



REPUBLIC OF CYPRUS



**MINISTRY OF ENERGY, COMMERCE,
INDUSTRY AND TOURISM**

**4TH PROGRESS REPORT UNDER ARTICLE 22
OF DIRECTIVE 2009/28/EC**

Two-year period: 2015-2016

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INTRODUCTION

The 4th progress report on the promotion of the use of energy from renewable sources for the two-year period 2015-2016 in the Republic of Cyprus was prepared in accordance with Article 22 of Directive 2009/28/EC, using the format of the updated template in which additional provisions were included after Directive 2009/28/EC was amended by Directive (EU) 2015/1513 of 9 September 2015.

In the two-year period 2015-2016, the intermediate target regarding the RES share in gross final consumption of energy was attained in accordance with the indicative trajectory defined by the 'National Action Plan (NAP) for Renewable Energy for the years 2010-2020'. More specifically, the RES share in gross final consumption of energy was 9.27 % at the end of 2016, exceeding the indicative target of 7.45% for the two-year period 2015-2016, as referred to in the indicative trajectory of part B of Annex I to Directive 2009/28/EC.

The individual sectors performed as follows:

Heating-cooling: The average RES share in heating-cooling in the years 2015-2016 was 23.66 %, thus outperforming the NAP indicative target of 20.7 % for 2016. The average RES share in heating-cooling rose by 2.96 % in the two-year period 2015-2016 compared to that of the previous two-year period 2013-2014 (20.7 %).

Electricity generation: The average RES share in electricity generation in the two-year period 2015-2016 was 8.56 %. The indicative target for a 10 % RES share in electricity generation in 2016, as set in the context of the 'Updated NAP section pertaining to electricity generation for the period 2015-2020' was not attained. The average RES share in electricity generation **rose** by 1.06 % in the two-year period 2015-2016 compared to that of the two-year period 2013-2014 (7.5 %).

Transport: The average RES share in transport in the two-year period 2015-2016 was 2.54 %. The average RES share in transport rose by 0.54 % in the two-year period 2015-2016 compared to that of the previous two-year period (2 %). The intermediate targets specified in the NAP for the two-year period concerned were not attained. In the two-year period 2015-2016, there was a significant increase in the use of biofuels produced from used cooking oil, the contribution of which towards a 10 % RES target in transport is twice their energy content. Please note that 93.88 % of the biofuel used in 2016 was produced from used cooking oil.

The 'Solar Energy for All' scheme, as modified to become more attractive to consumers, remained in effect in the period 2015-2016. The scheme covers:

- I. The installation of net-metering photovoltaic (PV) systems with a power of up to 5kW for all consumers (residential and non-residential/commercial).
- II. Subsidisation by EUR 900.00 per installed kW (with a subsidy ceiling of EUR 2 700.00) for the installation of PV systems in the homes of vulnerable consumers.
- III. Installation of PV systems with a power of 10kW to 10MW, for autoproduction in commercial and industrial establishments.
- IV. Installation of independent PV systems.

Schemes were also implemented for providing economic incentives for the installation of solar water heaters in homes, for purchasing and installing PV systems in agricultural/stock-farming units, as well as for major energy upgrading projects in existing buildings.

The competent authorities (Cyprus Energy Regulatory Authority, Cyprus Transmission System Operator, Department of Environment, Town Planning and Housing Department) further simplified the approval and licensing procedures for RES installation projects.

A new policy was adopted in 2015 for promoting RES electricity generation projects operating on a commercial basis. The Council of Ministers adopted Decision No 78.656 on 15 April 2015 abolishing the support schemes providing for guaranteed subsidy prices for RES electricity generation projects in the competitive electricity market. In the interim period up until the competitive electricity market is launched investors are allowed to enjoy the current RES electricity price specified by the Cyprus Energy Regulatory Authority (CERA), until the launch of the competitive electricity market whereupon these projects will have to be included in that market. Based on the above decision, a scheme was implemented in 2016 for RES electricity generation projects to be included eventually in the competitive electricity market.

Moreover, given the developments associated with the economic crisis, the restructuring of the energy sector in the Republic of Cyprus following the discovery of domestic deposits of hydrocarbons and the adoption by the Commission of a common strategy on energy and climate change, in 2015 it was deemed necessary to update the part of the NAP that related to electricity generation, with a view to attaining the national objectives in the most cost-effective manner.

The updated NAP, in respect of its part that relates to electricity generation, was adopted by the Council of Ministers by Decision No 80.240 of 16 February 2016 (Annex II). In drawing up the updated NAP, due account was taken of the results of several recent studies and of current policy and strategic factors including:

- (a) EU guidelines on state subsidies in the fields of environment and energy for the years 2014-2020, on the basis of which Council of Ministers Decision No 78.656 of 15 April 2015 was adopted, whereby support schemes providing for guaranteed long-term subsidy prices were abolished.
- (b) The significant reduction in electricity consumption in recent years, which largely overturned the official forecasts that were used in preparation of the NAP for the period up to 2020.
- (c) The amendment to the electricity market rules, to permit the participation of RES in the competitive electricity market from 2018-2019.
- (d) The potential introduction of natural gas, primarily as fuel for electricity generation, as well as the possible electric interconnection of Cyprus.

1. Sectoral and overall shares and actual consumption of energy from renewable sources in the preceding 2 years 2015-2016 (Article 22(1)(a) of Directive 2009/28/EC).

Table 1: Sectoral (electricity, heating and cooling, and transport) and overall shares of energy from renewable sources¹

	Year 2015	Year 2016
RES-H&C ² (%)	23.60 %	23.72 %
RES-E ³ [10]	8.48 %	8.64 %
RES-T ⁴ (%)	2.45 %	2.63 %
Overall RES share ⁵ (%)	9.34 %	9.27 %
<i>Of which from cooperation mechanism⁶ (%)</i>	0	0
<i>Surplus for cooperation mechanism⁷ (%)</i>	0	0

The RES share in gross final consumption of energy was 9.27 % in 2016, exceeding the indicative target of 7.45 % for the two-year period 2015-2016, as specified in the indicative trajectory of part B of Annex I to Directive 2009/28/EC and in the National Action Plan (NAP) for Renewable Energy.

The individual sectors performed as follows:

Heating-cooling: Table 3 of the National Action Plan (NAP) included a forecast for a 20 % and 20.7 % RES share in heating-cooling for the years 2015 and 2016, respectively. As shown by the information included in Table 1, the forecasts for the two-year period 2015-2016 in heating-cooling were outperformed. Also, the average RES share in heating-cooling rose by 2.96 % in the two-year period 2015-2016 compared to that of the previous two-year period 2013-2014 (20.7 %).

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 Article 5(1)(b) and (4) of Directive 2009/28/EC divided by gross final consumption of energy for heating and cooling. The same methodology as in Table 3 of NREAPs applies.

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

⁴ Share of renewable energy in transport: final energy from renewable sources consumed in transport (see Article 5(1)(c) and (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 shown in row 3 of Table 1). The same methodology as in Table 3 of NREAPs applies.

⁵ Share of renewable energy in gross final energy consumption. The same methodology as in Table 3 of NREAPs applies.

