaration through the Change to the Energy Tax Act *[Lag om ändring i lagen om skatt på energi]* (2012:1824). In exceptional cases, the Swedish Government may grant full or partial exemption from energy tax and carbon tax on fuel produced from biomass, or on fuel consumed as part of a pilot project for the technological development of more eco-friendly products. The possibility of exemption from energy tax and carbon tax applies even if the fuel is an ingredient in another fuel. From 1 January 2011 the tax exemption for fuel that is covered by the Government's decision has been effected by means of a deduction in the excise duty declarations.

14. New Fuels Act

The new Fuels Act implements *inter alia* Article 7(a) of the Fuel Quality Directive. The Fuels Act came into force on 1 May 2011. This law means that fuel suppliers have to reduce the emissions from the fuel they deliver by 6 % by 2020 compared with fossil fuels in 2010. Every year fuel suppliers must submit a report to the Swedish Energy Agency on the greenhouse gas emissions and origin of the fuel that they have delivered. Detailed regulations in the Fuel Quality Directive, including how to calculate the reduction in greenhouse gases and the fossil comparator used when calculating the reduction, have not yet been decided at EU level. The Swedish Energy Agency has therefore developed its own methodology and more information about this methodology can be found on the Swedish Energy Agency website.[36]

15. The super green car premium

On 22 December 2011, the Swedish Government decided to introduce a super green car premium in order to increase the sales and use of new cars with a low climate impact. The premium is for passenger cars with very low greenhouse gas emissions, a maximum of 50 grams of carbon dioxide per kilometre. The government has included a contribution – a premium – that will cover any additional costs for these cars. This contribution is a maximum of SEK 40 000 per car and the Swedish Transport Agency is tasked with paying this premium. The provisions for this premium are regulated in the Ordinance on the super green car premium *[Förordningen om supermiljöbilspremie]* (SFS 2011:1590). Although this ordinance came into force on 16 January 2012, it applies retrospectively from 1 January 2012. The

[35] www.energimyndigheten/hbk
[36] http://energimyndigheten.se/sv/Foretag/hallbara_branslen/Drivmedelslagen/

Swedish Transport Agency uses this ordinance when examining any issues relating to the super green car premium.

The premium is paid to the first 5 000 who purchase a new super green car between 1 January 2012 and 31 December 2014 (if the funds are still available). To receive the premium, the person must not have received any other state or municipal aid to acquire the car in question. A 'new' car is one that has not been used before either in Sweden or another country. The Swedish Transport Agency has produced a list of the cars that meet the requirements in the Ordinance on the super eco car premium on its website.[37]

16. Certification of installers of renewable energy

On 31 December 2012, the act on certification of installers of certain heating systems (SFS 2012:838) came into force. The regulations are based on Article 14 of the Renewables Directive. This certification is voluntary and covers all EU countries.[38]

17. Network for Wind Power

The Network for Wind Power aims to promote the expansion of wind power through information, training, the exchange of experience, and financial support for wind power projects. The Swedish Energy Agency acts as a hub in the Network for Wind Power and has formal responsibility, which means *inter alia* that it makes decisions on funds that are allocated to projects in the network through annual calls. The number of projects that were accepted in 2011 and 2012 was 22 and 26, respectively. In 2011, SEK 15.4 million was allocated, while in 2012 the total contribution was SEK 17 million.[39]

18. Energy and climate advice services

The Swedish Energy Agency provides financial aid to municipal energy and climate advice services in accordance with the Ordinance on municipal energy and climate advice *[Förordningen om kommunal energi- och klimatrådgivning]* (SFS 1997:1322). In November 2012, a new call for applications was launched. The applications that are received are for 2013–2014. The grants are allocated based on the size of the municipalities. The grants are paid by 30 April every year, for one calendar year at a time. By 30 November every year at the latest, the municipalities must send an activity report to the Swedish Energy Agency, which compiles the responses from all the municipalities into one annual report. An operations plan is also submitted to the Swedish Energy Agency every year. This is an obligatory report, describing the planned activities in the following year. It must also include a financial report on how the funding has been used over the year. The municipalities also provide a monthly report on the activities they carry out, i.e. talks with people asking for advice.

19. Aid to regional energy offices

Since 2002, the Swedish Energy Agency has been in charge of the financial grants given to the regional energy offices. The Swedish Energy Agency itself pays some of the funding for these energy offices, so it requires reports on the project activities and their roles as energy players and coordinators for energy and climate advisors. The energy offices initiate and contribute to major projects that promote energy efficiency and renewable energy sources, helped by funding from the Swedish Energy Agency, the EU, county administrative boards, regional associations and other organisations. The energy offices also operate regionally, where they coordinate with the business community, county administrative boards, municipalities, municipal associations, etc. This can include plans and strategies, for example. At the moment, 14 regional offices cover the entire country. However, only a temporary solution is in place for

[37] http://www.transportstyrelsen.se/Kontakta-oss/Stall-fragor-lamna-synpunkter-eller-information/Vanliga-fragor-till-Transportstyrelsen/Supermiljobilspremie/

[38] (http://energimyndigheten.se/sv/Foretag/Energieffektivt-byggande/Certifiering-av-installatorer-av-fornybar-energi-)

[39] 2012 Annual Report of the Swedish Energy Agency

one region and will end at the end of this year, so work is underway to find a solid and sustainable solution.

20. Conditional loans for seed companies working in energy

Since the beginning of 2006, the Swedish Energy Agency has increased its commitment to new companies working with energy. One important goal is to help them survive the start-up period — a period that is often critical as development costs are high and revenues are low. Conditional loans are being offered to help the development and commercialisation of the business concepts of these companies. The companies operate in different sectors and are at different stages of their development and growth. What they have in common is that their business concepts are linked to energy and help promote energy efficiency or the increase in the share of renewable energy.

Planned instruments

Extension of the reduced taxable benefit value of green cars

In its 2014 Budget Bill (prop. 2013/14:1), the Swedish Government proposed that the reduction for certain eco-friendly cars be extended by a further three years.

Extension of aid to municipal energy and climate advice services

In its 2014 Budget Bill, the Swedish Government proposed that the aid given to municipal energy and climate advice services be extended by three years to 2017 to maintain the knowledge and competence in the municipal energy and climate advice services.

Aid for biogas produced from manure

In its 2014 Budget Bill, the Swedish Government proposed investing in the digestion of manure to produce raw methane gas. The reason for this is to compensate the production of biogas from manure for its climate and environmental benefits by paying for the double environmental benefits by up to SEK 0.20 per kWH of the amount of energy produced from manure. In its bill, the Swedish Government wants to start a ten-year pilot project in Sweden, ending in 2023. The project is expected to help reduce greenhouse gas emissions and reduce eutrophication.

Biofuel quota

In its 2014 Budget Bill, the Swedish Government proposed a new law on quota obligations for biofuel. This law will come into force on 1 May 2014 and will also involve changes to the act on the taxation of energy (SFS 1994:1776). According to the bill, companies bound by the quota must ensure that there is a certain percentage of biofuel in the volume of petrol or diesel fuel bound by the quota. The proposed quota for diesel fuel is 9.5 % by volume, which must include 3.5 percentage points of special designated biofuel. The percentage of biofuel in petrol in 2014 must be at least 4.8 % by volume of the quota-bound volume, increasing to 7 % by volume in 2015. A new petrol quality has to be introduced in Sweden in order to achieve the latter: E10, with up to 10 % ethanol by volume. Changes to the taxation of biofuel will also be effected from 1 April 2014. The proposal is also to have an energy tax on biofuel in petrol and diesel that is based on energy content, corresponding to the tax on petrol and diesel. However, the proposal is also for pure and high-blend biofuel to remain completely exempt from tax.

Research and innovation in the energy sector

The Swedish Government's bill on research and innovation for a long-term sustainable energy system (prop. 2012/13:21) contains guidelines for continued action in the research, development, demonstration and commercialisation of the energy sector. The previous progress report described the increase in the funds that the Swedish Energy Agency had made available since 2009. The bill would involve general goals being set for research and innovation in energy. The research and innovation measures will be designed to help meet energy and climate goals, long-term energy and climate policy, and environmental policy objectives related to energy.

The Swedish Government has looked at the general priorities proposed by the Swedish Energy Agency for its future work and has assessed them to be appropriate and well-founded. They are:

- vehicle stock that is independent of fossil fuels
- power systems that can use renewable energy production
- energy efficiency in buildings
- increased use of bioenergy
- energy efficiency in industry.

The Swedish Government has proposed an extension and a gradual reinforcement of the research and development measures for energy, with total funding of SEK 1 240 million between 2013 and 2016. Based on the levels that have already been decided, the proposal is for the appropriations to increase by SEK 250 million in 2013, SEK 250 million in 2014, SEK 270 million in 2015 and SEK 470 million in 2016.

This is the equivalent of approximately SEK 1.3 billion between 2013 and 2015, with a permanently higher level of approximately SEK 1.4 billion from 2016, compared with the previous base level of just over SEK 900 million. These funds will continue to be administered by the Swedish Energy Agency.

Table B Increased investments in research and innovation (SEK million)

Priority measures and tasks	2013	2014	2015	2016	Total
Technology verification and demonstration	50	50	90	100	**290**
Cofunding with initiatives within the EU (SET plan etc.)	100	100	80	150	**430**
Bilateral agreements	25	25	25	25	**100**
High-quality research and development	45	45	45	110	**245**
Strategic innovation area: Energy	30	30	30	85	**175**
Evaluation of support for demonstration plants					
Total	**250**	**250**	**270**	**470**	**1240**

Tax reduction for microproducers of electricity

In its 2014 Budget Bill (prop. 2013/14:1), the Swedish Government announced the introduction of a tax reduction for microproducers of electricity from renewable energy sources. The earliest date that this proposal could come into force would be 1 July 2014.

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).*

Follow-up and evaluation of permit processes for renewable energy production

Many different projects are underway to monitor the permit processes in order to streamline these processes for *inter alia* renewable electricity production. This kind of monitoring work has been carried out before on several previous occasions.

The Swedish Government has tasked the Swedish Energy Agency with monitoring the permit processes for renewable electricity production and to work to streamline them on three separate occasions. In its 2011 and 2012 reports on this work the authority submitted a progress report on how the permit system works and presented possible proposals for ways that it could be made more efficient. This year the authority was entrusted with the same task and it reported its work on 30 September 2013.

In 2012, the National Council for Innovation and Quality in the Public Sector[40] supported a development project for environmental permit processes with the Land and Environment Court in Umeå, the County Administrative Board in the County of Västerbotten and the Swedish National Courts Administration. This work resulted in an official report[41] that uses a political perspective to report on the central premises for evaluating and monitoring state activities in general and environmental permit processes in particular.

A more detailed evaluation of the permit processes will be carried out by the County Administrative Board in the County of Västerbotten. In December 2012, the Swedish Government commissioned the county administrative board to develop and use methods, measurements and cooperation mechanisms to promote a more efficient environmental permit process, while retaining the legal certainty.

The extensive monitoring work that will now be carried out by the county administrative board will be based on the recommendations given in the report by the National Council for Innovation and Quality in the Public Sector. The county administrative board will report on this work in October 2014. The assignment not only covers renewable electricity production, but also any activities designated 'A' and 'B' in the Ordinance on environmental assessment *[miljöprövningsförordningen]* (SFS 2013:251), i.e. environmentally-hazardous activities that require permits.

A number of county administrative boards have also reported on the measures that have been taken and that are intended to be taken to provide competent and more effective assessment of B activities. This assignment also included reporting the handling times for different kinds of activities. This resulted in a report that was published in 2013.[42]

[40] The National Council for Innovation and Quality in the Public Sector was established by the Swedish Government in 2011 to improve the efficiency and quality of public activities at national, regional and local level (Dir. 2011:42).

