Special Forecast Document for Sweden under Article 4(3) of Directive 2009/28/EC

Estimated excess under Article 4(3)(a)

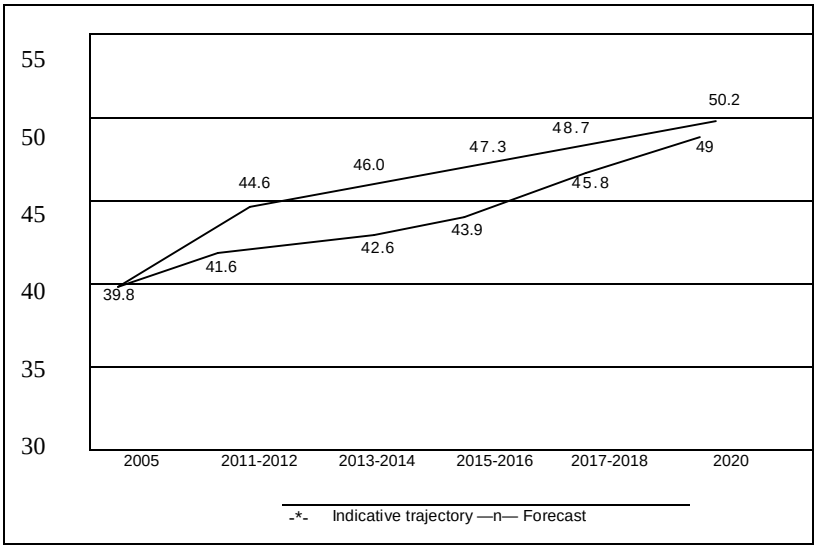
The proportion of energy from renewable sources in the gross final consumption of energy is forecast to be 50.2% in 2020, which may be compared with the binding national target of 49% in 2020. Sweden will have a forecast excess of approx. 1.2 percentage points in 2020.

According to the forecast, Sweden will also lie above the indicative trajectory throughout the forecast period, but the margin will reduce and be so small by 2020 that it will clearly fall within a margin of uncertainty (see the memorandum from the Swedish Energy Agency).

Table 1 Sweden's estimated excess production of energy from renewable sources compared to the indicative trajectory.

	2005	2011-2012	2013-2014	2015-2016	2017-2018	2020
Indicative trajectory (%)	39.8	41.6	42.6	43.9	45.8	49.0
Indicative trajectory (TWh)	160	177	184	193	205	224
Indicative trajectory (ktoe)	13 738	15 224	15 828	16 617	17 600	19 223
Forecast (%)		44.6	46.0	47.3	48.7	50.2
Forecast (TWh)		190	199	208	218	229
Forecast (ktoe)		16 297	17 100	17 903	18 705	19 709
Forecast – indicative (%)		2.9	3.4	3.4	2.9	1.2
Forecast – indicative (TWh)		12.5	14.8	15.0	12.9	5.6
Forecast – indicative (ktoe)		1 074	1 273	1 286	1 105	486

Figure 1 Forecast excess compared to the indicative trajectory



Estimated potential for joint projects under Article 4(3)(a)

Sweden is in favour of cooperation and flexibility to help to achieve the common commitments in the Renewables Directive. Joint projects constitute such an opportunity for flexibility. It is, however, difficult to decide what the *realisable* potential is for joint projects. Therefore, Sweden has not *estimated* such potential, but would like to state that, according to parliamentary targets, the conditions should be in place to generate 30 TWh of wind power by 2020, with 10 TWh of this offshore.

In line with the above, the enclosed memorandum and forecasts by the Swedish Energy Agency show that Sweden has what it needs to fulfil its commitments under the Directive, while the forecast also shows that land-based, but not offshore, wind power receives adequate levels of support through the electricity certification scheme. Sweden therefore sees an opportunity for the mechanism of joint projects to be updated to cover offshore wind power projects in the Swedish economic area. However, many questions need to be examined more closely and types of joint projects need to be developed in cooperation with other Member States and market players.

The Government has commissioned the Swedish Energy Agency to examine in more detail some of the questions relating to the Directive's cooperation mechanisms, in the context of a more detailed examination of increasing ambitions in the electricity certification scheme.

Estimated demand under Article 4(3)(b)

Sweden has an estimated excess, so no response is given to the question in Article 4(3)(b).

Memorandum concerning the “special forecast document”

under Article 4(3) of Directive 2009/28/EC on the promotion of the use of energy from renewable sources

Interim report on Swedish Energy Agency mandate 13 under the 2009 letter of regulation on the basis for the Swedish national renewable energy action plan

Contents

1 The mandate

This memorandum is an interim account of mandate number 13 – *Action Plan for Renewable Energy* in the 2009 letter of regulation for the Swedish Energy Agency. The mandate states that the Swedish Energy Agency must produce an interim account presenting forecasts of the trend in the proportion of renewable energy in comparison with the Swedish national commitment in the Renewables Directive, by no later than 1 December 2009.