⁶ In percentage point of overall RES share.

⁷ In percentage point of overall RES share.

Electricity generation: The ‘Updated NAP section pertaining to RES electricity generation for the period 2015-2020’, as attached to Annex II, included a forecast for a 9 % and 10 % RES share in electricity generation for the years 2015 and 2016, respectively. These forecasts were not fulfilled. This is mainly due to the increase in the demand for electricity for heating-cooling purposes. The average RES share in electricity generation rose by 1.06 % in the two-year period 2015-2016 compared to that of the two-year period 2013-2014.

Transport: Table 3 of the National Action Plan (NAP) included a forecast for a 3.1 % and 3.5 % RES share in transport for the years 2015 and 2016, respectively. Based on the information contained in Table 1, these shares were not attained. The average RES share in transport rose by 0.54 % in the two-year period 2015-2016 compared to that of the previous two-year period.

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

	Year 2015	Year 2016
(A) Gross final consumption of RES for heating and cooling	99.21	101.98
(B) Gross final consumption of electricity from RES	32.95	36.27
(C) Gross final consumption of energy from RES in transport	9.48	8.83
(C) Gross total RES consumption ⁹	141.64	147.08
(E) Transfer of RES to other Member States	0	0
(F) Transfer of RES from other Member States and 3rd countries	0	0
(G) RES consumption adjusted for target (D)-(E)+(F)	141.64	147.08

The actual total gross energy consumption in 2015 and 2016 was lower than the forecasts included in Table 1 of the NAP. More specifically, Table 1 of the NAP had forecast 1 884 ktoe of gross final energy consumption for 2015 (after the limit of the quantity of energy consumed in aviation), whereas the actual gross final energy consumption was 1 516 ktoe. It had also forecasted 1 915 ktoe of gross final energy consumption for 2016, whereas the actual gross final energy consumption was 1 586 ktoe (after the limit of the quantity of energy consumed in aviation).

Also the actual gross total RES consumption in 2015 and 2016 was lower than the forecasts included in Table 4a of the NAP. However, as energy consumption was lower than the forecasts included in the NAP, the RES shares in the total energy consumption in 2015 and 2016 outperformed those shown in the NAP.

⁸ Facilitates comparison with Table 4a of the NREAPs

⁹ In accordance with 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 1b: Total actual contribution (installed capacity, gross electricity generation) from each renewable energy technology in the Republic of Cyprus to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in electricity¹⁰.

	2015		2016	
	MW	GWh	MW	GWh
Hydro ¹¹ :	0	0	0	0
non pumped	0	0	0	0
<1MW	0	0	0	0
1MW-10MW	0	0	0	0
>10MW	0	0	0	0
pumped	0	0	0	0
mixed ¹²	0	0	0	0
Geothermal	0	0	0	0
Solar:	78.3	126.66	87.57	147.65
photovoltaic	78.3	126.66	87.57	147.65
concentrated solar power	0	0	0	0
Tide, wave, ocean	0	0	0	0
Wind:	157.5	205.23	157.5	222.11
onshore	157.5	205.23	157.5	222.11
offshore	0	0	0	0
Biomass ¹³ :	10.4	51.24	10.4	52.02
solid biomass	0	0	0	0
biogas	10.4	51.24	10.4	52.02
bioliquids	0	0	0	0
TOTAL	246.2	383.13	255.47	421.78
of which in CHP		51.24		52.02

The following conclusions are reached by comparing Table 1b against the information included in the ‘Updated NAP section pertaining to RES electricity generation for the period 2015-2020’:

Year 2015

- It was forecasted for 2015 that there would be a total RES installed capacity of 257.5MW (90MW from photovoltaic systems, 10MW from biomass/biogas systems and 157.5MW from wind farms). The forecast was fulfilled by 95.61 %. The total installed capacity was 246.2MW (78.3MW from photovoltaic systems, 10.4MW from biomass/biogas systems and 157.5MW from wind farms). The total contribution of RES to electricity generation was 383.13GWh (32.95 ktoe). Therefore, the forecast included in the updated NAP for a total

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 Take into account only those complying with applicable sustainability criteria (see the last subparagraph of Article 5(1) of Directive 2009/28/EC).

RES electricity generation of 397GWh in 2015 was fulfilled by 96.5 %.

- The updated NAP had included a forecast for a total electricity generation of 4.475GWh, i.e. 384.85 ktoe, in 2015. The total actual electricity generation was 388.43 ktoe in 2015.
- The RES share in electricity generation in 2015 was 8.48 % compared to the 9 % forecast included in the NAP.

Year 2016

- It was forecasted for 2016 that there would be a total RES installed capacity of 296.2MW (123.7MW from photovoltaic systems, 15MW biomass/biogas systems and 157.5MW wind farms). Finally the total RES installed capacity was 255.47MW (87.57MW from photovoltaic systems, 10.4MW from biomass/biogas systems and 157.5MW from wind farms). The total contribution of RES to electricity generation was 421.78GWh (36.27 ktoe). Therefore, the forecast included in the updated NAP for a total RES electricity generation of 473GWh in 2016 was fulfilled by 89.17 %.
- The updated NAP had included a forecast for a total electricity generation of 4 530GWh, i.e. 389.58 ktoe, in 2016. The total actual electricity generation in 2016 was 419.81 ktoe, i.e. it exceeded the NAP forecast by 7.76 %.
- The RES share in electricity generation in 2016 was 8.64 % compared to the 10 % forecast included in the NAP. The failure to attain the indicative target is mainly due to the delayed completion of photovoltaic plants licensed through a tender procedure, due to which it was impossible to commission them in 2016, as forecasted. There was also a delay in the completion and commissioning of a biomass power plant. These projects will be commissioned in their entirety in the current two-year period 2017-2018. Please note that the low oil prices and the resulting low RES electricity purchasing cost in 2016 deterred interested parties, thus resulting in a reduced number of RES systems included in the 'Scheme for RES power plants to be included in the competitive electricity market eventually'.
- Moreover, the existing support scheme for encouraging RES electricity generation for own consumption is currently being revised, to make it more attractive to consumers (introducing a net-billing scheme for photovoltaic systems, increasing the capacity of net-metering photovoltaic systems).

Table 1c: Total actual contribution (final energy consumption¹⁴) from each renewable energy technology in the Republic of Cyprus 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

	Year 2015	Year 2016
Geothermal (excluding low temperature geothermal heat in heat pump applications)	0	0
Solar	67.86	68.97
Biomass ¹⁶ :	29.81	31.46
<i>solid biomass</i>	25.36	27.02
<i>biogas</i>	4.445	4.44
<i>bioliquids</i>	0	0
Renewable energy from heat pumps:		
- of which aerothermal	0	0
- of which geothermal	1.55	1.55
- of which hydrothermal	0	0
TOTAL	99.21	101.98
<i>Of which DH¹⁷</i>	0	0
<i>Of which biomass in households¹⁸</i>	8.33	8.03

The following conclusions are reached by comparing Table 1c against the forecasts included in Table 11 of the NAP:

- In accordance with the NAP, the RES share in heating-cooling should be 100.95 ktoe in 2015. The actual RES share in heating-cooling was 99.21 ktoe in 2015. Therefore the indicative target was attained by 98.3 %. More specifically, the forecast for 75.14 ktoe from solar systems was not fulfilled, the forecast for 1.61 ktoe from heat pumps was almost fulfilled, and the forecast for 24.20 ktoe from biomass was outperformed.