[41] The National Council for Innovation and Quality in the Public Sector: Increased efficiency in the environmental permit process — how case processes can be monitored and developed across functional and authority borders using a systematic approach *[Ökad effektivitet i miljötillståndsprocessen – hur ärendeprocesser kan följas upp och utvecklas över funktions och myndighetsgränser utifrån en systemsyn]*, 2012.

[42] The County Administrative Board of Stockholm County Council, Final report on the assignment; Organising activities for assessing permits for less environmentally hazardous activities *[Inordnande av verksamhet som avser prövning av ansökan om tillstånd till mindre miljöfärliga verksamheter]*, County Administrative Board reference number: 101-5366-2013.

Improvements to administrative procedures in order to remove legislative and non-legislative obstacles for developing renewable energy sources

In 2009, the regulations changed so that wind power plants that require a permit in accordance with the Environmental Code *[Miljöbalk]* (SFS 1998:808) do not also need to have a building permit, as required by the Planning and Building Act *[Plan- och bygglagen]* (SFS 2010:900) . These changes to the regulations were introduced to simplify and shorten handling times in order to promote the expansion of wind power in Sweden. A rule was also introduced into Chapter 16(4) of the Environmental Code to ensure that the municipalities can retain their influence of the use of land; this rule means that the assessment authority may only issue a permit for a wind power plant if the municipality has supported it. The Swedish Energy Agency intends to work with the Swedish Environmental Protection Agency and the Swedish Association of Local Authorities and Regions to produce guidelines for applying these provisions.

In 2010, the Swedish Government proposed that the assessment of activities designated as B activities in the Ordinance on environmental assessment (SFS 2013:251) should be concentrated to a fewer number of environmental assessment delegations (prop. 2009/10:215 Land and Environment Courts) in order to achieve more unified handling procedures. On 1 December 2011 the Swedish Government decided on the new Ordinance on environmental assessment delegations *[Förordning om miljöprövningsdelegationer]* (SFS 2011:1237), which came into force on 1 June 2012. This ordinance means that the assessment of B activities have been concentrated from the previous 21 environmental assessment delegations to 12.[43] The B activities are environmentally hazardous activities that have such a high environmental impact that they require a permit, but are not assessed by the Land and Environmental Court in the first instance, but by the environmental assessment delegation at the county administrative board.

When the environmental assessment delegations were merged, a time limit was introduced for the handling of applications from B activities by the county administrative boards. A Government decision stipulated that the aim should be for a case to be decided within six months from when a satisfactory application has been submitted. A longer processing time can be justified if there are special reasons.[44] One of the factors that could result in a case needing more time is the need to supplement the application and the kind of data that is required for the assessment. In this instance it is up to the environmental assessment delegation to decide when the application fulfils the requirements of the Environmental Code and when the time limit starts to apply.

In December 2013, the Swedish Energy Agency decided on revised areas that are earmarked by the authority as areas of national interest for wind power. Areas of national interest for wind power are incredibly important for evaluating wind power in relation to other interests in the physical planning process. The purpose of revising these areas was to improve the planning tool for areas of national interest for wind power and to therefore help municipalities and county administrative boards in their work to plan the use of their local land and water.

The website Vindlov[45] collates up-to-date information about the permit process for wind power plants in one location. Vindlov has been set up for companies, authorities, organisations and private individuals. It was created and is run by the Swedish Energy Agency along with more than 20 other authorities. In August 2012, Vindbrukskollen was launched, which is a map-

[43] B activities are concentrated in the environmental assessment delegations at the county administrative boards in Stockholm, Uppsala, Östergötland, Kalmar, Skåne, Halland, Västra Götaland, Örebro, Dalarna, Västernorrland, Västerbotten and Norrbotten. The assessment areas for the county administrative boards in Halland, Västra Götaland, Västerbotten and Norrbotten will also include each county.

[44] Assignment for some county administrative boards to prepare and implement the organisation of activities for assessing permit applications for less environmentally-hazardous activities, B activities, from other county administrative boards, S2011/10681/SFÖ.

[45] www.vindov.se

based web service for establishing wind power plants in Sweden. Vindbrukskollen has been developed through collaboration between the Swedish Energy Agency, the county administrative boards and the Network for Wind Power.[46]

Project planners for wind power and the assessment authorities register ongoing information about each wind power project in Vindbrukskollen to ensure that the database is kept up to date about existing and planned wind power plants. This web service is available to everyone and can be used to search for information about wind power plants and their surroundings. Vindbrukskollen can also be used as an aid for planning, and for producing and submitting application documents to the right authority.

Changes to the Electricity Certificates Act

A new Electricity Certificates Act (SFS 2011:1200) came into force on 1 January 2012. The new law includes *inter alia* editorial and linguistic changes, as well as reorganisations in order to make it more clear and transparent. The proposals also include changes to improve the administrative procedures of the authorities. The proposal intends to simplify the regulations. For example, the new law would mean that small producers of renewable electricity that use the electricity they have produced may be exempted from the quota obligation.

[46] This network is organised by the Swedish Energy Agency and includes, for example, county administrative boards, Gotland University College and municipalities.

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).*

In Sweden, the state-owned Svensk Kraftnät (the Swedish national grid) has the task of managing, operating and developing in a commercial way a cost-effective, reliable and eco-friendly power transmission system, selling excess capacity, and in other ways operating activities that are linked to the power transmission system. According to the instruction for its sphere of activities, Svenska Kraftnät is to ensure that the possibilities of expanding renewable electricity production are facilitated.[47]

To facilitate the connection of renewable electricity production to the backbone grid, Svenska Kraftnät has produced a document providing guidance for project planners of large wind power production plants in matters related to grid connection.[48] This guidance is described in more detail in the previous progress report.

Pursuant to Chapter 3 of the Electricity Act (SFS 1997:857) connection fees and the terms and conditions for connecting electricity production to the grid have to be reasonable. The grid authority (the Energy Markets Inspectorate) may appraise how reasonable the fees and terms and conditions are to ensure that renewable energy sources can access the grid in an objective and non-discriminatory way.

In its 2014 Budget Bill (2013/14:1), the Swedish Government proposed the introduction of an early sharing system for grid reinforcement costs over a transitional period in order to reduce the threshold effects of expanding renewable energy production. A memorandum containing the Swedish Government's proposal for a transitional solution has been circulated for comment, in which the changes to the legislation are proposed to come into force on 1 July 2014.

The threshold effect refers to the power producer connecting to a grid that lacks spare capacity being forced to pay the entire grid reinforcement cost, including for added capacity that the producer itself cannot utilise. Producers that subsequently connect to the grid can then utilise this spare capacity without any particular cost. For this reason, no producer wants to be the first to connect to such a grid.

According to the Swedish Government's proposal, Svenska Kraftnät will be tasked with selecting suitable geographic areas and identifying suitable projects within them, so that the early sharing of connection fees can be calculated. Svenska Kraftnät will cover the costs of grid reinforcement, for example through loans to the regional grid companies.

Companies that want to connect a plant have to pay a fee, which will compensate the grid company's costs and will correspond to the plant's share of the capacity of the total grid reinforcement. The grid company will then pay back the subsidies given by Svenska Kraftnät as the grid reinforcement's capacity starts to be used by connecting different plants.

The total grid reinforcement cost paid by Svenska Kraftnät within the framework of this proposal must not exceed SEK 700 million. The idea is for the selected projects to bear their own costs at the end of the day, with a limited amount of risk to the state. The Swedish Government aims to replace

[47] See Section 3, point 12 in Ordinance with instruction for Affärsverket svenska kraftnät [*Förordning med instruktion för Affärsverket svenska kraftnät]* (SFS 2007:1119).
[48] Svenska Kraftnät 2011, Guidance for connecting wind power to the backbone grid *[Vägledning för anslutning av vindkraft till stamnäte]*, Ref. no. 2009/393, 2011-05-06, available in Swedish from: www.svk.se/global/06_energimarknaden/pdf/vindkraft/110506-vagledning-forvindkraftsanslutning.pdf

this transitional solution in 2016 with a long-term market solution, in which the state does not have to take any financial risk.

The Swedish Government has also decided[49] to set up the Swedish Coordination Council for Smart Grid. This Coordination Council was established on 30 May 2012 and includes members from authorities, organisations, the business community and different research fields. Its role is to develop smart grids that contribute to more efficient and more sustainable energy use. There are many different dialogue forums that are associated with the Coordination Council, where different perspectives on smart electricity grids are discussed.

The Coordination Council is developing a website that will become a national knowledge platform for smart grids. The council is also developing a proposed action plan for developing smart grids in Sweden. It will submit its action plan to the Swedish Government by 1 December 2014 at the latest.

[49] Directive 2012:48

3. 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 with respect to those set out in your National Renewable Energy Action Plan *(Article 22(1)(b) of Directive 2009/28/EC).*

The Commission reminds Member States that all national support schemes must respect the state aid rules as foreseen in Articles 107 and 108 of the Treaty on the Functioning of the EU. The notification of the report in accordance with Article 22 of Directive 2009/28/EC does not replace a state aid notification in accordance with Articles 107 and 108 of the Treaty on the Functioning of the EU.

*It is suggested that **Table 3** is used to provide more detailed information on the support schemes in place and the support levels applied to various renewable energy technologies. Member States are encouraged to provide information on the methodology used to determine the level and design of support schemes for renewable energy.*

Note that an account of the changes with regard to support schemes and other measures being applied compared with the measures specified in the progress report from 2011 is given first and foremost under point 2. Under this point, only more detailed information about the support schemes for renewable energy requested in Table 3 is provided.

Note also that the support schemes listed in Table 3 in many instances overlap each other, and for this reason it may be difficult to obtain a true picture of the total subsidies involved. This factor, together with the fact that it has not been possible to quantify all aid for renewable energy (and because it has not been possible to separately record energy tax exemptions), is the reason why the total calculated aid, per sector and in total, has not been specified.

Generally speaking for Table 3, the specified aid levels are the estimated values. It should therefore not be interpreted as the aid level, whether a capital grant or a loan, amounting to precisely the level specified in this table. The table should not be taken out of its context and makes no claim to be complete.

Table 3: **Support schemes for renewable energy Note comments about the table and footnotes.**

RES support schemes, year specified per scheme		**Aid per unit**	**Total, million SEK***	**Total, million EUR*[50]**
Renewable electricity 2012				
Electricity Certificate System[51]	Obligation/quota (%) = 17.9 % of quota-bound electricity use			
	Penalty/buy out option/ buy out price (euro/unit)	SEK 298/MWh	SEK 2.86 million	0.33
	Average electricity certificate price	SEK 199[52]/MWh	SEK 4 188 million (for renewables excl. peat), SEK 109 million (for peat)	481 (renewable), 13 (peat)
Solar photovoltaic cells 2009–2012				
Investment aid for solar photovoltaic cells connected to the grid	Investment subsidies (capital grants or loans) (SEK/unit)	SEK 1.1/kWh[53]	Granted amount (2009–2012) approx. SEK 261 million. Paid amount (2009–2012) approx. SEK 193 million.	Granted amount 31 Paid amount 22
Wind power				
Aid for placing wind power on the market	Investment subsidies (capital grants or loans) (SEK/unit)	SEK 23 million/TWh[54]	SEK 661.2 million (2003–2012)	76
Renewable heating				
Solar heating (solar thermal collectors for the production of hot water)				
Investment aid for solar heating[55]	Investment subsidies (capital grants or loans) (euro/unit)	SEK 0.1/kWh	SEK 130 million (1 Jan 2000 – 30 Nov 2011)	15
Renewable fuels 2011 and 2012				

[50] The official rates of exchange have been used for the conversion of SEK million to euro. For amounts that have been paid across several years the conversion rate for 2012 has been used. EUR 1 = SEK 9.0335 (2011), EUR 1 = 8.7053 (2012), NOK 1 = SEK 1.1641 (2012). Source: Riksbanken (Swedish Central Bank).