The mandate in the letter of regulation stems from the requirement in Directive 2009/28/EC on the promotion of the use of energy from renewable sources (the Renewables Directive). Article 4(3) mentions the forecast document:

Each Member State shall publish and notify to the Commission, six months before its national renewable energy action plan is due, a forecast document indicating:

> *a) its estimated excess production of energy from renewable sources compared to the indicative trajectory which could be transferred to other Member States in accordance with Articles 6 to 11, as well as its estimated potential for joint projects, until 2020; and*
>
> *b) its estimated demand for energy from renewable sources to be satisfied by means other than domestic production until 2020.*

That information may include elements relating to cost and benefits and financing. That forecast shall be updated in the reports of the Member States as set out in Article 22(1)(l) and (m).

In this memorandum, the Swedish Energy Agency will give an account of the results from the forecast, and of the fundamental prerequisites and assumptions that form the basis for the forecast result. Uncertainties in the result will also be discussed.

2 Background, prerequisites, delimitation and estimate assumptions

2.1 Background

The forecast is based on the Swedish Energy Agency's *Long-Term Forecast 2008*[1]. The forecast has been updated with the changes to instruments known in June 2009 that have the greatest bearing on renewable energy.

The *Long-Term Forecast 2008* was drawn up in response to a mandate under the Climate Reporting Decree (SFS 2005:626) to produce forecasts for the energy sector in accordance with Decision No 280/2004/EC of the European Parliament and of the Council concerning a mechanism for monitoring Community greenhouse gas emissions. For more details of the forecasting method and assessments, please refer to the report *Long-Term Forecast 2008.*

The *Long-Term Forecast 2008* also forms the basis for emissions forecasts for the energy sector in Sweden's fifth national report, which will be presented to the UN Framework Convention on Climate Change on 1 January 2010.

The present forecast concerning excess renewable energy is therefore largely consistent with the emissions forecasts that Sweden has supplied to the EU and will supply to the UN.

2.2 Basic assumptions for the underlying forecast

The Long-Term Forecast 2008 makes the following important basic assumptions:

- Oil price $90/barrel, Emission allowance price €30/tonne.[2]
- Economic growth: 2.5% per year.
- Operational lifetime of nuclear power reactors from the start year: 60 years, i.e. current reactors are in operation throughout the forecast period.

2.3 Updated assumptions for this forecast

This forecast has also been updated with the following assumptions:

- The target for the electricity certification scheme has been increased to a level of 25 TWh by 2020 (compared to 17 TWh by 2016).

' Swedish Energy Agency report Long-Term Forecast 2008, ER 2009:14 can be downloaded from the Swedish Energy Agency's website.

[2] The resulting electricity price and district heating price are a model result from the MARKAL-Nordic model, and are not accounted for here.

- Energy and carbon dioxide taxes in accordance with the proposal by the Ministry of Finance to amend the Energy Taxes Act[3] as of 1 January 2010.
- The Swedish Energy Agency has assumed a higher low blend (10% ethanol low blend in petrol and 7% FAME in diesel) in accordance with the possibilities of the Fuel Quality Directive (Directive 2009/30/EC), and that emissions requirements of 130 g/km for vehicle manufacturers will be introduced from 2015 onwards.
- Forecasts of energy consumption in the functional sectors[4] of housing and services, transport and industry have been justified on the basis of the points mentioned above.

2.4 Delimitation

According to the footnote to Table 1 in the Commission template[5] for action plans (Table 2 in this memorandum), the estimates on energy efficiency and energy savings shall be consistent with other such estimates that Member States notify to the Commission, notably in Action Plans under the Energy Services Directive and the Energy Performance of Buildings Directive. If different units are used in those Action Plans the conversion factors applied should be indicated.

The Swedish Energy Agency has determined that this requirement will not be completely met. The reason for this is that the Energy Services Directive deals with an energy saving target up to 2016, whereas the increase in energy efficiency is the one that is relevant to the Renewables Directive. This means that other calculation methods will be used for action plans under the Energy Services Directive.

The Government has also ordered a different national target for energy efficiency by 2020 from the indicative target that applies to Sweden until 2016 under the Energy Services Directive. The national target for energy efficiency drawn up by the Government for up to 2020 is more in line with the Renewables Directive and will be observed in the long run.

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[3] DS 2009:24
[4] The Renewables Directive has other sector groupings, since the separate sector for heating/cooling is a sector that also includes energy consumption for industrial processes, in addition to energy for heating and cooling, excluding electricity.
[3] Commission Decision (C(2009) 5174 final) of 30 June 2009 establishing a template for National Renewable Energy Action Plans under Directive 2009/28/EC.