¹⁴ Direct use and district heat as defined in Article 5.4 of Directive 2009/28/EC.

¹⁵ Facilitates comparison with Table 11 of the NREAPs.

¹⁶ Take into account only those complying with applicable sustainability criteria, (see the last subparagraph of Article 5(1) of Directive 2009/28/EC).

¹⁷ District heating and/or cooling from total renewable heating and cooling consumption (RES-DH).

¹⁸ From the total renewable heating and cooling consumption.

- In accordance with the NAP, the RES share in heating-cooling should be 105.76 ktoe in 2016. The actual RES share in heating-cooling was 101.98 ktoe in 2016. Therefore the indicative target was attained by 96.43 %. More specifically, the forecast for 78.43 ktoe from solar systems was not fulfilled, the forecast for 1.88 ktoe from heat pumps was almost fulfilled, and the forecast for 25.45 ktoe from biomass was outperformed.
- Table 1 of the NAP had forecast 506 ktoe of total energy consumption in heating-cooling for 2015, whereas the actual consumption was 420.42 ktoe. It had also forecasted a total energy consumption of 512 ktoe in heating-cooling for 2016, whereas the actual consumption cooling was 429.94 ktoe.
- The RES share in heating-cooling was 23.72 % in 2016, outperforming the NAP forecasts for an average RES share of 20.7 % in 2016 and 23.5 % in 2020 in heating-cooling.

Table 1d: Total actual contribution from each renewable energy technology in the Republic of Cyprus to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in transport sector (ktoe)^{19,20}

	Year n-2	Year n-1
- Bioethanol	0	0
- Biodiesel (FAME)	9.48	8.83
- Hydrotreated Vegetable Oil (HVO)	0	0
- Biomethane	0	0
- Fischer-Tropsch diesel	0	0
- Bio-ETBE	0	0
- Bio-MTBE	0	0
- Bio-DME	0	0
- Bio-TAEE	0	0
- Biobutanol	0	0
- Biomethanol	0	0
- Pure vegetable oil	0	0
Total sustainable biofuels	9.48	8.83
Of which		
sustainable biofuels produced from feedstock listed in Annex IX Part A	0	0
other sustainable biofuels eligible for the target set out in Article 3(4)(e), sustainable biofuels produced from feedstock listed in Annex IX Part B	0	0
	5.97	8.29
sustainable biofuels for which the contribution towards the renewable energy target is limited in	3.51	0.54

¹⁹ For biofuels take into account only those complying with sustainability criteria (see the last subparagraph of Article 5(1)).

²⁰ Facilitates comparison with Table 12 of the NREAPs.

accordance with Article 3(4)(d)		
Imports from third countries:	3.14	3.57
Hydrogen from renewables	0	0
Renewable electricity	0	0
Of which	0	0
consumed in road transport	0	0
consumed in rail transport	0	0
consumed in other transport sectors	0	0
other (Please specify)	0	0
other (Please specify)	0	0

The RES share in transport was 2.45 % and 2.63 % in 2015 and 2016, respectively. This contribution falls short of that shown in the indicative trajectory of Table 4a of the NAP, i.e. 3.3 % and 4.7 %, respectively.

The total RES consumption in transport was 9.48 ktoe in 2015, whereas the forecast shown in the indicative trajectory of Table 12 of the NAP was 22.7 ktoe for 2015. The 3.3 % contribution of RES in transport for 2015, as referred to in the NAP, was not attained.

In 2015, the contribution of biofuels produced from the feedstocks listed in Annex IX to the Directive, the contribution of which towards the RES target in transport is twice their energy content, was 5.97 ktoe, thus outperforming the NAP forecast of 1.5 ktoe. These biofuels were produced from used cooking oil.

The total RES consumption in transport was 8.83 ktoe in 2016, whereas the forecast shown in the indicative trajectory of Table 12 of the NAP was 25.7 ktoe for 2016. The 4.7 % contribution of RES in transport for 2016, as referred to in Table 4b of the NAP, was not attained.

Despite a reduction in the total contribution of biofuels in 2016 compared to 2015, from 9.48 ktoe to 8.83 ktoe, given that 8.29 ktoe (approximately 93.88 %) of the biofuels used in 2016 were produced from used cooking oil, the contribution of which towards the RES target in transport is twice their energy content in accordance with part B of Annex IX to the Directive, the RES share in transport rose to 2.63 % in 2016 compared to 2.45 % in 2015. The NAP forecast for 6.7 % ktoe from advanced biofuels for 2016 was also outperformed.

The RES contribution in transport in Cyprus has resulted entirely from the obligation imposed in 2011 on all transport fuel suppliers, to mix biofuels that meet the sustainability criteria with conventional transport fuels (petrol and diesel) with a view to ensuring that the average annual biofuel energy content of conventional fuels represents 2.4 % of the total energy content of the conventional fuels they place on the market. This obligation has remained unchanged to date (RAA 431/2011).

To draw up a financially and technically optimal strategy for attaining the 10 % RES target in transport and to ensure the optimal penetration of alternative fuels in transport in Cyprus, the study ‘Penetration of alternative fuels in Cyprus road and maritime sectors’ was conducted by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, which was financed by the Commission (European Commission Structural Reform Support Services) and the German Ministry of Economic Affairs and Energy. The results of this study and other studies are being

reviewed by the competent authorities in order to implement optimal actions towards attaining the 10 % RES target in transport by 2020.

Please note the following concerning the study results:

- The 10 % RES consumption target in transport by 2020 is hard to attain and cost-ineffective for Cyprus due to a number of technical difficulties associated with its attainment.
- The very hot climate of Cyprus combined with the volatile nature of bioethanol does not allow for using petrol mixed with bioethanol, as the petrol specification laid down in standard EN 228, the steam pressure specifications in particular, are not met. The study recommended the use of petrol mixed with bioethanol. Please note that, if the use of bioethanol was permitted, it would be easier to attain the target as there would be no need for a considerable change in the number of existing vehicles.
- The cost-optimal option for attaining the 10% RES target in transport by 2020 is to use advanced biofuels, primarily 2nd generation biodiesel. However, to attain the target, it is necessary to convert a large number of petrol-driven vehicles into diesel-driven ones (approximately 40 %), which is unrealistic within such a short period of time.
- The study also recommended the use of B100 in buses (in approximately 50 % of the fleet) as the most cost-effective method for attaining the 10 % RES target in transport. Due to restrictions in the contracts with public transport companies and other technical obstacles, the use of B100 in buses is hard to implement.

The 13 % target RES share in gross final energy consumption in Cyprus by 2020 is attainable without the anticipated contribution from transport (10 % RES) if an equal amount of RES is used in electricity generation and heating-cooling. The general target of 13 % can be attained in a more cost-effective manner under this scenario.