[51] The average electricity certificate price specifies the average price based on all transfers executed in the account keeping system during the year in question and differs from the market price. In 2012, 21.6 TWh of renewable electricity production was allocated electricity certificates in total for Sweden and Norway. Source: the Swedish Energy Agency.

[52] The average price of an electricity certificate between 1 April 2012 and 31 March 2013.

[53] Estimated as the total aid granted for the plants that have been built so far, divided by the sum of the figures for estimated production of electricity (on an annual basis) specified per actor in the applications, divided by an assumed life of 25 years. There is currently no figure on the actual electricity production.

[54] The granted wind pilot projects are assessed to generate 1.44 TWh/year and have a life of 20 years.

[55] Reference: Evaluation of the contribution from solar heating and solar heating aid *[Utvärdering av solvärmebidraget och solvärmestödet]* Swedish National Board of Housing, Building and Planning, 2012. 0.15 SEK/kWh represents the effectiveness of the subsidy calculated as annual aid (that is, the total aid converted into annual instalments for the 20 year life of the measure) divided by the solar thermal collectors' estimated annual production of heating (kWh/year) and is based on the Swedish National Board of Housing, Building and Planning's assumption that 60 % of the expanded capacity in solar heating is due to the aid.

RES support schemes, year specified per scheme		Aid per unit	Total, million SEK*	Total, million EUR*[50]
Energy and carbon tax exemption for biofuels[56]	Tax exemption/refund	Information not available	In the government communication Annual account of tax expenditure 2012 and 2013 respectively [*Redovisning av skatteutgifter 2011]* the tax loss from the energy tax exemption for biofuels is estimated to be SEK 1 970 million and SEK 1 940 million respectively in 2011 and 2012.	218 (2011) 223 (2012)
Energy and carbon tax exemption for biofuels (not for transport)	Tax exemption/refund	Information not available	In the government communication Annual account of tax expenditure 2012 and 2013 respectively the tax loss from the energy tax exemption for biofuels, peat, etc., for heating is estimated to be SEK 4 570 million and SEK 5 520 million respectively in 2011 and 2012.	506 (2011) 634 (2012)
Vehicles				
Vehicle tax exemption for green cars	Tax exemption/refund	Information not available	SEK 200 million (tax loss 2011) SEK 280 million (tax loss 2012)	22 (2011) 24 (2012)
Reduced taxable benefit value for certain vehicles	Tax exemption/refund	Information not available	In the government communication Annual account of tax expenditure 2012 and 213 respectively, the tax loss from the reduced taxable benefit value for certain vehicles is estimated to be SEK 420 million and SEK 150 million for 2011 and 2012 respectively.	46 (2011) 17 (2012)
Super green car premium	Investment subsidies (capital grants or loans) (euro/unit)	Private individual: SEK 40 000 Legal person: 35 % of the difference in the new car price between the super green car and the nearest comparable car, up to a maximum of SEK 40 000	SEK 20 million in 2012[57]	2.3
Biogas and other renewable gases 2011 and 2012				

[56] Note that the carbon tax exemption for biofuels should not be seen as a form of aid for biofuels (because they ought to be tax exempt from the emissions of fossil fuels they do not lead to from a lifecycle perspective, which means they are an instrument).

[57] In accordance with the statistics from the Swedish Transport Agency, http://www.transportstyrelsen.se/Kontakta-oss/Stall-fragor-lamna-synpunkter-eller-information/Vanliga-fragor-till-Transportstyrelsen/Supermiljobilspremie

RES support schemes, year specified per scheme		Aid per unit	Total, million SEK*	Total, million EUR*[50]
Investment aid for biogas and other renewable gases	Investment subsidies (capital grants or loans) (euro/unit)		SEK 125 million[58] (2011–2012)	14
Biogas 2011 and 2012				
Investment aid for the production or refinement of biogas within the Swedish Rural Development Programme.	Investment subsidies (capital grants or loans) (euro/unit)		Granted amount (2011–2012) SEK 67 million Paid amount (2011–2012) SEK 35 million[59]	Granted 7.7 Paid 4.0
Total annual estimated aid in the electricity sector				
Total annual estimated support in the heating sector				
Total annual estimated aid in the transport sector				

***** The quantity of energy receiving aid per unit gives an indication of the effectiveness of the aid for each type of technology.

Each authority that investigates the content and levels of support schemes for renewable energy is also required to carry out impact assessments of the analysed support schemes. These include, for example, assessing the socio-economic benefit and the impact on the environment. A political assessment is then made of the content and level before a final proposal is tabled.

[58] Aid was given to a total of 19 projects in 2011 and 2012 (source: Swedish Energy Agency, http://www.energimyndigheten.se/Global/Forskning/Br%c3%a4nsle/Biogas/Beviljade%20ans%c3%bkningar%202010-2012.pdf)

[59] Source: Information from the Swedish Board of Agriculture.

3.1. Provide the information on how supported electricity is allocated to final customers for purposes of Article 3(6) of Directive 2003/54/EC *(Article 22(1)(b) of Directive 2009/28/EC).*

Support for producers of renewable electricity through the electricity certificates system is paid for by those who are bound by the quota obligation. Those who are bound by a quota obligation are: (i) electricity suppliers that supply electricity to consumers; (ii) electricity consumers who use electricity that they themselves have produced, imported or purchased on the Nordic electricity exchange; and (iii) electricity intensive industries. However, electricity intensive industries have the right to deductions for electricity used in the manufacturing process when calculating their quota obligation.

Pursuant to Chapter 8 Section 12 of the Electricity Act *[Ellagen]* (SFS 1997:857), electricity suppliers are required to provide information about:

1 each individual energy source's share of the average composition of energy sources used to generate the electrical power that the electricity supplier sold during the preceding calendar year, and
2 the impact on the environment in the form of carbon dioxide emissions and the quantity of nuclear waste resulting from the production of the electricity sold.

This information is to be provided on or in conjunction with invoices for the sale of electrical power and in advertising directed at electricity consumers. The electricity supplier may also choose to direct the customer to where they can find this information, for example, on the company's website. Electricity from renewable energy sources that has been allocated certificates within the electricity certificate system is not accounted for separately, but the energy sources that are entitled to electricity certificates are described within the framework of the system.

A large proportion of the electricity in the Nordic countries is sold via the Nordic electricity exchange Nord Pool. The customers in this market purchase their electricity from electricity suppliers who in turn primarily purchase electricity via Nord Pool. Under the rules in the Electricity Act, a customer who has signed a contract with an electricity supplier is to receive information about the electricity supplier's electricity mix in the previous year. Some electricity suppliers also offer their customers the option of signing an electricity agreement that specifies the origin of the electricity, or for example electricity from only wind power or only hydro power. The electricity supplier who purchases electricity via Nord Pool can purchase guarantees of origin in order to guarantee the specific origin of the electricity (the Swedish system for guarantees of origin for electricity is described under point 5). Bilateral agreements can also stipulate requirements relating to the origin of the electricity. This enables an electricity supplier to guarantee that a corresponding amount of electricity from a certain origin has been purchased. Many electricity suppliers report the origin of their electricity for their various agreements on their websites.

The Energy Markets Inspectorate has supervisory authority with respect to the Electricity Act and in the autumn of 2011 it published its regulations and general guidance on origin marking for electricity (EIFS 2011:4). The Swedish Consumer Agency is responsible for electricity suppliers complying with the rules that exist governing marketing, etc.

4. 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)*.

Firstly, it should be mentioned that all biofuels produced from wastes, residues, non-food cellulosic material, and ligno-cellulosic material are entitled to a share in the relevant general instruments described under point 2 and in the Swedish National Renewable Energy Action Plan.

Quota obligation for biofuel (planned)

In its 2014 Budget Bill (2013/14:1), the Swedish Government proposed a new law on quota obligations for biofuel. This law will come into force on 1 May 2014 and will also involve changes to the Energy Tax Act (SFS 1994:1776). As a decision has not yet been taken on the law, this report refers to the proposal as it is worded in the bill.

In the bill the Swedish Government states that it is important to ensure that there is a sufficient market for the second generation of biofuel, taking into consideration the higher production costs of these fuels. The government believes that a positive step in the long term is to introduce a specific quota for the second generation of biofuel that can replace petrol; however, it states that a suitable first step would be to limit this kind of special quota to diesel fuel. The bill therefore contains the requirement that 3.5 percentage points of 9.5 percentage points by volume that the diesel fuel has to blend in must consist of certain designated biofuels. In the bill the Swedish Government refers to the Renewables Directive's current definition of biofuel that gives additional benefits, but believes that the authority that the Swedish Government decides on should be authorised to issue further regulations on what is meant by certain designated biofuels.

HVO has had a major impact in the Swedish biofuel market, so the mix of it in diesel fuel is expected to increase to approximately 3.5 % by volume when the law comes into force. A small percentage of the quota for certain designated biofuels is also expected to include FAME from waste that is rich in fat and oil, and residues.

The Renewables Directive enables Member States to double-count biofuel produced from wastes, residues, non-food cellulosic material, and ligno-cellulosic material compared with national quotas. However, the proposal for the act on quota obligations does not include double-counting in the quota.

Aid for biogas production from manure

In its 2014 Budget Bill, the Swedish Government proposes investing in the digestion of manure to produce raw methane gas. Also see Section 2, planned measures.

5. 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 Swedish system of guarantees of origin for electricity is described below. However, Sweden does not currently have any system of guarantees of origin for heating and cooling from renewable energy sources.

The purpose of guarantees of origin is to make it possible to rely on origin marks for electricity. The end consumer of electricity should be able to get clear information about the origin of the electricity. Under the Guarantees of Origin for Electricity Act *[Lag om ursprungsgarantier för el]* (SFS 2010:601), electricity producers in Sweden have the right to have guarantees of origin issued that show the origin of the electricity produced. A guarantee of origin is given for each megawatt hour of electricity generated. Guarantees of origin can be issued for all types of electricity production, which is more comprehensive than the Directive's minimum requirements.

The Swedish Energy Agency is the supervisory authority and the authority that assesses the applications. It has also issued regulations for guarantees of origin (STEMFS 2010:3). The issuing of guarantees of origin is managed in purely practical terms by Affärsverket Svenska Kraftnät (SvK), an account keeping authority. Guarantees of origin exist only electronically as a record in an account in SvK's account keeping system CESAR. There is therefore an electronic register of guarantees of origin. The Swedish Energy Agency informs SvK of decisions concerning the right to the allocation of guarantees of origin and transfers the details that are necessary for the issuing of guarantees of origin to SvK. A guarantee of origin from another Member State of the EU is also recognised in Sweden unless there is reason to doubt its authenticity. If a guarantee of origin is not recognised, SvK will ensure that it cannot be cancelled as an origin mark.

To warrant the reliability of the guarantees of origin, there are requirements related among other things to measuring and reporting the transmitted electricity, unique identification numbers for each guarantee of origin and that the guarantees are to be cancelled after they have been used.[60] The party noted as the holder in the register of guarantees of origin must ensure that the account keeping authority (SvK) cancels a guarantee of origin after it has been used. A guarantee of origin is also to be cancelled if it has not been used within 12 months of the time that the energy unit to which the guarantee of origin refers was generated. In this way, the cancellation becomes a guarantee that the producer and supplier do not sell more electricity of a certain origin than what has been generated. A guarantee of origin cancelled because of the 12-month rule cannot be used to label product-specific electricity but goes up into the residual mix.[61] In Sweden the guarantee of origin is automatically cancelled 12 months after the production of the energy unit used as the basis of the guarantee of origin.