2.5 Specific estimate assumptions required to estimate the proportion of renewables under the Directive

It must be emphasised that the Directive establishes a number of restrictions concerning which renewable energy sources can be taken into account in achieving the target. These restrictions must also be addressed in the context of a forecast, despite the fact that the Commission has still to reply with an explanation and decision, and that Eurostat has to develop methods for the statistical basis.[6]

2.5.1 Heat pumps

There are specific restrictions that apply to ambient heat sequestered for heat pumps, and these rules must be finally established by the Commission in 2013 in accordance with Annex VII to the Directive. Before then, Eurostat must, in cooperation with the Member States, produce methods for generally accounting for heat pumps in the European energy statistics.

Sweden, which has basic statistics on heat pumps, is lacking defined seasonal performance factors (SPFs) for heat pumps of different applications, ages and locations, in exactly the same way as all other Member States. A number of assumptions therefore need to be made.

For the year 2020, the Swedish Energy Agency assumes that sequestered heat:

- of up to 100% from geothermal[7] and hydrothermal heat pumps;
- of up to 50% from aerothermal heat pumps; and
- of up to 40% from heat pumps at district heating facilities

can be counted towards the target.

With regard to geothermal and hydrothermal heat pumps, the assumption is probably uncontroversial. With regard to heat pumps at district heating facilities, the same distribution has been assumed for heat sources (40% seawater against 60% non-approved heat sources, e.g. waste water) as today. Finally, with regard to aerothermal heat pumps, the assumption is more uncertain, especially given that it is more difficult for aerothermal heat pumps to achieve an adequately high SPF, and that it is difficult to estimate the proportion of heat pumps using discharge air (which cannot be included) among aerothermal pumps.

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[6] Regulation (EC) No 1099/2008 of the European Parliament and of the Council of 22 October 2008 on energy statistics.

[7] The terms used in the Directive are used here. Geothermal heat pumps include rock and soil heat pumps. Hydrothermal heat pumps include seawater heat pumps. Aerothermal heat pumps include air heat pumps. The Directive does not permit the inclusion of discharge air, sewage or other waste heat as renewable energy.

2.5.2 Biofuels and bioliquids

For biofuels (and bioliquids), there are sustainability criteria[8] that must be met in order for their use to be counted against the target.

The Swedish Energy Agency assumes that:

- All biofuels and bioliquids used in 2020 will meet the sustainability criteria and may be counted against the target.

The Swedish Energy Agency bases this assumption on the fact that this instrument will mean that the use of non-sustainable biofuels and bioliquids will be non-existent, or at most insignificant. On the other hand, the Agency has not assessed the consequences for access, pricing and trade flows for first-generation biofuels that will result from the Directive and the sustainability criteria. Quite simply, this cannot currently be done.

See the section on uncertainties below.

2.5.3 Other biofuels – the greatest contribution to Sweden's proportion of renewable energy

According to Article 17(9) of the Directive, the Commission must produce a report by December 2009 proposing, "where appropriate", a sustainability scheme for biomass other than biofuels and bioliquids used for energy generation. Such a sustainability scheme will affect the remaining – very great – use of bioenergy in Sweden.

The Swedish Energy Agency assumes that:

- All uses of "other biomass" in Sweden will be sustainable, including those under any future requirements.

The basis for this assumption is that most use will be based on raw materials produced domestically. The Swedish Energy Agency assumes that no future sustainability criteria will significantly prevent or restrict the current opportunities for using biomass from Swedish forestry for energy purposes. The legislation relating to Swedish forestry, combined with the instruments promoting the use of biofuels that meet the criteria, means that the use of non-sustainable biofuels will at most be insignificant. The spirit of the Directive will also probably not prevent renewable energy from

[8] According to the Renewables Directive, the sustainability criteria must be met for biofuels and bioliquids to be counted towards the target and to be eligible for financial support. Among other things, the sustainability criteria lay down minimum reductions for greenhouse gas emissions, as well as a requirement that the biofuel shall not be made from raw materials obtained from land with high biodiversity value or high carbon stock.

Swedish forestry. Furthermore, in the action plan (4.6), Member States are required in particular to account for measures to promote the use of biomass.

See below regarding uncertainties.

2.5.4 Waste

The Swedish Energy Agency assumes that:

- 50% of waste is renewable.

This assumption is based on research that the Swedish Energy Agency carried out in 2008, and the Agency therefore assumes that the proportion of renewables will remain unchanged until 2020.