2. Measures taken in the preceding 2 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 your National Renewable Energy Action Plan (Article 22(1)(a) of Directive 2009/28/EC).

Table 2: Overview of all policies and measures

<i>Name and reference of the measure</i>	<i>Type of measure*</i>	<i>Expected result**</i>	<i>Targeted group and/or activity***</i>	<i>Existing or planned****</i>	<i>Start and end dates of the measure</i>
1. Support scheme for the installation of photovoltaic systems with a capacity of up to 5kW in homes of vulnerable consumers, using the net metering method, under which the electricity consumed is offset against that generated. Total available capacity: 1.2MW	Financial	Promoting RES and reducing electricity costs for vulnerable consumers.	Vulnerable groups of consumers.	This measure supplements measures set out in Table 5 of the NAP.	The measure was launched in 2013. It was implemented in 2015 and 2016 with an available capacity of 1.2MW per year. The measure remained in force in 2017 and will be terminated as soon as total available capacity is covered.
2. Support scheme for the installation of photovoltaic systems with a capacity of up to 5kW for all consumers, using the net metering method, under which the electricity consumed is offset against that generated. Total available capacity: 8.8MW for installations in homes of non-vulnerable consumers and 13MW for installation in non-residential establishments (commercial, industrial, etc.)	Regulatory	Promoting RES and reducing electricity costs for all consumers	All electricity consumers	This measure supplements measures set out in Table 5 of the NAP.	The measure was launched in 2013, but initially concerned only installations in homes and head offices of local authorities. The measure was revised in 2015 to cover photovoltaic installations for all consumers. The maximum capacity per system was also increased from 3kW to 5kW. The measure will remain in force and will be terminated as soon as available capacity is covered.

3. Support scheme for the installation of photovoltaic systems with a capacity of 10kW to 10MW using the autoproduction method in commercial and industrial establishments. Total available capacity: 40MW	Regulatory	Promoting RES and reducing electricity costs for commercial and industrial consumers	Commercial and industrial consumers	This measure supplements measures set out in Table 5 of the NAP.	The measure was launched in 2013. Following amendments to the measure in 2015 and 2016, the maximum capacity of each PV system that may be included in the measure was increased to 10MW and the total available capacity was increased to 40MW. The measure will be terminated as soon as available capacity is covered.
4. Support scheme for independent photovoltaic systems in holdings/parcels not connected with the grid.	Regulatory	Promoting RES and the supply of electricity in areas where there is no electricity supplied via the grid	All consumers	This measure replaces measures set out in Table 5 of the NAP. (Installations of independent photovoltaic systems were subsidised up until 2013 in the context of the aid schemes.)	Start date: 2016 The measure shall remain in force until it is amended.
5. Solar water heater replacement scheme Financial aid was granted in the context of the scheme for replacing solar water heaters in existing homes	Financial	Promoting RES	Owners of residential units with a building permit up until 21 December 2007	Existing measure also implemented in the context of previous aid schemes.	Start date: Dec 2015. End date: Feb 2016

6. A new policy was adopted for promoting RES electricity generation projects operating on a commercial basis. The Council of Ministers adopted Decision No 78.656 of 15 April 2015 abolishing the support schemes providing for guaranteed subsidy prices for RES electricity generation projects in the competitive electricity market. In the interim period up until the competitive electricity market is launched investors are allowed to enjoy the current RES electricity price specified by the Cyprus Energy Regulatory Authority (CERA), until the launch of the competitive electricity market whereupon these projects will have to be included in that market.	Regulatory	Promoting RES. Regulation of the functioning of the competitive electricity market.	Investors in RES electricity generation projects	This measure replaces measures set out in Table 5 of the NAP. Termination of aid schemes that provide for a guaranteed selling price for RES electricity generation projects	Start date: 15.4.2015.
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7. Scheme for RES electricity generation projects to be included eventually in the competitive electricity market. It concerns the installation of RES electricity generation systems for commercial purposes. The electricity generated by systems included in the scheme is sold to the grid at the current RES purchasing price, as specified by CERA, up until the competitive electricity market (CEM) is launched.	Regulatory	Promoting RES. Regulation of the functioning of the competitive electricity market.	Undertakings	This measure supplements measures set out in Table 5 of the NAP.	Start date: 16.5.2016. End date: 14.8.2016.
8. Obligation to replace conventional transport fuels with biofuels at a level of 2.4% per energy content of all transport fuels (RAA 431/2011)	Regulatory	Increase in the proportion of biofuel in transport	Oil companies	Existing measure supplementing the measures set out in Table 5 of the NAP	Start date: 21.10.2013
9. Certification of small-scale RES system installers Setup of a registry of installers of RES systems	For information	Training to RES system installers	Small-scale RES system installers	This measure supplements measures set out in Table 5 of the NAP.	Start date: 13.11.2015
10. 'Save & Upgrade' scheme for enterprises	Financial	Energy upgrading of existing buildings used by SMSs.	Undertakings	This measure replaces measures set out in Table 5 of the NAP	The measure was launched on 23.12.2015 End date: 11.5.2016
11. 'Save & Upgrade' scheme for residential buildings	Financial	Energy upgrading of existing residential buildings	Owners of residential units	This measure replaces measures set out in Table 5 of the NAP	The measure was launched on 17.3.2015 End date: 17.2.2016

12. Rural development programme 2014-2020 of the Ministry of Agriculture, Rural Development and Environment. Aid is granted in the context of the programme to photovoltaic plant installations in agricultural holdings/parcels	Financial	Promoting RES in agriculture	Agriculture	This measure supplements measures set out in Table 5 of the NAP.	The measure will be implemented in the period 2014-2020
13. Individual support schemes for two solar thermal plants selected for financing in the context of the European Commission's funding programme NER300.	Regulatory	Promoting RES. Regulating the functioning of projects included in the NER300 programme.	Owners of two solar thermal plants selected for financing in the context of the European funding programme NER300.	This measure supplements measures set out in Table 5 of the NAP.	The individual support scheme for the first solar thermal plant was launched on 7 October 2015, and the final decision on the inclusion of the project was taken on 31 January 2017. The individual support scheme for the second solar thermal plant was launched on 29 October 2015, and the final decision on the inclusion of the project was taken on 30 July 2018.

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

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

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

**** Does this measure replace or complement measures contained in Table 5 of the NREAP?

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).

The Republic of Cyprus has taken the following measures aimed at improving administrative procedures and removing barriers to the promotion of RES energy:

1. Continued exemption of RES electricity generation systems with a capacity of up to 5MW from the obligation to obtain construction and operating licences from CERA.
2. To set up RES electricity generation systems with a total capacity from 1kW to 20kW, it is necessary to apply to CERA for exemption from the obligation to obtain a licence, and there is an exemption from the obligation to apply for exemption from the obligation to obtain a licence. Photovoltaic systems included in, and operating under, net metering and autoproduction support systems are exempted from the obligation to apply for exemption from the obligation to obtain construction and operating licences.
3. Exemption of photovoltaic systems up to 150kW from the obligation to obtain a town planning permit, on condition that said systems are installed in a specific manner in accordance with the General Town and Country Planning Decree of 2014, and exemption of photovoltaic systems up to 20kW installed in legally existing buildings from the obligation to obtain a building permit.