The Swedish Energy Agency is the supervisory authority for the system of guarantees of origin and has the right to obtain on request information and to view the documentation required to carry out its supervision. The Agency also has the right on request to gain access to production facilities as well as premises and sites associated with the production facilities in question to the extent necessary to carry out its supervision. The Swedish Energy Agency can also revoke a decision concerning the allocation of guarantees of origin.

[60] For more detailed background about the system, see Government Bill 2009/10:128 Implementation of the Renewable Energy Directive *[Genomförande av direktiv om förnybar energy]*.
[61] Residual mix is sold electricity whose origin is not guaranteed or whose guarantees of origin have been cancelled, i.e. what remains when the electricity with guarantees of origin is not included.

The development of biomass for energy purposes (points 6-9 in the template)

6. Describe the developments in <u>the preceding 2 years</u> in the availability and use of biomass resources for energy purposes *(Article 22(1)(g) of Directive 2009/28/EC).*

*It is suggested that **Tables 4 and 4a** are used to provide more detailed information on the biomass supply.*

Note that domestic and imported biofuel and biofuel raw materials are specified uniformly in thousands of tonnes of dry weight (1 000 tonnes DW) in Table 4. The reason for the choice of reporting unit is that tonnes DW is a better unit of measurement in comparisons of different sources of raw material. Note also that the figures in Table 4 for 2012 are preliminary, except for biomass for transport. This is because the final versions of the underlying publications and other data on which these figures are based are not yet available.

***Table 4*: The use of biomass for energy**

	Amount of domestic raw material (1000 tonnes DW)*		Primary energy in domestic raw material (ktoe)		Amount of imported raw material from EU (1 000 tonnes DW)*		Primary energy in the amount of imported raw material from EU (ktoe)		Amount of imported raw material from non-EU (1 000 tonnes DW)*		Primary energy in the amount of imported raw material from non-EU (ktoe)	
	Year 2011	**Year 2012**	**Year 2011**	**Year 2012**	**Year 2011**	**Year 2012**	**Year 2011**	**Year 2012**	**Year 2011**	**Year 2012**	**Year 2011**	**Year 2012**
Biomass for heating and electricity:												
Direct use of wood biomass from forests and other wooded land energy purposes (fellings etc.)**	6 916	7 795	2 766	3 098	47	17	18	7	27	13	11	5
Indirect use of wood biomass (residues and by-products from wood industry, etc.)**	20 158	19 616	7 054	6 785	400	231	163	93	297	336	120	135
Energy crops (grasses, etc.) and short rotation trees (Salix)	48	53	19	20	-	-	-	-	-	-	-	-
Agricultural by-products / processed residues and fishery by-products **	215	240	124	148	44	59	28	39	22	21	18	17
Biomass from waste (municipal, industrial etc.)	2 375	2 367	751	751	-	-	-	-	75	83	23	26
Other - Biogas	195	272	45	79	-	-	-	-	-	-	-	-
Biomass for transport:***												
Traditional agricultural crops for biofuels (sugar cane, cereals, maize)	-	-	80	62	-	-	242	273	-	-	100	99
Energy crops (grasses, etc.) and short rotation trees for biofuels (Not used)	-	-	-	-	-	-	-	-	-	-	-	-
Other – Biomass-based	-	-	66	85	-	-	9	49	-	-	4	10
Residues/by-products from the pulp and paper industry (sulphite liquor and tall oil)	-	-	30	51	-	-	-	2	-	-	-	2

** Amount of raw material, if possible **in m^3 for biomass from forestry**, and **in tonnes for biomass from agriculture and fishery, and biomass from waste**. Note that domestic and imported biofuel and biofuel raw materials are specified uniformly in thousands of tonnes of dry weight (1 000 tonnes DW). In Tables 7 and 7a in Sweden's Action Plan, tonnes DW (or dry weight) and ktoe are also used as units of measurement.*

*** The definition of this biomass category should be understood in line with Table 7 of part 4.6.1 of Commission Decision C (2009) 5174 final establishing a template for National Renewable Energy Action Plans under Directive 2009/28/EC.*

***It was judged not to be possible to report raw materials in weight in a fair and useful way, as the different raw materials are not comparable in terms of weight in relation to energy content.

Comments on the category 'forest fuels'

The following forest fuels are included in the reporting:

- round timber and fuel wood
- residues from tree felling such as branches, tops and (stumps)
- the forestry industry's solid by-products such as shavings and bark, etc.
- the forestry industry's liquid by-products such as black liquors, crude tall oil, and tall oil pitch
- recovered (recycled) wood such as packing material, old furniture and demolition timber
- processed fuel wood such as pellets, briquettes and wood powder.

The following sources of information have been used concerning fuel from forestry:

- The Swedish Forest Agency[62]
- The Swedish Energy Agency[63]
- Statistics Sweden (SCB)[64]
- Swedish Wood Fuel Association *[Svenska trädbränsleföreningen]*[65]
- Swedish Pellet Association *[Pelletsförbundet]*[66].

Imports

A variety of forest biofuel raw materials and biofuels are imported (including pellets, round timber, wood waste and shavings/sawdust). In such cases, the import quantities of these raw materials are reported by the Swedish Forest Agency[67], the Swedish Wood Fuel Association[68] and the Swedish Pellet Association[69]. In these instances the quantity is reported separately. Indirect imports also occur, i.e. when the forest industry imports round timber for forestry purposes. When processing round timber, whether this is done mechanically in a sawmill or processed into pulp, by-products are generated that can be used for energy purposes. There are no reliable statistics for this.

The following sources of information have been used for the conversion rates and ratios:

- The conversion between the units of measurement m^3 and tonnes DW has been done on the basis of established conversion rates/ratios in forestry in accordance with the Practical forestry manual *[Praktisk skogshandbok]* (1992).[70]
- The conversion between the physical units of measurement (m^3 and tonnes) and energy units is done on the basis of established conversion rates according to Lehtikangas (1998).[71]
- Conversion rates for waste liquors were derived from Alakangas (2000).[72]

[62] The Swedish Forest Agency. Swedish Statistical Yearbook of Forestry *[Skogsstatistisk årsbok]* 2012 and 2013. www.svo.se.
[63] The Swedish Energy Agency. Energy in Sweden 2012 *[Energiläget 2012]*, ES2012:03, ES2012:04, ES2012:05 and ES2012:06. www.energimyndigheten.se.
[64] Statistics Sweden (SCB). Statistics publications, EN11, EN20 and EN31. www.scb.se.
[65] The Swedish Fuel Wood Association. Annual reporting to the Swedish Energy Agency (2011/2012). www.tradbransle.se.
[66] The Swedish Pellet Association. Statistics 2011 and 2012. www.pelletsindustrin.org.
[67] The Swedish Forest Agency. Swedish Statistical Yearbook of Forestry *[Skogsstatistisk årsbok]* 2012 and 2013. Table 15.8. www.svo.se.
[68] The Swedish Wood Fuel Association. Annual reporting to the Swedish Energy Agency (2011/2012). www.tradbransle.se.
[69] The Swedish Pellet Association. Statistics 2011 and 2012. www.pelletsforbundet.se.
[70] The Swedish Forestry Association. 1992. Practical forestry manual *[Praktisk skogshandbok]* (1992).
[71] Lehtikangas, P. 1998. Storage Handbook *[Lagringshandboken]*. Swedish University of Agricultural Sciences.
[72] Alakangas, E. 2000. *Suomessa käytettävien polttoaineiden ominaisuuksia. Tiedotteita. 2045*. VTT. Finland.

The following conversion rates are used for wood fuel:

- residues from tree felling, round timber, etc. 4.65 MWh/tonnes DW
- sawdust and bark, etc. 4.5 MWh/tonnes DW
- black liquors, etc. 3.6 MWh/tonnes DW
- pellets, etc. 4.8 MWh/tonnes DW
- recovered wood 4.8 MWh/tonnes DW

Comments on the category 'biomass from agriculture'

The biofuels and biofuel raw materials included are:

- cereals
- straw
- short rotation trees (Salix)
- bio-oils (animal and/or vegetable oils and fats)
- olive pits, sunflower pellets, bean pods/husks, etc.

The information about fuel from agriculture comes from the following sources:

- SCB[73]
- Swedish Board of Agriculture[74]
- Swedish Energy Agency[75]

The conversion between physical units of measurement (m^3, tonne, tonne DW) and energy units (MWh or similar) is done on the basis of established conversion rates/ratios in agriculture, derived in part from the Data book for operational planning in agriculture *[Databok för driftsplanering i jordbruket]* (1992)[76], and in part from the Bioenergy Portal[77] as well as Fredriksson et al. (2004)[78].

The following conversion rates used for biomass from agriculture:

- cereals 4.0 MWh/tonnes DW
- straw 4.0 MWh/tonnes DW
- short rotation trees (Salix) 4.6 MWh/tonnes DW
- bio-oils (animal and/or vegetable oils and fats) 9.3 MWh/tonnes
- olive pits, sunflower pellets, bean pods/husks, etc. 5.0 MWh/tonnes DW.

Comments on the category 'solid waste'

The information about refuse derived fuel (RDF) for the production of heating and electricity comes from the following sources:

[73] Statistics Sweden (SCB). 2011, 2012 and 2013. The provision of electricity, gas and district heating *[El-, gas- och fjärrvärmeförsörjningen]*, EN11SM.
[74] Swedish Board of Agriculture, 2011. Annual agricultural statistics www.jordbruksverket.se and separate report to the Swedish Energy Agency for this progress report.
[75] Swedish Energy Agency. Sustainable bioliquids 2011 and 2012 *[Hållbara flytande biobränsle 2011 och 2012]*.
[76] Swedish University of Agricultural Sciences. 1992. Data book for operational planning in agriculture *[Databok för driftsplanering i jordbruket]*.
[77] www.bioenergiportalen.se
[78] Fredriksson, C., Padban, N. and Zinti, F. 2004. Broadening the fuel base for pellets and powder burners *[Breddning av bränslebasen för pellets och pulverbrännare]*. Swedish District Heating Association.

- Statistics Sweden[79]
- Avfall Sverige AB.[80]

The renewable fraction of the waste has been consistently assumed to be 60 % (for reference and reasoning, see point 12 of the template). The renewable fraction of solid municipal waste, including biowaste and the biodegradable fraction of industrial waste is specified in tonnes of dry weight.

Comments on the category 'biomass for electricity and heating production'

The quantities specified in Table 4 are an estimate of the amounts of raw material used for the production of biogas for electricity and heating production. The following raw materials are included in the reporting:

- catering waste sorted at source
- waste from foodstuffs
- slaughterhouse waste
- sewage sludge
- industrial waste
- energy crops

The information about biomass for heating and electricity production comes from:

- Swedish Energy Agency[81]

The conversion from physical units of measurement for raw materials to energy terms has been done with the help of various conversion factors from:

- Alakangas (2000)[82]
- The Phyllis database[83]
- Swedish Board of Agriculture[84]
- Bioenergy portal[85]
- Hadders (2004).[86]

The share of biogas used for electricity and heating production is reported in the substrate that has been used for the production of biogas. The conversion from physical units of measurement for the substrate to energy content has been done with the help of various conversion factors taken from the Substrate handbook for biogas production *[Substrathandbok för biogasproduktion]*[87] (2009), Basic data about biogas *[Basdata om biogas]* (2011)[88] and Alakangas (2000)[89].