3 Forecast excess, assessment and uncertainties

Given the assumptions and calculation methods above, the forecast excess of renewable energy for 2020 is set out below. For technical reasons relating to the forecast, the intervening years are interpolated back to the 2008 statistical year.

3.1 Estimated excess under Article 4(3)(a)

The proportion of energy from renewable sources in the gross final consumption of energy is forecast at 50.2% in 2020, which may be compared with the binding national target of 49% by 2020. Sweden is therefore predicted to have an excess in 2020 of approx. 1.2 percentage points. In terms of energy, this corresponds to an excess of approximately 5.6 TWh.

According to the forecast, Sweden will also lie above the indicative trajectory throughout the forecast period, but the margin will reduce and be so small by 2020 that it will clearly fall within the uncertainty interval discussed in more detail below.

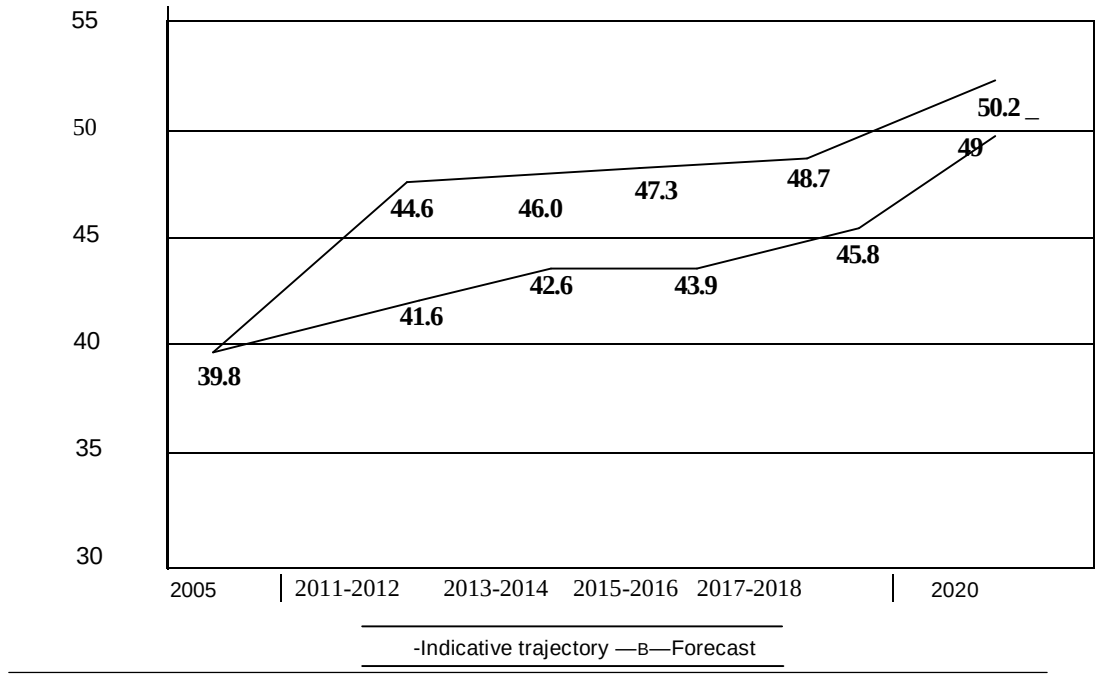

Figure 1 Forecast excess compared to the indicative trajectory.

3.2 Uncertainties

All forecasts are associated with a number of uncertainty factors. The forecast by the Swedish Energy Agency is, as explained in the *Long-Term Forecast 2008,* a combination of usage forecasts per sector and model-based supply forecasts for electricity and district heating. The forecast is based on assumptions concerning economic growth, fossil fuel prices, the structural composition of the energy system and various restrictions for model optimisation (e.g. regarding carbon for electricity production), etc. The forecast also has a large element of expert assessments concerning industry investment in the short and medium term.

The forecasts by the Swedish Energy Agency also follow tradition in constituting an impact analysis for instruments that have already been introduced or decided upon. This is intended to guide the political system and other decision-makers with regard to what other measures might need to be adopted for the trend to "continue as it is today".

This generates a need to discuss some of the major uncertainty factors in the present forecast, so that neither the result of 50.2% renewable energy by 2020 nor the excess compared to the indicative trajectory is taken as read.

3.2.1 Assumptions for the basic forecast

By performing a summary sensitivity analysis of the consequences of the Long-Term Forecast 2008 for the proportion of renewable energy in its reference scenario in terms of the oil price parameter, the Swedish Energy Agency can state that the proportion of renewable energy in the forecast will increase by between 2 and 3 percentage points at a higher oil price of $120/barrel in comparison with $90/barrel in the reference scenario.