Under the General Town and Country Planning Decree of 2014 (RAA 451/2014), it is deemed that a permit has been issued by the town planning authority and, therefore, no application needs to be submitted in the following cases:

1. Installation of a photovoltaic system with a capacity of up to 150kW in a legally existing building, irrespective of use, or on the soil of a property in which there is a legally existing building, subject to certain conditions.
2. Installation of a photovoltaic system with a capacity of up to 150kW in a property located in a defined development zone, but outside an archaeological site or ancient monument, outside a defined beach or protected natural area or protected landscape or protected area included in the 2000 network, outside a defined special wild bird and habitat protection area, outside an airport, airstrip and military facility, project or area, on condition that the property has access that is considered satisfactory under the provisions of the relevant order of the Minister for Interior and there are no system elements located closer than 8.0 m to any property boundary.

Environmental impact assessments are not required in the following cases:

- Wind turbines with a capacity of up to 30kW (a preliminary environmental impact assessment is required for wind turbines with capacity over 30kW).
- Photovoltaic systems with a capacity of up to 100kW.
- Electricity generation plants using biomass with an installed capacity of up to 20kW.

Additionally, the Ministry of Energy, Commerce, Industry and Tourism, in cooperation with all competent authorities, is looking into ways to further simplify the licensing procedures for small RES systems with a view to significantly reducing the time taken to review applications. Also, with a view to speeding up the implementation of small RES projects and facilitating the functioning of the various support schemes for RES projects intended for electricity generation

for own use, the documents used in the application and licencing procedure for net metering and autoproduction photovoltaic systems were amended.

Cyprus Energy Regulatory Authority (CERA)

CERA adopted Regulatory Decision No 01/2015 setting out the detailed planning for modifying the operating framework of the Cypriot electricity market (RAA 164/2015). By modifying the operating framework of the electricity market, CERA removed the barriers that existed in the context of the electricity market rules, which prevented RES power plants from participating in the electricity market.

To encourage and promote innovative RES electricity generation technologies, aiming primarily and exclusively at carrying out research for drawing scientific conclusions on the functioning and effectiveness of a new innovative electricity generation technology that is currently under development, which are not operating in the energy market as viable economic undertakings/entities aiming to commercially exploit the electricity generated by the proposed project, CERA adopted Decision No 1494/2016 of 23 May 2016 under which it will accept, review and evaluate applications for exemption from the obligation to obtain a licence relating to innovative RES electricity generation technology projects subject to the following conditions:

- the total installed capacity of the innovative projects does not exceed 200kW;
- the application states that the exclusive purpose of the investment consists in the construction and operation of a project in which the applied technical innovation results will be looked into only for research, development and demonstration purposes from a technical point of view, instead of commercially exploiting the electricity generation activity;
- the electricity generated will be fed into the distribution system free of charge, without any financial consideration;
- the exemption from the obligation to obtain a licence is granted for the specific time that is required for the innovative technology to be implemented and depending on the duration of the research required under the research practice contemplated in each individual application.

Cyprus Transmission System Operator (CTSO)

CTSO accepts applications for connection to the transmission system provided that they are accompanied by the respective authorisation (construction licence) from the Cyprus Energy Regulatory Authority (CERA). In accordance with the approved Technical Guide on Connection Procedures, which entered into force on 1 January 2013, and with a view to simplifying the connection application submission procedure, CTSO does not require any authorisation other than the construction licence. Under the new method, the procedures for obtaining the other licences are carried out parallel to the review of the connection application, thus avoiding any additional delays due to the licensing process. Similarly, CTSO allows the applicant to speed up the planning and licensing procedures for network connection works, by means of a separate agreement.

To provide interested investors with complete information regarding the connection procedures for RES power units/plants, CTSO has published the following on its website:

- An outline of the connection terms. The outline contains typical connection terms applicable to RES power plants, including inter alia the operating requirements applicable to such plants.
- A Technical Guide on Connection Procedures. The approved Technical Guide describes the detailed terms and requirements for connection of RES power plants to the transmission/distribution system. The Guide was supplemented by the approved document 'Key tariff policy principles for connection to the transmission/distribution system'.

Information

All competent authorities responsible for the authorisation and licensing of RES power plants operate websites providing all necessary information to potential applicants, such as the application forms, the licensing procedure, a list of applications submitted, reviewed and rejected etc. Moreover, some competent licensing authorities, such as the Department of Town Planning and Housing, provide a functionality on their websites (www.publicaccess.tph.moi.gov.cy) allowing the general public to monitor the key stages of the town planning permit application process by entering their ID card number.

All of the aforementioned measures have helped improve the administrative procedures, inform the public in a direct and timely manner and speed up the licensing process.

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).

The Electricity Authority of Cyprus (EAC) purchases all the energy fed into the distribution/transmission system, which is generated by RES plants included in one of the support schemes, provided that the terms laid down in the purchase agreement between the EAC and the producer, as well as those laid down in the transmission and distribution rules in force each time, are met. Regarding RES projects included in support schemes, a 15- to 20-year long agreement is signed by and between EAC and the system owner for purchasing the energy generated.

In accordance with the legislation in force, CTSO gives priority to RES power plants in dispatching the electricity generated. More specifically, RES plants enjoy preferential treatment in terms of the dispatch of the electricity they generate as they feed all that electricity into the system, on condition that the safe and reliable operation of the electricity supply system is not adversely affected in any way.

With regard to the requisite new infrastructure and/or improvement of the existing transmission network, CTSO is preparing a 10-year transmission system development plan, which will be submitted to CERA for approval. The 10-year plan, which is subject to annual review, includes all grid development projects considered necessary in order to maintain a safe and reliable system, with due account taken of the new RES projects. CTSO follows the instructions/guidelines provided by CERA, which are consistent with the EU framework, thus ensuring that new infrastructure projects are designed and planned to facilitate optimal financial and operational connectivity for RES projects.

A connection fee is still charged in accordance with CERA Decision No 03/2013 laying down the policy followed regarding the fee charged on RES producers for connecting to the transmission/distribution system, as posted on the CERA and CTSO websites (as already referred to in paragraph 2.a. The following rules are in force in accordance with the current charging policy:

Assumption of costs: Costs are calculated using the shallow connection method. Connection costs are calculated on the basis of the technically acceptable solution with the minimum cost. RES producers bear and pay 100 % of the costs incurred for connecting their plants to the network.

Allocation of costs: CTSO encourages wind farm applicants who wish to be connected in the same area to apply for grid connection at the same time so that network connection costs can be shared. Otherwise, the cost is shared on the basis of reimbursable expenditure, meaning that the first applicant assumes the connection costs and, if at a later stage another (RES or non-RES) applicant applies for connection within 10 years from the first connection, the first applicant is entitled to reimbursement from subsequent applicants of part of the costs incurred.

3. Please describe the support schemes and other measures currently in place that are applied to promote energy from renewable sources and report on any developments in the measures used with respect to those set out in your National Renewable Energy Action Plan (Article 22(1)(b) of Directive 2009/28/EC).