[79] Statistics Sweden (SCB). 2011, 2012 and 2013. The provision of electricity, gas and district heating *[El-, gas- och fjärrvärmeförsöjningen]*, EN11SM.
[80] www.avfallsverige.se.
[81] Swedish Energy Agency. Production and use of biogas in 2011 and 2012 *[Produktion och användning av biogas 2011 resp. 2012]*, ES2012:08.
[82] Alakangas, E. 2000. *Suomessa käytettävien polttoaineiden ominaisuuksia. VTT tiedotteita 2045*. Finland.
[83] ECN, "Phyllis database for biomass and waste", available from: www.ecn.nl/phyllis/single.html.
[84] Tolke et al., 2011. Renewable fuels from agriculture – ethanol, biodiesel, biogas *[Förnybara drivmedel från jordbruket – etanol, biodiesel, biogas]* Report 2011:14.
[85] Bioenergy portal *[Bioenergiportalen]* . 2013. Available from: www.bioenergiportalen.se.
[86] Hadders, G. 2004. Cereals as fuel *[Spannmål som bränsle]*.
[87] Carlsson, M., Uldal, M. 2009. Substrate handbook for biogas production *[Substrathandbok för biogasproduktion]*, Svensk Gasteknisk Centrum AB. Report SGC 200.
[88] Svenskt Gastekniskt Centrum AB, 2011. Biogas – Basic data about biogas 2011 *[Biogas – Basdata om biogas 2011]*.
[89] Alakangas, E. 2000. *Suomessa käytettävien polttoaineiden ominaisuuksia. VTT tiedotteita 2045.* Finland.

Comments on the category 'biomass for transport'

The quantities specified in Table 4 are an estimate of the amounts of raw material used for the production of various biofuels. The following raw materials are included in the reporting:

- cereals
- maize
- sugar cane
- sugar beet
- sugar molasses
- oil plants
- catering waste sorted at source
- waste from foodstuffs
- slaughterhouse waste
- sewage sludge
- industrial waste
- tall oil
- sulphite liquor

Since neither energy crops nor short rotation trees are used for the production of biofuel in Sweden, there are no data about these in Table 4.

The information about biomass for transport comes from the Swedish sustainability reporting.[90, 91]

Table 4a. Current domestic agricultural land use for production of crops dedicated to energy production (hectares).

Land use	**Surface (hectares)**	
	2011	**2012**
1. Land used for traditional arable crops (wheat, sugar beet etc.) and oilseeds (rapeseed, sunflower etc.) (Please specify main types)[1]	N/A	N/A
2. Land used for short rotation trees (willows, poplars). (Please specify main types)[2]	**12 064 hectares** Of which: **11 080 salix** **613 poplars** **371 hybrid aspen**	**11 861 hectares** Of which: **10 637 salix** **947 poplars** **277 hybrid aspen**
3. Land used for other energy crops such as grasses (reed canary grass, switch grass, Miscanthus), sorghum. (Please specify main types)[2]	**912 hectares** Of which: **817 reed canary grass** **95 hemp**	**828 hectares** Of which: **766 reed canary grass** **62 hemp**

[1] The Swedish Board of Agriculture's statistics for traditional arable crops do not specify the purpose for which the crops are used.

[2] Information about short rotation trees and other energy crops comes from the Swedish Board of Agriculture and is clarified in the text below.

The Swedish Board of Agriculture's statistics on agricultural land use contain information about which crops are grown and on which acreages. However, there is no information about what the crops are used for.

Information on land where cereals and other crops are grown for food production can be found in the Swedish Board of Agriculture's statistics database.[92] Some of these crops may also be used as raw material for energy.

[90] Swedish Energy Agency 2012. Sustainable biofuel and bioliquids in 2011 *[Hållbara biodrivmedel och flytande biobränsle under 2011]*, ET2012:212.
[91] Swedish Energy Agency 2012. Sustainable biofuel and bioliquids in 2012 *[Hållbara biodrivmedel och flytande biobränsle under 2012]*, ET2013:06.
[92] The databases for 2011 and 2012 can be found at the following Internet addresses: http://www.jordbruksverket.se/webdav/files/SJV/Amnesomraden/Statistik%2C%20fakta/Arealer/JO10/JO10SM1201/JO10SM1201.pdf

Table 4 (a) shows the amount of energy crops and energy forests that are cultivated. Hemp is also included in the report, but this is probably not used for energy to any major extent.

It should be noted that grassland is currently used for biogas to a certain extent and this use may increase as the number of biogas plants increases. Farm-scale plants that mainly digest manure often benefit by mixing in some grassland, and there are some individual plants that use grassland as their main substrate. One example of this is SBI's biogas plant in Örebro.

It is estimated that approximately one million tonnes of straw is available for energy use. [93] Approximately 100 000 tonnes are used for fuel, corresponding to 0.4–0.5 TWh.[94]

In 2011 there were 24 farm-scale biogas plants in operation. Another 15 were opened in 2012. When all 39 of these farm-scale biogas plants are in use, they digest approximately 480 000 tonnes of manure. As well as these farm-scale biogas plants, there are large co-digestion plants that are in operation, which mainly use manure from farms. They digest an additional 250 000 to 350 000 tonnes of manure.

This means that the existing agricultural biogas plants digested somewhere between 730 000 and 830 000 tonnes of manure per year in total at the end of 2012.

http://www.jordbruksverket.se/webdav/files/SJV/Amnesomraden/Statistik%2C%20fakta/Arealer/JO10/JO10SM1301/JO10SM1301.pdf

[93] Bernesson, S. & Nilsson, D., 2005. Straw as an energy source *[Halm som energikälla]*. Report 2005:7. Swedish University of Agricultural Sciences. Department of Biometry and Technology.

[94] SOU 2007:36. Bioenergy from agriculture – a growing resource *[Bioenergi från jordbruket – en växande resurs]*.

7. Provide information on any changes in commodity prices and land use within your Member State in the preceding 2 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 in your country *(Article 22(1)(h) of Directive 2009/28/EC).*

When assessing commodity price impacts, it is suggested to consider at least the following commodities: common food and feed crops, energy wood, pellets.[95]

Changes in commodity prices

No empirical studies have been carried out to show the impact the increased domestic use of biomass has had during the period on either domestic commodity prices or domestic land use. Neither have any major changes in either land use or commodity prices been observed during the period in question that can directly be explained by the increased use of biomass.

One reason for the link being weak is assessed to be due to the fact that the majority of biomass usage is primarily based on waste and residues with limited alternative areas of use. In a future where competition for these waste and residue products could arise, or when forests or agricultural land is used directly for the production of biomass for energy purposes to a greater extent than today, more tangible effects may arise. In 2011 and 2012 the use of waste oil and residue oil increased so significantly that it is worth taking a closer look at the trend in their price in the future. This coincides with the increase in the use of HVO and vehicle gas produced by waste.

Figure 1 shows the trend in prices for solid biofuels. Over the past two years the trend in prices for wooden pellets and wood chips in particular has fallen, which is a break in the trend. The downwards trend that started following the record cold winter of 2009/2010 has continued. This is also reflected in the trend for the most important solid biofuels, i.e. processed wood fuels (pellets, briquettes and powder) and wood chips. Many reasons could be behind this trend, including better import opportunities, which may keep the prices down, and a greater use of waste in the heating sector. It is also probable that the fall in demand due to warmer winters over the past three years has affected this trend. Taken from a longer perspective, the real price of wood fuel for heating plants remained mostly unchanged in the 1980s and 1990s. During this period there was a surplus of residues from the forestry industry without any outlet for them. In the 2000s demand has increased, which has been reflected in the trend in prices. More expensive ranges, from, for example, an increase in branch and top removal for chipping, has affected prices. Political instruments, including the electricity certificates system, has also increased the willingness to pay in the market.

Figure 1: **The trend in prices for fuel wood and peat used by heating plants, SEK/MWh, prices from the year 2012. Processed biofuel includes pellets, briquettes and wood powder.**

[See graph in original]

Source: Fuel wood and peat prices, Swedish Energy Agency 2013

Sweden forms part of the international market for ethanol and FAME, so it cannot be shown whether the price impact is on a national or international level. The prices of Swedish companies vary in accordance with the price quotations[96] for European biofuel and in this context Swedish producers can be considered to be price takers without being able to influence the prices. This is true for both low-blend and high-blend fuel such as E85, B100 and ED95, even though the prices of the latter do not

[95] Traditional forest ranges should also be included here.
[96] For example, F.O. Licht och Platts

only depend on the price of ethanol and FAME. A clear majority of crops used for biofuel production has foreign origins (see Table 4), so it is difficult for the use of biofuel to have an impact on the price of agricultural products. Cereals and other agricultural products from Sweden, just like ethanol and FAME, form part of the international market, and the trend in prices for wheat and rape, which are Swedish raw materials that are used in production, reflect the international price quotations.[97, 98]

Changes in land use due to increased use of bioenergy

As the predominant use of biofuel in Sweden today comprises by-products and residues generated by forestry, the wood and timber industry, and the pulp and paper industry (see Table 4), its use is currently not resulting in changes to land use.

The current use of domestic crops for the production of biofuels and bioliquids is still limited, and is assessed as not resulting in any changes to land use in Sweden either. As the total cultivated area for cereals and rape increased from 0.963 million hectares in 2010 to 1.0 million hectares in 2012[99] [100] it is only reasonable to assume that the majority of cereal cultivation for biofuel production is occurring on what was previously open areas of arable land. The area of rape/turnip rape fell between 2010 and 2011, but increased in 2012 to the same level as for 2010, approximately 110 000 hectares.

Changes in land use due to the expansion of wind power

In 2012, 842 MW of wind power was installed in Sweden. Over the past six years there has been a significant increase, compared with the years before 2007, when the increase in installed output was approximately 60 MW per year. In total 367 plants started operating in 2012. The expansion of wind power in 2012 was exclusively on shore.[101]

The land occupied varies depending on conditions at the site as well as the requisite distance from other land use. There is a safety distance to residents that is associated with the sound levels (40 dB(A)), i.e. not a specific distance. This generally means a distance of at least 500 metres, often more. A general figure used to estimate the land required for a wind power installation is around 0.3 km^2 for a normal 2–3 MW power plant. However, wind power plants generally only change land use to a certain extent, since the land around them can still be used for certain purposes. Industrial activities are compatible with wind power installations, but are naturally dependent on other parameters as well. Agriculture or forestry are very common in wind power areas and here, the establishment of a wind power plant does not mean in practice any requirements in terms of distance to the plant. Roads, etc., to wind power plants of course take some land and can alter the current land use. However, there is no estimate of this area available. During the construction phase, access to the land around wind power installations is limited for security reasons, but not to operating installations. For the former, the same rules apply as to other construction sites. With regard to the safety distance for ice throw, there are control programmes that can indicate that access roads may be closed if there is a risk of ice throw, but this is in special cases.

This means that it is deemed to be not possible to estimate quantitatively the change in land use resulting from wind power.

The change in land use due to the expansion of wind power in 2011 and 2012 is assessed to be minimal.

[97] Analysis of the markets for ethanol and biodiesel 2011 *[Analys av marknader för etanol och biodiesel 2011]*, Swedish Energy Agency.
[98] Analysis of the markets for biofuel 2012 *[Analys av marknader för etanol och biodiesel 2012]*, Swedish Energy Agency.
[99] Statistics Sweden (SCB). 2012. Use of agricultural land 2011 *[Jordbruksmarkens användning 2011]*.
[100] Statistics Sweden (SCB). 2013. Use of agricultural land 2012 *[Jordbruksmarkens användning 2012]*.
[101] Swedish Energy Agency. Wind Power Statistics *[Vindkraftstatistik]* ES 2013:01, 2013, p 11-14.

8. Describe the development and share of biofuels made from wastes, residues, non-food cellulosic material, and lingo cellulosic material *(Article 22(1)(i) of Directive 2009/28/EC)*.