The price is currently (November 2009) approximately $80/barrel, but it did reach record levels of $140/barrel in the middle of 2008, only to fall rapidly to $40/barrel in the context of the global recession. Therefore, if the oil price stays low in the long term, e.g. $60/barrel, it may be assumed that it would be difficult for Sweden – in terms of the forecast and if the instruments are maintained – to achieve the target of 49% renewable energy.

However, a similar sensitivity analysis for a scenario with higher growth levels than in the basic forecast seems not to have any decisive significance for the proportion of renewable energy, in terms of the forecast. However, it is not certain whether this conclusion can be drawn in the other direction. When the statistics for 2009 are available, it may be possible to draw certain conclusions, specifically with regard to lower levels of activity in the paper and pulp industry and the significance of this for the proportion of renewable energy.

3.2.2 Biofuels, etc.

As mentioned earlier, the Swedish Energy Agency has assumed that all bioenergy that will be used in Sweden in 2020 will meet the sustainability criteria of the Directive. This may be a bold assumption, but it is probably the only one that can reasonably be made, since tax reductions, quota-based systems or other support schemes will only apply to sustainable bioenergy.

Since it has not been possible to assess the pricing effects of the sustainability criteria, we can only say that this is an uncertainty factor in comparison with both the overall achievement of the target (49%) and the achievement of the 10% target for the transport sector.[9]

It should be possible to achieve the latter in any case, but if the proportion of renewable energy in the transport sector falls towards this limit, it will also be – in terms of the forecast – a close-run thing to attain the 49% target.

3.2.3 Electricity exports, pricing and flexibility mechanisms

The forecast by the Swedish Energy Agency indicates a significant excess of electricity, of approximately 28 TWh, compared to domestic demand in 2020. In terms of the model, it is assumed (the model has an endogenous basis and assumes investment costs expressed in öre/kWh for transferred electricity) that there will be adequate transfer links for exporting these volumes. Naturally, this is an assumption made in the model that needs to be kept in mind.

Sweden will be divided up into four different registration areas.[10] In practice, the date of introduction will be decided by the Commission, and this will happen initially at the beginning of February 2010. According to the proposal, the dividing up will be done from mid-2011 onwards. What impact this might have on, for example, wind power investments in the northern parts of the country has not been taken into account for the purposes of this forecast (lower regional prices are expected in the north, and higher prices in the south).

The Directive provides the opportunity to use three cooperation mechanisms; statistical transfers between states, joint support schemes and joint projects. Sweden and Norway have a political agreement to set up a common support scheme by linking Norway to the Swedish electricity certification scheme. The Swedish Energy Agency certainly has to investigate this, but it has also not been possible to include this in the forecasting work.

[9] In the Long-Term Forecast 2008, as in this updated forecast, it is assumed, among other things, that it will be profitable to fill up with E85 rather than petrol throughout the period.
[10] Usually called “pricing areas”.

The Government has also commissioned the Swedish Energy Agency to investigate the question of joint projects, for example on how this mechanism could be used to promote offshore wind power in the Swedish economic area in the Baltic Sea, in conjunction with the question of a joint electricity certification scheme with Norway.

It has not been possible to take account of these opportunities in the forecast, and there are some major questions regarding how any joint projects should be organised, what impact there might be on the electricity certification scheme, industrial interest in this opportunity, etc.

3.2.4 Heat basis; energy efficiency and climate change

The forecast by the Swedish Energy Agency suggests a relatively large expansion of cogeneration, both in the existing district heating system and through waste cogeneration. Making homes more energy efficient in line with the national target of a 20% reduction in energy use in homes by 2020 and 50% by 2050, and a hotter climate, are factors that argue against any increased demand for heat from district heating, and these are therefore limiting factors for the possibility of producing heat from cogeneration. They constitute an uncertainty in the forecast that needs to be followed up carefully.

3.3 Excess production that “could be transferred”?

According to Article 4(3)(a), an account must be given of the excess production that *could* be transferred in accordance with Articles 6 to 11. Given the reasoning above regarding the outcome and uncertainties of the forecast, the Swedish Energy Agency would urge a cautious interpretation, and that the concept “could be transferred” should be read as “should be capable of being transferred”, if the forecast is implemented.

Table 1 below and Figure 1 above show that the excess is greater than the indicative trajectory at the start of the commitment period, and that the accumulated excess compared with the indicative trajectory throughout the period – in terms of the forecast – comes to approximately 120 TWh. At the same time, it is quite clear that the proportion of renewables in 2020 falls within the margin of error in the forecast.

Table 1 Sweden's estimated excess production of energy from renewable sources compared to the indicative trajectory.