The following support schemes were implemented in the period 2015-2016 to promote RES energy:

1. The 'Solar Energy for All' scheme was continued, covering:
 - V. The installation of net-metering photovoltaic (PV) systems with a power of up to 5kW for all consumers (residential and non-residential/commercial).
 - VI. Subsidisation by EUR 900.00 per installed kW (with a subsidy ceiling of EUR 2 700.00) for the installation of PV systems in the homes of vulnerable consumers.
 - VII. Installation of PV systems with a power of 10kW to 10MW, for autoproduction in commercial and industrial establishments. VIII. Installation of independent PV systems.
2. Special charges for ancillary services, grid use and other services will be imposed for the broader implementation of the net metering method, under which the electricity fed into the grid is offset against that generated by PV systems installed in homes (CERA Decision No 909/2013).
3. Special charges for ancillary services, grid use and other services will be imposed for the broader implementation of the autoproduction method by the use of PV systems installed in industrial and commercial establishments (CERA Decision No 919/2013).
4. Solar water heater replacement scheme. The scheme was launched in November 2015 and relaunched in September 2017. This scheme aims to provide economic incentives in the form of a State grant for replacing solar water heaters in existing dwellings.
5. 'Save & Upgrade' scheme for enterprises. The scheme was announced on 23 December 2015. The scheme is co-financed by the Republic of Cyprus and the European Regional Development Fund (ERDF) in the context of the Operational Programme 'Competitiveness and Sustainable Development, programming period 2014-2020. Subsidy is granted under the scheme for actions that involve major upgrades in existing buildings owned or rented by SMEs. These actions also include the installation of RES systems for heating/cooling or hot water.
6. 'Save & Upgrade' scheme for residential buildings. The scheme was announced on 17 March 2015. The scheme is co-financed by the Republic of Cyprus and the Cohesion Fund (CF) in the context of the Operational Programme 'Competitiveness and Sustainable Development, programming period 2014-2020. Subsidy is granted under the scheme for actions that involve energy upgrades in existing residential buildings or building units. These subsidised actions also include the installation of RES systems for heating/cooling or hot water.
7. Rural Development Programme of the Ministry of Agriculture, Rural Development and the Environment. Subsidy is granted under the scheme for actions that involve purchasing and installing PV systems used to generate energy for own use in agricultural holdings/parcels. Subsidy is also granted under the scheme for purchasing energy storage systems.

Schemes 2 and 3 were operated without any modification compared to 2013. The operation of scheme 1 was continued just like in 2013, with the following key modifications:

- Introducing a new investment category relating to the installation of net metering PV systems by non-residential consumers.
- Increasing the maximum capacity of net metering PV systems from 3kW to 5kW.
- Increasing the maximum capacity of autoproduction PV systems from 2MW to 10MW.

The table below provides details on the economic incentives granted in the form of State aid under support schemes 1 and 4.

Table 3: Support schemes for the years 2015-2016 for natural persons and organisations not engaged in economic activity

Technology	Subsidy
Small-scale residential PV systems with a capacity of up to 3kW, to be installed on the rooftops of homes owned by vulnerable groups of residential consumers, using the net metering method, under which the electricity consumed is offset against that generated.	Subsidy of EUR 900.00 for each kW installed is granted to vulnerable groups of residential consumers, with a subsidy ceiling of EUR 2 700.00 per system.
Residential solar systems (for replacement of systems in existing private residential units)	The subsidy is: EUR 350.00 per residential unit for the replacement of a complete water heating solar system, and EUR 175.00 per residential unit for panel replacement in existing solar water heating systems

Town Planning and Housing Department

On 17 November 2014, the Minister for Interior issued an order under Article 6 of the Town and Country Planning Act setting out incentives and/or requirements for encouraging the use of RES in different types of developments. The order aims to create the conditions for encouraging natural and legal persons to produce energy from RES and concerns different types of developments, as described in the order. The incentive granted consists in increasing the building ratio, or in some cases the use of RES is a requirement for applicability of other incentives under the development plans.

Following are the key provisions of Order 1 of 2014:

- The use of RES concerns PV and solar thermal system installations.
- In the case of PV systems used to generate electricity, the installation is connected to the grid.
- This applies to new or existing developments.
- All developments covered by the Order must meet the minimum energy generation requirements in conjunction with the relevant energy efficiency requirements of the development.

It is understood that the minimum energy generation requirements listed in the relevant table can be met through different energy efficiency combinations of the development and the RES installation. However, to ensure better environmental protection, combinations that focus primarily on reducing the energy needs of the development (e.g. better thermal insulation of the building) and then meet the required rate of the resulting energy needs are preferred.

TABLE OF INCENTIVES AND CONDITIONS RELATED TO USE OF RES

S/N	Type of building development or use	Key requirements					Incentive consisting in increasing building ratio by:	Scope
		Requirements	Optional use of the incentive or mandatory requirement for other incentives for this type of development to apply		Energy rating category of the establishment	Minimum mandatory coverage ratio (%) of all energy needs for the relevant use or minimum installed capacity in relation to the floor area of the development		
			Optional incentive	Mandatory requirement for applicability of other incentives under the development plans				
1	All types of developments (in addition to types 35 below) that fall within the development boundary (or in the vicinity thereof)	As indicated in the respective development plans	Optional		A	25 % (*2)	5 %	All of Cyprus

2	Sizeable composite use developments, sizeable composite urban use developments, special developments outside urban development areas and boundaries		Optional		A	25 % (*1), (*2)	5 %	All of Cyprus
3	Industries, crafts establishments and warehouses		Optional		A (only for the part of the building that falls under Act 142(I)/2006 on the energy performance of buildings, as amended)	2kW/100 m ² of the total industrial space/year (*1)	5 %	All of Cyprus

4	Tall buildings as indicated in the respective development plans			Requirement for applicability of other incentives	A	25 % (*2)		Applies in relation to the provisions of the local plans of Nicosia, Larnaca, Limassol and Pafos
5	Developments with desired uses in central areas			Requirement for applicability of other incentives for desired uses	A	25 % (*2)		Applies to the local plans of Nicosia, Larnaca, Limassol and Pafos

Notes: (*1) Primary energy based on the methodology for calculating the energy performance of buildings
(*2) Combination of the energy efficiency level of the development and A installation (see relevant condition of para. 5.1 of Order 1 of 2014)

3.1. Please 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*)

As referred to under Question 2b too, EAC, being the sole electricity supplier in Cyprus currently, has to purchase all the energy produced by RES units included in a support scheme and fed into the distribution/transmission network at the tariffs specified by CERA, on condition that the terms laid down in the purchase agreement between EAC and the producer and in the distribution and transmission rules in force each time are met. Regarding RES projects included in support schemes, a 15- to 20-year long agreement is signed by and between EAC and the system owner for purchasing the energy generated.

EAC sends to the Ministry of Energy, Commerce, Industry and Tourism the monthly amount of electricity generated by RES units that obtain support and publishes the RES share in electricity generation in its annual report, to inform consumers too.