In the most recent progress report conservative figures were given for the known amounts in the 'Total usage of Article 21(2) biofuels' and 'Share of 21(2) fuels from total RES-T'. This report stressed that the figures given could be underestimates. When producing this progress report, the Swedish Energy Agency reported on the previous two years in accordance with Sustainability Act (SFS 2010:598). The figures that are now quoted are therefore the actual amounts reported by companies that handle biofuel and refer specifically to biofuel used for transport.

Waste and residues are not defined in the directive, so it is up to the Member States to decide on this. Sweden has not produced an exhaustive list of waste or residues, but instead refers to the definitions contained in the Sustainability Act. In accordance with these definitions, waste is any substance or object which the holder discards or intends or is required to discard; residues are the materials that remain after a completed process, whose main purpose is not to produce this material and where the process has not intentionally been changed to produce this material. In its guidelines[102] the Swedish Energy Agency has provided examples of what constitutes residues and waste.

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

Article 21(2) biofuels[103]	2011	2012
Production –		
Biogas	57	73
DME	<1	<1
Ethanol	7	3
FAME	<1	<1
HVO (hydrogenated vegetable oils)	28	50
Usage –		
Biogas	61	78
DME	<1	<1
Ethanol	7	3
FAME	<1	<1
HVO	28	102
Total production of Article 21(2) biofuels	92	126
Total usage of Article 21(2) biofuels	95[a]	183
Share of 21(2) fuels from total RES-T (%)	31%	46%

a. As the figures have been rounded, some sub-items deviate from the total.

HVO

All of the major fuel suppliers in Sweden now blend HVO into their diesel and many of them use HVO that is produced from waste and residues, which has led to a significant increase in its use. In 2011 Swedish tall oil was used almost exclusively as the raw material for HVO in this item. The HVO that was used in Sweden in 2011 was almost exclusively produced in Sweden.[104] More than half[105] of the HVO that was produced in 2012 used Swedish tall oil as the raw material, while the rest was produced from slaughterhouse waste and vegetable or animal waste oil, primarily from the Netherlands, but also from a small number countries both inside and outside the EU.[106] In 2012 imports grew substantially; fuel suppliers that accounted for all sales of HVO up to 2012 have their own production, while the others rely on foreign production.

[102] ER 2012:27.
[103] Biofuels made from wastes, residues, non-food cellulosic material, and ligno-cellulosic material.
[104] 93% from Sweden, 7% from the Netherlands
[105] 51% tall oil, 25% slaughterhouse waste and 24% from vegetable or animal waste oil.
[106] Finland, United States of America (USA), Spain and Uruguay.

Biogas

The use of biogas in the transport sector continues to increase and was the area of use for biogas that increased most rapidly in both 2011 and 2012.[107] As most of this was produced from waste and residues, the share used for the transport target is rapidly increasing. Swedish production accounts for virtually all the quantities that have been reported here. Although there were some imports of biogas and raw materials from other countries, the production figure above is a conservative estimate and only includes biogas from Swedish raw materials. The raw materials used for biogas vary, the most common in this category being sludge from municipal sewage treatment plants and individual sewage drainage systems, as well as source-sorted food waste from households and businesses (solid form) and slaughterhouse waste.

Ethanol

The production and use of ethanol from residues and waste that are sustainable and can be double-counted for the transport target fell between the reporting years, while the raw materials used have been restricted, from having used lye, molasses from sugar crops, and wine residues, to almost exclusively consisting of wine residues.

DME and FAME

Table 5 also includes small quantities of DME and FAME in this item. The DME that has been reported was produced from black liquor, which is a residual product from the pulp and paper industry. The previous progress report described a pilot plant that was set up in 2010 and where production would soon start. The production of DME started in 2011 and the DME produced here in both years has been reported here.

The FAME that is also included in this table has only been produced in very small quantities. It was produced from waste oils from Denmark and was classed in the Swedish Energy Agency's most recent report on sustainable biofuel as being negligible.[108]

[107] Production and use of biogas in 2011 *[Produktion och användning av biogas år 2011]*.

[108] Sustainable biofuel and bioliquids in 2012 *[Hållbara biodrivmedel och flytande biobränsle under 2012]*. ET 2013:06

9. 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 <u>in the preceding two years</u> *(Article 22(1)(j) of Directive 2009/28/EC).* *Please provide information on how these impacts were assessed, with references to relevant documentation on these impacts within your country.* ***(Article 22 (1)(j) of Directive 2009/28/EC)***

The use of agricultural land for growing crops for Swedish biofuel production

The current use of domestic crops for the production of biofuels and bioliquids is still limited, and is assessed as not leading to any change in land use in Sweden. As the total area of land growing cereals and rape seed/turnip rape in Sweden has decreased compared with 2005 (applies to both 2011 and 2012)[109], it can be argued that cereals and rape seed for biofuel production has not led to any further impact (compared with if the crops were being grown for other purposes). As long as new agricultural land is not used, and as long as other crops do not start to be cultivated to be used as raw material, the effects of growing these crops are the same, whether the harvest is used to produce food or fuel. In this section we attempt as far as possible to quantify, in a simplified way, the actual impact that the cultivation of crops for biofuels has. Information about the quantities of ethanol and biodiesel is based on the reported volumes of sustainable fuel with a Swedish origin.[110] However, it should also be noted that it is possible that the effects described below would arise even if Sweden did not have any production of biofuel from domestic raw materials. This would be the case if the same amount of wheat and rape seed was grown for purposes other than energy. The amount of domestic raw materials varies from year to year depending on the harvest and harvest quality, as well as the international nature of the market for raw materials.

It should be noted that no consideration has been taken to the by-products, such as feed, that are produced when biofuel is produced, and which should therefore represent a share of the effect that we have reported here for biofuels (which would therefore be an overestimation of its effect). The fact that no consideration has been taken of the environmental impact of the by-products means these figures are a major simplification of the current situation.

Assuming that all raw materials for biofuel production are domestically produced, approximately 110 000 hectares of agricultural land is required to cultivate the cereals for the total production capacity of cereal ethanol. Approximately 50 000 hectares are needed to fully meet the current production capacity for biodiesel using domestic raw materials.[111] When taking into consideration the amount of biofuels (ethanol and FAME) in Sweden with raw materials that have Swedish origin[112], this means that approximately 55 000 hectares of agricultural land are required to cultivate cereals and approximately 3 000 hectares for cultivating oilseed plants. This corresponds to approximately 5 % and 3 % of the current agricultural land for cereals and oilseed plants.

Biodiversity

The land take for biofuel production in Sweden is marginal. Sweden's total utilised agricultural area is 2.6 Mha and comprises 6 % of Sweden's land area. Only a small proportion of the agricultural area is utilised for crops for biofuels. The total cultivated area is currently not controlled to any great extent by demand for raw materials for biofuels.

The loss of biodiversity in agriculture is well documented and is due to a high degree to rationalisation and new agricultural methods. As it is so marginal, being able to quantify the effects

[109] Based on data from Statistics Sweden (SCB) in 2013.
[110] As this information was not available for the previous report, several assumptions were made which provided higher values of substances that have an impact on the environment for the years 2009 and 2010.
[111] Börjesson, P, Tufvesson, L, Mikael, L, 2010. Lifecycle analysis of Swedish biofuel *[Livscykelanalys av svenska biodrivmedel]* Report 70, University of Lund.
[112] According to the reports on sustainable fuels.

on biodiversity of Sweden production of biofuels from wheat and rape seed is hardly possible. It is difficult to determine changes at all over such a short period of time as the two years that the Commission has asked for. In addition, questions arise concerning the choice of methodology and the zero alternative for comparison.[113] The production of various agricultural crops is dependent on demand and the general EU aid to agriculture. Energy crops are grown in a similar way to conventional agricultural crops. An absence of investment in biofuel would not necessarily mean a reduced production of the crops. Work is currently being done in Sweden in an attempt to preserve biodiversity in agriculture. This work is done irrespective of what the products of agriculture are used for. The main initiatives are environmental compensation of various types in order to preserve biodiversity, as well as information and advice.

For the reasons mentioned above, it is hardly possible to quantify how the cultivation of raw materials for biofuels is impacting biodiversity.

Water resources

'Water resources' here refers to activities that impact on the quantity of water, that is, irrigation, etc. In Sweden, access to water is not a problem other than in particular years when parts of the country can be hit by drought. However, cereals and other crops used to produce biofuels are not irrigated, not even during years with drought.

Soil and water quality

Since it is assessed that no new agricultural land is taken for the current production of crops for biofuels, the assumption is that these do not contribute to any direct changes in stored carbon in the soil that need to be taken into account in this context.

The cultivation of cereals for ethanol in Sweden adds more than 300 tonnes of eutrophying substances (PO_4^3 equivalents) and around 150 tonnes of acidifying substances (SO_2 equivalents). Rape seed for biodiesel adds approximately 100 tonnes of eutrophying substance (PO_4^3 equivalents) and approximately 30 tonnes of acidifying agents (SO_2 equivalents), see Table C below.

In 2011 the production of biogas for biofuel amounted to around 75 Mm^3 (the equivalent of 0.67 TWh or 61 ktoe), adding around 24 tonnes of eutrophying substances (PO_4^3 equivalents) and around 130 tonnes of acidifying substances (SO_2 equivalents) if the value for the biogas substrate from household waste is used for the entire production. In 2012 the production of biogas for biofuel amounted to around 83 Mm^3 (0.78 TWh or 67 ktoe), adding around 26 tonnes of eutrophying substances (PO_4^3 equivalents) and around 145 tonnes of acidifying substances (SO_2 equivalents) with the same assumptions as for 2011.

The report Lifecycle analysis of Swedish biofuels *[Livscykelanalys av svenska biodrivmedel]* from Lund University, Faculty of Engineering[114] has been used for the estimates above. The information about the emissions of eutrophying substances and acidifying substances for Swedish biofuels based on current conditions and with the energy allocation method has been used (see Table D below which, along with information reported in the text, is the basis for Table C).

[113] Does this refer to land entirely unaffected by humans, i.e. native forest, or is it when biodiversity in agriculture was at its greatest before the mechanisation of agriculture, or should one compare with a particular year before which the crop was used for something other than biofuel?

[114] Börjesson, P., Tufvesson, L., Mikael, L., 2010. Lifecycle analysis of Swedish biofuels *[Livscykelanalys av svenska biodrivmedel]*. Report 70, Lund University.

Table C: Estimated emissions of eutrophying substances (tonnes of PO_4^3 equivalents) and acidifying substances (tonnes of SO_2 equivalents) from the Swedish cultivation of cereals and rape for biofuel for 2011 and 2012.[115] Note that the fact that the by-products bear a portion of the environmental impact has not been taken to account.

	Estimated impact take into account domestic raw materials (tonnes PO_4^3 equivalents)		Estimated impact take into account domestic raw materials (tonnes SO_2 equivalents)	
	2011	**2012**	**2011**	**2012**
Ethanol	360	320	162	144
Biodiesel	108	87	35	28
Biogas	24	26	130	145

Table D: Summary assessment of biofuel emissions of eutrophying substances (mg PO_4^3 equivalents/MJ fuel) and acidifying substances (mg SO_2 equivalents/MJ fuel) based on current conditions. Source: Börjesson et al., 2010.

Crop or substrate	Fuel	mgPO_4^3 equivalents/ MJ fuel	mgSO_2 equivalents/ MJ fuel
Wheat	**Ethanol**	147	66
Rape seed	**Biodiesel**	243	78
Household waste	**Biogas**	8	47
Industrial waste	**Biogas**	6	32
Manure	**Biogas**	9	49

Besides water and organic material, the digestion residue formed in the production of biogas also contains microorganisms and various nutrients. The digestion residue can be used as fertiliser. Depending on its origin, the digestion residue is given different names: biofertiliser (co-digestion plants) and digested sludge (sewage treatment plants). For biofertiliser, there is a certification system (SPCR 120) through which the biogas plant can quality-assure its biofertiliser and show the entire chain from raw material to end product. Concentrations of metals and pathogenic bacteria for example are checked regularly. The heavy-metal content of digested sludge can limit its use in agriculture. To develop and systematise the upstream work of sewage treatment plants Sweden has a certification system called ReVAQ.