	2005	2011-2012	2013-2014	2015-2016	2017-2018	2020
Indicative trajectory (%)	39.8	41.6	42.6	43.9	45.8	49.0
Indicative trajectory (TWh)	160	177	184	193	205	224
Indicative trajectory (ktoe)	13738	15224	15828	16617	17600	19223
Forecast (%)		44.6	46.0	47.3	48.7	50.2
Forecast (TWh)		190	199	208	218	229
Forecast (ktoe)		16297	17100	17903	18705	19709
Forecast – indicative (%)		2.9	3.4	3.4	2.9	1.2
Forecast – indicative (TWh)		12.5	14.8	15.0	12.9	5.6
Forecast – indicative (ktoe)		1074	1273	1286	1105	486

The Swedish Energy Agency does not therefore propose to make any recommendations on the basis of this forecast, other than that the Government should investigate further what benefits there might be (what opportunities are offered for statistical trade with other Member States, for example), but it would be irresponsible of the Agency currently to recommend that Sweden commit to transferring the forecast excess production for the target year of 2020.[11]

Given the structure of the Directive, with binding target years and indicative trajectories with non-binding control stations, the Swedish Energy Agency also finds it difficult to see why people would want to pay for statistical transfers at the start of the period, when the only obvious consequence of a Member State falling below its indicative trajectory is that it must revise its action plan. We may also assume that the nearer we come to the target year, the greater will be the willingness to pay. However, this should be examined in more detail by the Government, via diplomatic channels.

[11] A possible structure could be that Sweden commits to transfer statistics, on condition that an excess has been found as a probable outcome.

3.4 Estimated potential for joint projects under Article 4(3)(a)?

Sweden is in favour of flexibility where this contributes to cost-effectiveness, and the cooperation mechanisms in the Renewables Directive strive for this. Joint projects offer such an opportunity for flexibility.

According to Article 4(3)(a), Member States must give an estimated potential for joint projects. However, the Article does not provide any further guidance on what type of potential for joint projects should be considered.

The Swedish Energy Agency is of the opinion that the realisable potential, i.e. potential that takes account of all restrictions (as opposed to purely technical potential, or technical/economic potential) is the only potential of any real interest. However, the realisable potential for joint projects can be either estimated or evaluated, which appears from the reasoning below.

However, it should be mentioned that the underlying forecast[12], with a high level of ambition for the electricity certification scheme, shows that the scheme gives an adequate level of support for land-based wind power, whereas the level of support is inadequate for offshore wind power. Given the decision by Parliament concerning a planning framework for wind power (30 TWh), which also includes a planning target for offshore wind power of up to 10 TWh, it may be said that Sweden has taken a position on "planned wind power potential" that exceeds what has been forecast through the electricity certification scheme. Note, however, the difference between a planning framework (targets for physical and other planning assumptions) and a production target.

However, with regard to such projects, which are only expected to come into being on the basis of one (more) future value from the cooperation mechanism of joint projects, there are still too many unanswered questions for the estimated realisable potential for joint projects in Sweden to be determined. Here are some examples of questions that need to be examined further:

- Expected marginal costs of investment in renewable energy in different Member States for the targets under the Directive
- How much value will be added and transferred to the investment calculation via the cooperation mechanism

[12] The same underlying forecast has been used for the Swedish Energy Agency's examination of new quotas in the electricity certification scheme, which is reported in the Agency's report, *Commission to Propose New Quotas for the Electricity Certification Scheme, etc.* Interim Mandate 1. Increased Level of Ambition ER 2009:29.

- The long term nature of the cooperation mechanism and its value after 2020 (compare, for example, the extension of the electricity certification scheme to 2035 and the possibility of banking certificates)
- The industrial interest
- Business models and business logic; how revenue, costs and risks are distributed
- How the mechanism for joint projects can work in parallel with the electricity certification scheme
- The impact on the electricity price, the electricity certificate price, the electricity market and opportunities for transfers of power
- The impact on the community and costs for Swedish consumers, the environmental impact, exploitation of land resources, and the impact on wildlife.
- The impact on Sweden's ability to achieve its renewables target

The Swedish Energy Agency will therefore examine in more detail, by Government mandate, the opportunities and restrictions for Sweden resulting from the different mechanisms for cooperation that can be found in the Directive. This applies both to the joint support scheme and to joint projects and statistical transfers.

3.5 Estimated demand to be satisfied from sources other than domestic production under Article 4(3)(b)

The forecast shows that Sweden will have an excess of renewable energy until 2020, so Article 4(3)(b) is irrelevant.

4 Detailed basis for the excess estimate

This chapter gives a preliminary account of the tables numbered 1, 2, 3, 4a and 4b in the action plan template.

4.1 Expected final energy consumption

This section explains the expected final gross energy consumption for all energy types (both from renewable and conventional sources), as a total and for each sector, during the period up to 2020. The sectors are heating and cooling, electricity and transport.