It should be noted that CERA, by its decision of 28 May 2015, approved the methodology for calculating the fuel mix used in electricity generation in Cyprus and the fuel mix of the suppliers, as well as the resulting technical manual setting out the procedure for calculating the fuel mix used in electricity generation and the fuel mix of the suppliers, and the disclosure of the fuel mix of electricity suppliers.

CERA also adopted a decision to approve the methodology used to disclose the fuel mix of the supplier, as required by Article 3(9) of Directive 2009/72/EC.

4. Please provide information on how, where applicable, the support schemes have been structured to take into account RES applications that give additional benefits, but may also have higher costs, including biofuels made from wastes, residues, non-food cellulosic material, and ligno-cellulosic material (*Article 22(1)(c) of Directive 2009/28/EC*).

The practice used to calculate the amount and intensity of the grant/subsidy takes into account the following:

- the domestic renewable energy potential per technology,
- the cost, maturity, efficiency, potential, development and social acceptance of each technology,
- the safety of network operation and the capabilities offered by each technology in terms of reserve,
- the dispersed and decentralised RES energy generation.

As referred to under Question 2, a new policy for promoting RES electricity generation projects has been implemented since 2015, whereupon the support schemes that provided for the subsidisation of RES electricity generation projects were abolished. Investors implementing RES electricity generation projects now enjoy the current RES electricity price specified by the Cyprus Energy Regulatory Authority (CERA) up until the competitive electricity market is launched, whereupon these projects will have to be included in that market and thus compete conventional technologies on equal terms.

5. Please provide information on the functioning of the system of guarantees of origin for electricity and heating and cooling from RES, and the measures taken to ensure reliability and protection against fraud of the system (*Article 22(1)(d) of Directive 2009/28/EC*).

The Republic of Cyprus operates a system of guarantees of origin for electricity from RES but there are currently no plans to create a system of guarantees of origin for heating and cooling from RES.

Pursuant to the Promotion and Encouragement of the Use of Renewable Energy Sources Act of 2013²¹, as well as the new Regulatory Decision of Cyprus Energy Regulatory Authority²², Cypriot legislation has fully transposed Article 15 on the guarantees of origin for electricity produced from RES.

The Cyprus Transmission System Operator, being the authorised issuer of guarantees of origin, has operated an electronic register since December 2010 for both the guarantees of origin from RES and the guarantees of origin from high-efficiency cogeneration of heat and power. On 1 February 2011, the CTSO issued the first guarantee of origin for the first wind farm installed in Cyprus.

CTSO has taken a number of measures to ensure the reliability of the system and protect it against fraud, in addition to those described in the Directive (setup of an electronic register, issuance of guarantees of origin with a unique identification number). Firstly, the electronic register has been so designed as to integrate actual measurements taken by remote transmission from electricity meters installed at the connecting point between RES power plants and the transmission/distribution system. Two meters are installed in each RES power plant (a main

²¹ Act 112(I)/2013

²² Regulatory Decision No 02/2010 under Article 21 of Act 162(I)/2006

meter and a verification meter), which are certified, tested and sealed in accordance with the legislation in force. Moreover, measures have been taken in each RES plant to prevent the feeding into the grid of electricity from conventional sources or via other interconnections. In addition to that, each RES power plant is inspected on a regular basis to ensure that the output recorded comes from RES only. CTSO has also drawn up a technical manual setting out the electronic registry's entire operating procedure, and all necessary measures have been taken to ensure controlled access to the electronic register (solely by entry of authorised user name and password), the provision of relevant supporting documentation and thorough checks at each phase of the procedure used to issue guarantees of origin.

The electronic register of guarantees of origin operated by CTSO was recently upgraded to fully conform to the regulations of the Association of Issuing Bodies (AIB), whereas CTSO has become a full member of AIB since September 2014. The connection of the electronic register of guarantees of origin with AIB's server, known as AIB hub, is expected to be completed before the end of 2017. Therefore, as of January 2018, it will be possible to communicate RES guarantees of origin to other European countries via the AIB hub.

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

Table 4: Biomass supply for energy use

		Amount of domestic raw material in tonnes (tn)*		Primary energy in domestic raw material (ktoe)		Amount of imported raw material from EU in tonnes (tn)*		Primary energy in amount of imported raw material from EU (ktoe)*		Amount of imported raw material from non EU in tonnes (tn)(*)		Primary energy in amount of imported raw material from non EU (ktoe)	
		2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Biomass supply for heating and electricity:													
Direct supply of wood biomass from forests and other wooded land energy generation (fellings etc.)**	Wood biomass	2096	2096	0.75	0.75	525.632	360.879	0.19	0.13	1 165.42	888.14	0.42	0.32
Indirect supply of wood biomass (residues and co-products from wood industry etc.)	Scrap wood / wood residues	1 044.44	1 044.44	0.38	0.38	551.292	472.238	0.20	0.17	337.38	202.80	0.12	0.07
	Processed wood fuel (charcoal)	1 367	2 355	0.98	1.70	150.269	378.65	0.11	0.27	12 309	12 962	8.86	9.33
	Wood pellets	0	0	0	0	349	10.16	0.14	0.0042	3 504.44	2 120.24	1.44	0.87
Agricultural by-products / processed residues and fishery by-products **	Charcoal from olive pit	3 121	3 187	1.34	1.37	0	0	0	0	0	0	0	0
	Meat meal	1 465	1 454	0.554	0.67	0	0	0	0	0	0	0	0
Biomass from waste (municipal, industrial etc.) **	Sludge from municipal waste	671	732	0.17	0.18	13 791	14 313	3.50	3.48	0	0	0	0
Energy crops (grasses, etc.) and short rotation trees (please specify)	0	0	0	0	0	0	0	0	0	0	0	0	0
Other (please specify)	Biogas from animal and municipal waste			8.85	8.91	0	0	0	0	0	0	0	0

<i>Biomass supply for transport:</i>													
Common arable crops for biofuels (please specify main types)		0	0	0	0	3 944 MT (biofuels from rapeseed oil, sunflower oil)	604 MT (biofuels from sunflower oil)	3.51	0.54	0	0	0	0
Energy crops (grasses, etc.) and short rotation trees for biofuels (please specify main types)		0	0	0	0	0	0	0	0	0	0	0	0
Other (please specify)	Biofuels from used cooking oil	73 MT	57 MT	0.065	0.05	3 109 MT	5 246 MT	2.77	4.67	3 527 MT	4 015 MT	3.14	3.57

- * Amount of raw material if possible in **m3 for biomass from forestry** and in **tonnes for biomass from agriculture and fishery and biomass from waste**
- ** 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

Table 4a: Current agricultural land use for production of crops dedicated to energy production (ha)

Land use	Area (ha)	
	2015	2016
1. Land used for common arable crops (wheat, sugar beet etc.) and oilseeds (rapeseed, sunflower etc.) (Please specify main types)	0	0
2. Land used for short rotation trees (willows, poplars) (Please specify main types)	0	0
3. Land used for other energy crops such as grasses (reed canary grass, switch grass, Miscanthus), sorghum (Please specify main types)	0	0

No agricultural land was used for energy crops in Cyprus in 2015 and 2016. In the above two-year period, only very small quantities of biofuels were produced from used cooking oil in Cyprus.