[115] The following energy content has been used in the estimation: 21.2 MJ/litre ethanol, 33 MJ/litre biodiesel and 35.3 MJ/Nm^3 biogas.

Estimated net greenhouse gas emission savings due to the use of energy from renewable sources (point 10 in the template)

10. 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)*.

Net greenhouse gas emission savings have been estimated using two different calculation methods, which are reported for Case 1 and Case 2. Refer to the first progress report for a more detailed description of the calculation methods and assumptions.

Case 1 Emission savings compared with a reference scenario where all renewable sources are replaced by fossil fuels

The Commission requires Member States to estimate the net greenhouse gas emission savings due to the **total** use of energy from renewable sources in the Member State.

Net greenhouse gas emission savings have therefore been estimated by calculating the difference between emissions from the renewable energy sources[116] and their fossil comparators, where emission factors for the fossil comparators are based on the Commission's recommendations,[117] which correspond to the separate production of electricity and heating with fossil fuels.

For biofuels, the typical values for greenhouse gas emission savings that are set out in the Renewables Directive have been used. When calculating the savings, the amounts, raw materials, production processes and origins were taken from the reports that companies that are obliged to report in accordance with the Act on sustainability criteria for biofuels and bioliquids (SFS 2010:98) have submitted to the Swedish Energy Agency. The savings have been calculated using the method[118] stipulated in STEMFS 2011:2.

Case 2 Greenhouse gas emission savings compared with a reference scenario where renewable sources for electricity and heating production is replaced with the average energy mix for electricity and heating production in 2009

Sweden started to use hydro power on a large scale in the early 1900s and without it, the industrial structure in the country would look different today. Calculating the consequences of the theoretical greenhouse gas emission savings for Sweden without hydro power, in accordance with Commission's proposals, would therefore not be particularly useful from a Swedish perspective.

The net greenhouse gas emission savings have been estimated in Case 2 by calculating the difference between the emissions from the renewable energy sources (as in Case 1) and the emissions for the fossil comparators of the renewable energy sources that are represented by the emission factors[119] for Swedish electricity and district heating production mixes for 2009 (instead of emission factors for fossil production, as in Case 1).

[116] Gode, J et al., Environmental Fact Book 2011 Estimated emission factors for fuels, electricity, heating and transport in Sweden *[Miljöfaktaboken 2011 - Uppskattade emissionsfaktorer för bränslen, el, värme och transporter]*, Värmeforsk (Thermal Engineering Research Institute).

[117] COM (2010) 11 final. Report from the Commission to the Council and the European Parliament on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling

[118] A Nordic electricity mix had to be used to calculate GHG performance for the Swedish report.

[119] Approximately 25 grams of CO_2 equivalents/kWH for electricity and approximately 120 grams of CO_2 equivalents/kWH for heating. These emission factors come from: Martinsson, F and Gode, J 2011. Emission factors for the Swedish electricity mix and Swedish district heating in 2009 *[Emissionsfaktorer för svensk elmix och svensk fjärrvärmemix år 2009]*. IVL Swedish Environmental Research Institute. Report produced for Article 22 Reporting. Available from the Swedish Energy Agency.

For Case 2 it ought to be pointed out that the emission factor for the district heating mix has been used as the fossil comparator for all heating production (i.e. including heat pumps and solar heating, etc.), which is a very simplified assumption. In addition, note that the emission factors used in this case represent the total greenhouse gas emissions (i.e. using the lifecycle perspective). In this context, it should also be pointed out that the emission factors for the Swedish electricity and district heating production mix for 2009 would not be the same if hydro power did not exist, for example, but it does give a picture of how the different calculation methods affect the results.

Biofuels are calculated in the same way as in Case 1.

Results

The estimated net greenhouse gas emissions savings in Table 6 are not a description of the actual emissions savings that have resulted from the use of renewable energy. The calculation methods give a very simplified description of the fossil emissions that are assumed to have been replaced but shows how important the choice of method has on the results. This information should therefore not be taken out of context or used for other purposes. However, the calculation can be of interest to compare with corresponding estimates for Sweden in previous and future progress reports on the development of renewable energy.

Table 6: Estimated greenhouse gas emissions savings due to the use of energy from renewable sources in Case 1 and Case 2 (the latter is shown in parenthesis), Mt carbon dioxide equivalents.

Environmental aspects	2011	2012
Total estimated theoretical net reduction in GHG savings from the use of energy from renewable sources[120]	86 (13)	98 (14)
- Estimated net GHG saving from the use of renewable electricity	58 (1.2)	67 (1.5)
- Estimated net GHG saving from the use of renewable energy for heating and cooling	27 (11)	31 (11)
- Estimated net GHG saving from the use of renewable energy for transport[a]	1.0 (1.0)	1.4 (1.4)

[a] *Note that renewable electricity for transport is not included in this item but is instead included in the estimation of the net greenhouse gas emissions savings from the use of renewable electricity*.

Case 1

In Case 1 the total use of renewable energy in 2011 gives a theoretical possibility of the emissions being approximately 86 Mt CO_{2eq} (carbon dioxide equivalents) lower than they would have been if the renewable energy had come from their fossil comparators instead.

Table 6 also reports the data divided by sector. The use of renewable electricity in Sweden in 2011 represents the highest contribution with 58 Mt CO_{2eq} of the theoretical net savings, which includes 47 Mt CO_{2eq} from hydro power. This shows the impact of hydro power on this method of calculating net savings.

For 2012 the total use of renewable energy gives a theoretical possibility of emissions having fallen by approximately 98 Mt CO_{2eq}. In 2012 the production of electricity from hydro power was at record high levels, having a greater impact than in previous years. Hydro power alone accounts for as much as 56 Mt CO_{2eq}.

The use of biofuels continues to increase in Sweden. It was primarily the use of low-blend biodiesel and biogas that increased in 2011 and 2012, which explains the increase in theoretical net savings of greenhouse gases in the transport sector.

[120] 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 only be counted once towards the total estimated net GHG savings.

It is not only hydro power production that affects the results in this method of calculating the theoretical net greenhouse gas emissions. Wind power is growing in Sweden and accounts for a higher share of production every year. Temperature is a factor that affects the use of energy for heating in the winter in Sweden. Although it had been warmer than normal in Sweden for several years, it was only 3% warmer than normal in 2012. Preliminary statistics also show that the housing sector reported a higher use of biofuels in 2012 than in previous years, which also impacts the use of biofuel in the district heating plants.

Case 2

Using the emission factors for the Swedish electricity and district heating production mix, the total use of renewable energy in 2011 instead provides a theoretical possibility of having reduced emissions by 13 Mt CO_{2eq}. For 2012 the corresponding data is approximately 14 Mt CO_{2eq}. The differences between the years are very minor compared with the calculations in Case 1.The difference between 2011 and 2012 is caused by the renewable electricity item, which as in Case 1, is mostly a result of the very high hydro power production in 2012.

The potential for and information about cooperation mechanisms (point 11 in the template)

11. 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 ***(Article 22(1)(l–m) of Directive 2009/28/EC).***

According to the forecast[121] that is the basis for estimating the potential excess production and/or deficit production all energy from renewable sources compared with the indicative trajectory[122] in this progress report (Table 7), Sweden lies over the indicative trajectory throughout the entire forecast period (see Figure 2 below). For a description of the underlying forecast and the conditions for the forecast, see Annex 1.

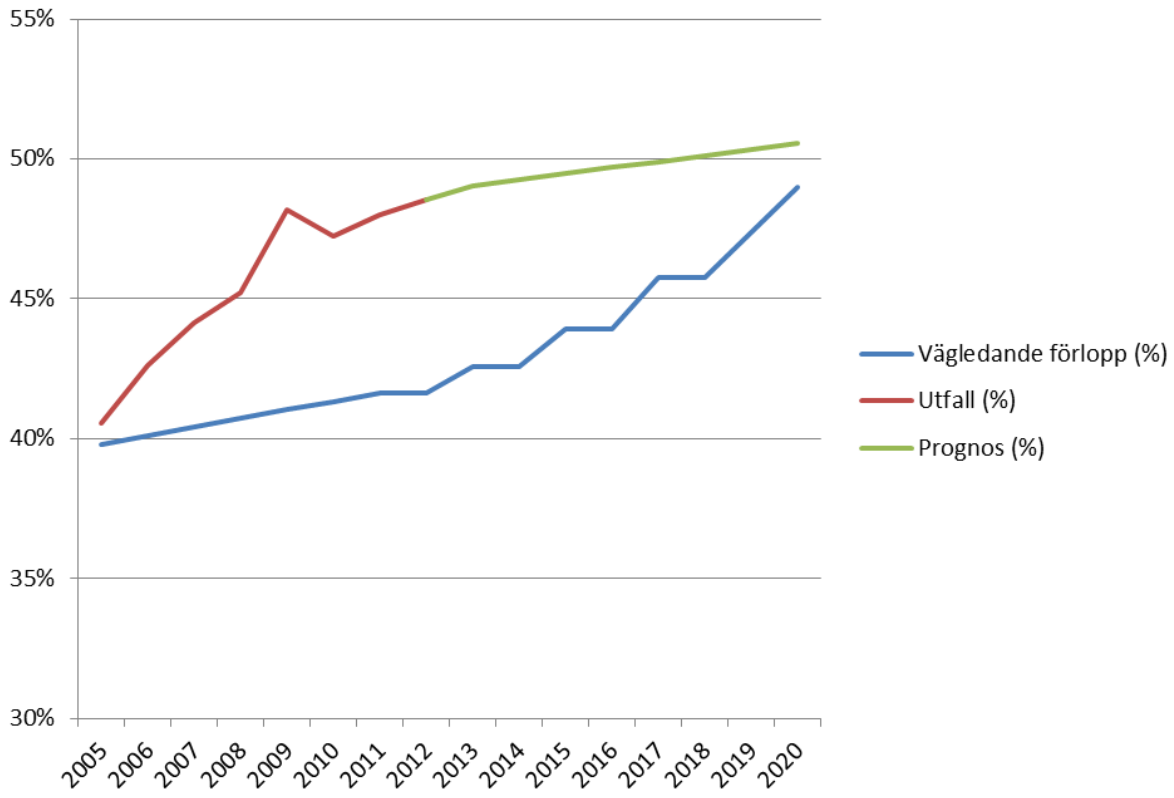
Table 7 shows the actual (for 2009–2012) and the estimated (for the other years) excess production of energy from renewable energy compared with the indicative trajectory.

Table 7: **Actual and estimated excess and/or deficit production of energy from renewable sources compared to the indicative trajectory which could be transferred to other Member States in Sweden (ktoe).[123],[124]**

	Year 2009	Year 2010	Year 2011	Year 2012	Year 2013	Year 2014	Year 2015	Year 2016	Year 2017	Year 2018	Year 2019	Year 2020
Actual/estimated excess or deficit production[125] (ktoe)	2 190	2 020	2 200	2 930	2 470	2 560	2 120	2 220	1 590	1 680	1 150	610
Actual/estimated excess or deficit production (TWh)	25	23	26	34	29	30	25	26	18	20	13	7

[121] Swedish Energy Agency report: *Long-term forecast 2012 [Långsiktsprognos 2012]*, ER 2013:03.
[122] The indicative trajectory is stipulated in the directive.
[123] *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, the Member State may correct the data of the previous reports.*
[124] *When filling in the table, for deficit production, the shortage of production is marked using negative numbers (e.g. –x ktoe).*
[125] The Commission has asked for this information to be "distinguished per type of renewable energy and per origin/destination of import/export", which we have disregarded in this report because the data on which this report is based does not present the excess production per type of renewable energy.