The Swedish Energy Agency will return to the reference scenario, excluding energy efficiency increases, in the final report on the mandate to form a basis for the action plan.

Table 2 [Table 1 in the Commission template] Expected gross final energy consumption of Sweden in heating and cooling, electricity and transport up to 2020 taking into account the effects of energy efficiency and energy saving measures[13] 2010-2020 (ktoe)

	2005	2010		2011		2012		2013		2014	
	Base year	Ref. scenario	Additional energy efficiency	Ref. scenario	Additional energy efficiency	Ref. scenario	Additional energy efficiency	Ref. scenario	Additional energy efficiency	Ref. scenario	Additional energy efficiency
1) Heating and cooling[14]	13 190	-	14 448	-	14 700	-	14 951	-	15 203	-	15 455
2) Electricity[15]	12 987	-	13 089	-	13 109	-	13 130	-	13 150	-	13 170
3) Transport as in Article 3(4)a[16]	7 473	-	7 686	-	7 728	-	7 771	-	7 813	-	7 856
4) Gross final energy consumption[17]	34 519	-	36 089	-	36 404	-	36 718	-	37 032	-	37 346

	2015		2016		2017		2018		2019		2020	
	Ref. scenario	Additional energy efficiency	Ref. scenario	Additional energy efficiency	Ref. scenario	Additional energy efficiency	Ref. scenario	Additional energy efficiency	Ref. scenario	Additional energy efficiency	Ref. scenario	Additional energy efficiency
1) Heating and cooling	-	15 706	-	15 958	-	16 209	-	16 461	-	16 713	-	16 964
2) Electricity	-	13 191	-	13 211	-	13 232	-	13 252	-	13 273	-	13 293
3) Transport	-	7 898	-	7 941	-	7 983	-	8 026	-	8 068	-	8 111
4) Gross final energy consumption	-	37 660	-	37 974	-	38 288	-	38 603	-	38 917	-	39 231

[13] These estimates on energy efficiency and energy savings must be consistent with other such estimates that Member States notify to the Commission, notably in Action Plans under the Energy Services Directive and the Energy Performance of Buildings Directive. If different units are used in those Action Plans the conversion factors applied should be indicated.

[14] The final energy consumption of all energy commodities except electricity for purposes other than transport, plus the consumption of heat for own use at electricity and heat plants and heat losses in networks (items '2. Own use by plant' and '11. Transmission and distribution losses' of Regulation (EC) No 1099/2008 (p. 23-24)).

[15] The gross electricity consumption is national gross electricity production, including autoproduction, plus imports, minus exports.

[16] Transport consumption as defined in Article 3(4)(a) of Directive 2009/28/EC. Renewable electricity in road transport for this figure should be multiplied by a factor of 2.5, as indicated by Article 3(4)(c) of Directive 2009/28/EC.

[17] As defined in Article 2(f) of Directive 2009/28/EC. This comprises final energy consumption plus network losses and own use of heat and electricity at electricity and heating plants (NB: this does not include consumption of electricity for pumped hydro storage or for transformation in electrical boilers or heat pumps at district heating plants).

4.2 National overall target

Table 3 shows the overall target for Sweden.

Table 3 [Table 2 in the Commission template] National overall target for the share of energy from renewable sources in gross final consumption of energy. Figures for 2005 and 2020 to be transcribed from Annex 1, Part A to Directive 2009/28/EC.

A) Share of energy from renewable sources in gross final consumption of energy in 2005 (S2005) (%)	**39.8**
B) Target for energy from renewable sources in gross final consumption of energy in 2020 (S2020) (%)	**49**
C) Expected total adjusted energy consumption in 2020 (ktoe)	**39 231**
D) Expected amount of energy from renewable sources corresponding to the 2020 target (calculated as B x C) (ktoe)	**19 223**

4.3 Sector shares and trajectory

In accordance with Article 4(1) of Directive 2009/28/EC, Member States are obliged to establish targets for the share of energy from renewable sources in 2020 within the following sectors:

- Heating and cooling
- Electricity
- Transport

Sweden has not adopted percentage-based sector targets for heating and cooling or for electricity.[18] Sweden has a quantitative target for new, renewable electricity of "a level of 25 TWh by 2020", which is the target level for the electricity certification scheme.

Table 4 below therefore only shows the sector shares involved on the basis of the forecast (not set targets) together with the overall target, which is the result of the forecast.

Tables 5 and 6 show the underlying figures for calculating the sector shares.

[18] The Swedish Energy Agency will return to other national targets that have already been adopted, in the final report on the mandate.

Table 4 [Table 3 in the Commission template] National 2020 target and estimated trajectory of energy from renewable sources in heating and cooling, electricity and transport

	2005	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
RES-H&C[19] (%)	53.7%	57.0%	57.6%	58.2%	58.7%	59.3%	59.8%	60.3%	60.8%	61.2%	61.7%	62.1%
RES-E[20] (%)	50.9%	57.0%	57.6%	58.2%	58.7%	59.3%	59.8%	60.3%	60.8%	61.2%	61.7%	62.1%
RES-T[21] (%)	4.0%	7.4%	8.1%	8.8%	9.4%	10.1%	10.7%	11.3%	11.9%	12.5%	13.2%	13.8%
Overall RES share[22]	39.7%	43.5%	44.2%	44.9%	45.6%	46.3%	47.0%	47.7%	48.3%	49.0%	49.6%	50.2%
Of which from cooperation mechanism[23] (%)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Surplus from cooperation mechanism[24] (%)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
As Part B of Annex I to the Directive			2011-2012		2013-2014		2015-2016		2017-2018			2020
			S_{2005}+20% (S_{2020}-S_{2005})		S_{2005}+30% (S_{2020}-S_{2005})		S_{2005}+45% (S_{2020}-S_{2005})		S_{2005}+65% (S_{2020}-S_{2005})			S_{2020}
RES minimum trajectory[25] (%)			41.64		42.56		43.94		45.78			49
RES			16336		16697		17238		17600			19223

minimum trajectory (ktoe)							

[19] Share of renewable energy in heating and cooling : gross final consumption of energy from renewable sources for heating an d cooling (as defined in Articles 5(1)(b) and 5(4) of D irective 2009/28/E C) divided by gross final consumption of energy for heating and cooling .

[20] Share of renewable energy in electricity: gross final consumption of electricity from renewable sources for electricity (as defined in Articles 5(1)(a) and 5(3) of Directive 2009/28/EC) divided by gross final consumption of electricity .

[21] Share of renewable energy in transport: final energy from renewable sources consumed in transport (cf. Article 5(1)(c) and 5(5) of D irective 2009/28/E C) divided by the consumption in transport of 1) petrol; 2) diesel; 3) bio fuels used in road and rail transport and 4) electricity in land transport.

[22] Share of renewable energy in gross final energy consumption .

[23] In percentage point s of overall RES share .

[24] In percentage point s of overall RES share .

[25] As defined in Annex I.B to D irective 2009/28/EC .

Table 5 [Table 4a in the Commission template] Calculation table for the renewable energy contribution of each sector to final energy consumption (ktoe)

	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
A) Expected gross final consumption of RES for heating and cooling	7 084	8 237	8 468	8 698	8 929	9 159	9 390	9 620	9 851	10 082	10 312	10 543
B) Expected gross final consumption of electricity from RES	6 605	7 189	7 305	7 422	7 539	7 656	7 772	7 889	8 006	8 123	8 240	8 356
C) Expected final consumption of energy from RES in transport	288	528	576	624	672	720	768	816	864	912	960	1 008
D) Expected total RES consumption[26]	13 689	15 695	16 097	16 498	16 899	17 301	17 702	18 103	18 505	18 906	19 307	19 709
E) Expected transfer of RES to other Member States	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F) Expected transfer of RES from other Member States and 3rd countries	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

G) Expected RES consumption adjusted for target (D) – (E) + (F)	13 689	15 695	16 097	16 498	16 899	17 301	17 702	18 103	18 505	18 906	19 307	19 709

[26]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 6 [Table 4b in the Commission template] Calculation table for the renewable energy in transport share (ktoe)

	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
C) Expected RES consumption in transport[27]	287.6	527.7	575.8	623.8	671.8	719.9	767.9	815.9	864.0	912.0	960.0	1 008.1
H) Expected RES electricity in road transport[28]	0.0	3.0	3.5	4.1	4.7	5.3	5.9	6.5	7.1	7.7	8.3	8.9
I) Expected consumption of biofuels from wastes, residues, non-food cellulose and materials containing both cellulose and lignin in transport[29]	13.4	40.3	45.7	51.1	56.5	61.9	67.2	72.6	78.0	83.4	88.8	94.2
J) Expected RES contribution to transport for the RES-T target: (C) + (2.5 – 1) x (H) + (2 – 1) x (I)	101.0	572.5	626.8	681.1	735.4	789.7	844.0	898.3	952.6	1 006.9	1 061.2	1 115.5

[27] Containing all RES used in transport including electricity, hydrogen and gas from renewable energy sources, and excluding biofuels that do not comply with the sustainability criteria (cf. Article 5(1) last subparagraph). Specify here actual values without using the multiplication factors.

[28] Specify here actual values without using the multiplication factors.

[29] Specify here actual values without using the multiplication factors.

References and contact persons

Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

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