Figure 2: **The indicative trajectory, the actual outcome and the existing forecast growth in the share of energy from renewable sources in Sweden up to 2020.**



(Translation of figure above:

Blue = Indicative trajectory (%) Red = Outcome (5) Green = Forecast (%))

In 2020 the share of renewable energy will be 50.6 % based on the forecast's reference scenario.[126] The values between the statistics years and 2020 have been interpolated. The excess in the forecast corresponds to approximately 7 TWh in 2020. The uncertainty of this target achievement can be seen by the fact that if the amount of renewable energy is around 7 TWh lower *or* if the total energy use is around 14 TWh higher (everything else being equal in the forecast), the share of renewable energy will reach the target level of 49 %. As a comparison, the total energy use has varied between 391 TWh and 427 TWh between 2005 and 2011. In terms of renewable energy, consideration should not only be taken to the uncertainties that are inherent with the forecast, but also the fact that implementing the Water Directive and phasing out plants in the electricity certificates system may impact renewable energy production.

Since the previous report Sweden has established a joint electricity certificates system with Norway. In the forecast that this report is based on, slightly more renewable electricity is expected to be built in Norway than in Sweden in 2020. According to the distribution rule that Sweden notified to the European Commission on 25 March pursuant to Article 11(1)(b), Sweden should count some of this energy for itself in this instance. The energy based on the distribution rule is missing from the table above. It is assessed that approximately 1 TWh of additional renewable energy should be included in the figure for Sweden in 2020 based on

[126] In two alternative scenarios with assumptions on higher economic growth and higher prices for fossil fuels, the share of renewable energy was 50.1 % and 50.6 % respectively.

the forecast. With this additional 1 TWh of electricity, the excess of 610 ktoe in the table above would be 690 ktoe instead.

An assessment of the distribution of the renewable electricity that must be shared between Sweden and Norway in accordance with the Swedish Government's notification on 25 March 2012 for the distribution rule pursuant to Article 11(1)(b) has only been made for 2020 and a method for making these calculations needs to be further developed. It is important to point out that in the coming years, a higher share of renewable electricity should be built in Sweden, which is why some of the renewable energy produced in Sweden should then be counted in Norway.

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

Sweden and Norway came to an agreement regarding a joint support scheme for renewable electricity production by means of a joint market for electricity certificates, which started on 1 January 2012. A joint electricity certificates market means that an electricity certificate issued in one country can be used to meet the quota obligation in the other country and vice versa. This means that renewable electricity production can be located in both Norway and Sweden. The market determines where it is most cost-effective to build for a certain type of electricity production. The producers of renewable electricity can then sell their certificates in this joint market. This results in more players in the market and stronger competition.

In its annual budgetary allocations for 2013, the Swedish Energy Agency was given the new task of analysing different alternatives for the cooperation mechanisms in the Renewables Directive. This assignment had four different parts. The first part involved the Swedish Energy Agency continually assisting the Government Offices of Sweden (Ministry of Enterprise, Energy and Communications) with data that may be needed for sounding out interest with other Member States. The second part (reported in May 2013[127]) involved working with the wind power sector to produce a proposal for the practical handling of joint projects for offshore wind power. In its report the Swedish Energy Agency drew the conclusion that although there is interest for joint projects in the sector in Sweden, the interest from other Member States risks coming too late to develop cooperation before 2020. According to the report there are six offshore wind farms that have been granted a permit pursuant to the Environmental Code to be constructed, but they have not been built because they have not been assessed to be profitable enough. These farms represent a total installed output of 2300 MW, which would be able to produce 8.5 TWh per year.

The final two parts of the assignment were reported in December 2013 and included an analysis of the funding models for joint projects[128], and an analysis of the advantages and disadvantages of expanding the electricity certificates market to include more countries.[129] In previous studies, the Swedish Energy Agency has highlighted the fact that Sweden should be able to compete as a seller country. The Swedish Energy Agency has made the assessment[130] that the Swedish Government should firstly work to realise the cooperation mechanisms through the electricity certificates system and that joint projects should be limited to offshore wind power in order to minimise the impact on the electricity certificates system.

[127] Practical implementation of joint projects for offshore wind power – interim report of assignment 3 in the annual budgetary allocations for the Swedish Energy Agency 2013 *[Praktiskt genomförande av gemensamma projekt för havsbaserad vindkraft - delredovisning av uppdrag 3 i regleringsbrev för Energimyndigheten 2013]*

[128] Funding of joint projects pursuant to the Renewables Directive *[Finansering av gemensamma projekt enligt förnybart-direktivet]*, ER 2013:28.

[129] Advantages and disadvantages of expanding the electricity certificates market *[För- och nackdelar med en utvidgning av elcertifikats-marknaden]*, ER 2013:27.

[130] Swedish Energy Agency (2011). Cooperation mechanisms in accordance with the Renewables Directive – an in-depth analysis *[Samarbetsmekanismer enligt förnybartdirektivet – en fördjupad analys]*, ER 2011:16.

The Ministry of Enterprise, Energy and Communications has sounded out interest at staff level with a number of other Member States about the opportunity of establishing joint projects. At the moment there is only weak interest in such projects. However, this may change as 2020 approaches and the forecasts are replaced with actual outcomes.

Other information (point 12 in the template and Article 22(3))

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).*

In this report, the Swedish Energy Agency made the assumption that 60 % of the waste is comprised of renewable materials. This assumption is based on two studies carried out in 2008 by energy consultant Profu and commissioned by the Swedish Energy Agency.

The first study was based on figures for the amount of waste sent to incineration in the plants included in Avfall Sverige AB's (Swedish Waste Management) annual statistics. These statistics include all plants that incinerate household waste, as well as two plants that incinerate sorted refuse derived fuel, wood waste and plastic. In order to calculate the respective proportions of renewable and fossil energy content in the waste incinerated, information was initially gathered about the amount and composition of each category of waste. The majority of the fractions that were identified in this matter were comprised of either 100 % fossil, renewable or inert material. The contributions from the different fractions were weighted together to give the chemical composition of the waste category and then subsequently the category's heating value was calculated using the Miles and Chan equations.[131] The contributions from fossil materials and renewable materials to the heating value are calculated based on this. The result from the calculations of each category could then be added together by each category's contribution being totalled in proportion to the amount of waste of each category incinerated. In this manner, the proportions of renewable and fossil-derived energy in the waste for incineration could be calculated.[132] The result showed a renewable fraction of just under 60 %.

The second study was carried out by Profu in cooperation with SCB with the purpose of clarifying the differences between SCB's total estimation of the waste and the estimation from Avfall Sverige AB's study. Profu's studies showed that the renewable share in the Swedish Energy Agency's statistics (which were based on SCB's estimation) most likely lie around 50–60 %. For the forecast for the Action Plan and Sweden's first progress report, the Swedish Energy Agency chose to use the lower level as a precaution as Statistics Sweden (SCB) used 50 % of renewable fraction on that occasion. SCB has now moved over to using 60 % renewable fraction, which is why the Swedish Energy Agency also chose to use this percentage rate in its report.[133]

Amended methods of calculation – the 14C Project

In 2010–2011, Avfall Sverige AB carried out a project with SP as the project manager. The Swedish Energy Agency participated in the project as a co-financier. The purpose of the project was to generate a knowledge base that would provide the industry with an opportunity to be involved and influence the instruments and legislation within the area of waste incineration.

The project had three objectives:

1. To determine the proportion of fossil carbon from household and commercial waste, respectively, from Swedish waste incineration plants.
2. Compare two different methods for determining the waste's content of fossil and biogenic carbon which are: 1) analyses of solid waste, and 2) analyses of the flue gases formed during incineration.

[131] ECN (2006) http://www.ecn.nl/phyllis/
[132] For more information, see the study. Analysis of the renewable portion of waste for incineration in Sweden with reference to energy content *[Analys av den förnybara andelen av avfall till förbränning i Sverige med hänsyn till energiinnehåll]*, Profu (2008).
[133] EN11 The provision of electricity, gas and district heating *[El-, gas- och fjärrvärmeförsörjningen]*, SCB.

3. Evaluate the analysis results in relation to established standards which are based on selective analyses of the analysed waste.

Seven plants were included in the study: Sysav Malmö, Renova Göteborg, Borås Energi och Miljö, Händelöverket Norrköping, Tekniska verken Linköping, Högdalen Stockholm and Umeå Energi. The compiled results are not yet available.

The study revealed that the difference between the composition of the household waste and commercial waste in the plants was very small. The relative standard deviation was less than 10 %. In the solid samples 64 % of the carbon was from a renewable source and 62 % of the exhaust gases.[134]

[134] "Determination of the fossil carbon content in combustible municipal solid waste in Sweden" *[Bestämning av andel fossilt kol i avfall som förbränns i Sverige]*, Avfall Sverige – Swedish Waste Management (2012).

Annex 1: Description of the underlying forecast

Background

The forecast that forms the basis for Figure 2 and the estimated excess production of renewable energy compared with the indicative trajectory as presented in Table 7 is the Swedish Energy Agency's Long-Term Forecast 2012 *[Långsiktsprognos 2012]*.[135]

The *Long-Term Forecast 2012* was made in order to, in accordance with the Climate Reporting Ordinance *[Förordning om klimatrapportering]* (SFS 2005:626), implement the forecasts for the energy sector pursuant to Decision 280/2004/EC of the European Parliament and of the Council concerning a mechanism for monitoring Community greenhouse gas emissions. For more detailed information about the forecasting method and determinations, the reader is referred to the report *Long-Term Forecast 2012*.

The prerequisites of the underlying forecast

The prerequisites for the long-term forecast for 2012 include:

- The oil price is USD 112.4 per barrel in 2020.[136]
- The emission allowance price is EUR 17 per tonne per year in 2020.[137]
- Economic growth: 2.4 % per year between 2010–2020.
- The operating life of nuclear power reactors since their start year: 60 years, i.e. current reactors are in operation throughout the entire forecast period, but no new reactors are being built in Sweden.
- The instruments on climate and energy decided by the Government from 1 January 2012 are included.
- The Swedish Energy Agency has assumed a lower blend than the 10 % low biofuel blend of ethanol in petrol and the 7 % FAME in diesel specified in the Fuel Quality Directive (Directive 2009/30/EC). The levels in the forecast are 6.5 % ethanol and 5 % FAME since these were the levels that were tax-exempt in Sweden at the time of the forecast and were therefore judged to be the ceiling for the quantity of low-blends.

Specific assumptions required to calculate the share of renewables under the Directive

- 50 % of waste comprises renewables (however, the share of renewable waste that has been included in the statistics for 2011 and 2012 is 60 %, see point 6 *comments on the category 'solid waste'* and point 12)

- All biofuels and bioliquids used in 2020 fulfil the sustainability criteria and may be counted towards the target.

- All use of 'other biomass' in Sweden will be sustainable, even under any additional requirements to come.

- Renewable energy extracted from heat pumps is calculated as follows: 100 % from geothermal and hydrothermal heat pumps, 50 % from aerothermal heat pumps and 40 % from heat pumps in district heating plants.

[135] Swedish Energy Agency report: *Long-term forecast 2012 [Långsiktsprognos 2012]*, ER 2013:03.
[136] Source: Current policy scenario, World Energy Outlook 2011, IEA.
[137] Source: Impact Assessment to A Roadmap for moving to a competitive low carbon economy in 2050 [SEC(2010) 289 final]