- 7. Please 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).**

In the two-year period 2015-2016, no changes were made to the prices of basic commodities and to land uses, associated with an increase in the use of biomass or other forms of renewable energy.

In the previous two years, no agricultural land was used in Cyprus to produce energy crops or crops intended solely for energy purposes. The reason for this is that the agricultural sector of Cyprus cannot support the exploitation of substantial volumes of products or by-products from agriculture and forestry for energy generation purposes, primarily due to the water shortage problems and the absence of large agricultural parcels in Cyprus. In addition to that, the absence of large quantities of biomass from forestry does not allow for the extensive use of such biomass for energy purposes. As a matter of fact, therefore, most domestic agricultural products and by-products in Cyprus are used in food and feed, instead of energy purposes.

Moreover, the Republic of Cyprus promotes the use of animal, municipal and industrial waste as raw material for biomass energy production, and therefore there has not been, nor is there expected to be in the near future, any significant impact on other sectors reliant on agriculture and forestry which could lead to a change to the price of raw materials or land use.

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

In the two-year period 2015-2016, very small amounts of biofuels were produced in Cyprus from used cooking oils included in the list of wastes (Part B of Annex IV to Directive 2009/28/EC), the contribution of which towards the RES target in transport is twice their energy content. The amounts of biofuels produced in the Republic of Cyprus are shown in the table below.

Also, most of the used cooking oil collected in Cyprus is exported to Greece for the production of biodiesel. This biodiesel is mixed with diesel in Greek refineries and imported to Cyprus as diesel. Only a small quantity of local used cooking oil is used for domestic production of biodiesel and is consumed by the producers themselves.

Table 5: Development of biofuels

Please provide the total amounts of biofuels made from the feedstocks listed in Annex IX of Directive 2009/28/EC (ktoe)

Feedstocks as listed in Annex IX Part A of Directive 2009/28/EC	2015	2016
(a) <i>Algae if cultivated on land in ponds or photobioreactors.</i>	0	0
(b) <i>Biomass fraction of mixed municipal waste, but not separated household waste subject to recycling targets under point (a) of Article 11(2) of Directive 2008/98/EC.</i>	0	0
(c) <i>Bio-waste as defined in Article 3(4) of Directive 2008/98/EC from private households subject to separate collection as defined in Article 3(11) of that Directive.</i>	0	0
(d) <i>Biomass fraction of industrial waste not fit for use in the food or feed chain, including material from retail and wholesale and the agro-food and fish and aquaculture industry, and excluding feedstocks listed in part B of this Annex.</i>	0	0
(e) <i>Straw</i>	0	0
(f) <i>Animal manure and sewage sludge</i>	0	0
(g) <i>Palm oil mill effluent and empty palm fruit bunches</i>	0	0
(h) <i>Tall oil pitch</i>	0	0
(i) <i>Crude glycerine</i>	0	0
(j) <i>Bagasse</i>	0	0
(k) <i>Grape marcs and wine lees</i>	0	0
(l) <i>Nut shells</i>	0	0
(m) <i>Husks</i>	0	0
(n) <i>Cobs cleaned of kernels of corn.</i>	0	0
(o) <i>Biomass fraction of wastes and residues from forestry and forest-based industries, i.e. bark, branches, pre-commercial thinnings, leaves, needles, tree tops, saw dust, cutter shavings, black liquor, brown liquor, fibre sludge, lignin and tall oil.</i>	0	0
(p) <i>Other non-food cellulosic material as defined in point (s) of the second paragraph of Article 2.</i>	0	0
(q) <i>Other ligno-cellulosic material as defined in point (r) of the second paragraph of Article 2 except saw logs and veneer logs.</i>	0	0
Feedstocks as listed in Annex IX Part B of Directive 2009/28/EC	2015	2016
(a) <i>Used cooking oil</i>	0.065	0.051
(b) <i>Animal fats classified as categories 1 and 2 in accordance with Regulation (EC) No 1069/2009 of the European Parliament and of the Council</i>	0	0

Resource assessment

Please provide a resource assessment of the feedstock listed in Annex IX to Directive 2009/28/EC focusing on the sustainability aspects relating to the effect of the replacement of food and feed products

for biofuel production, taking due account of the principles of the waste hierarchy established in Directive 2008/98/EC and the biomass cascading principle, taking into consideration the regional and local economic and technological circumstances, the maintenance of the necessary carbon stock in the soil and the quality of the soil and the ecosystems.

In the two-year period 2015-2016, only very small amounts of biofuels were produced in Cyprus from used cooking oils (listed in Part B of Annex IV), and therefore there was no effect on the production of food and feed products or in the maintenance of the necessary carbon stock in the soil and the quality of the soil and the ecosystems.

9. Please provide information on the estimated impacts of the production of biofuels and bioliquids on biodiversity, water resources, water quality and soil quality within your country in the preceding 2 years. Please provide information on how these impacts were assessed, with references to relevant documentation on these impacts within your country (Article 22(1)(h) of Directive 2009/28/EC).

In 2015 and 2016, no significant amounts of biofuels and bioliquids were produced from domestic biomass, and therefore there were no impacts on biodiversity, water resources, water quality and soil quality in Cyprus. The only biofuels produced were derived solely from a small quantity of domestic used vegetable oil.

10. Please estimate the net greenhouse gas emission savings due to the use of energy from renewable sources (Article 22(1)(k) of Directive 2009/28/EC).

Annex I describes in detail the methodology used to calculate net greenhouse gas emission savings due to the use of renewable energy in electricity generation, heating/cooling and transport.

Table 6: Estimated greenhouse gas emission savings from the use of renewable energy (t CO₂eq)

Environmental aspects	2015	2016
<i>Total estimated net greenhouse gas emission saving from using renewable energy²³</i>	466 684	487 171
- Estimated net greenhouse gas saving from the use of renewable electricity	112 264	120 206
- Estimated net greenhouse gas saving from the use of renewable energy in heating and cooling	326 797	337 567
- Estimated net greenhouse gas saving from the use of renewable energy in transport	27 623	29 398

²³ 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 greenhouse gas savings.

11. Please report on (for the preceding 2 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).

The Republic of Cyprus aims to meet its binding targets on renewable energy sources using only domestic production and is not expected to use the cooperation mechanisms. However, it does not exclude the prospect of participating in joint projects with other Member States and/or third countries.

Table 7: Actual and estimated excess and/or deficit production of renewable energy compared to the indicative trajectory which could be transferred to/from other Member States and/or third countries in the Republic of Cyprus (ktoe)^{24, 25}

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Actual/estimated excess or deficit production (Please distinguish per type of renewable energy and per origin/destination of import/export)	0	-11.43	28.06	43.71	44.70	42.93	28.66	28.89	57	34	21	0

In the two-year period 2015-2016, just like in the two-year periods 2011-2012 and 2013-2014, the Republic of Cyprus exceeded the intermediate targets of Annex I to Directive 2009/28/EC concerning the RES share in gross final consumption of energy. The surplus RES energy in ktoe shown in Table 7 relates to the extra RES energy consumed in the Republic of Cyprus compared to the minimum RES energy that should have been consumed to attain the indicative trajectory targets laid down in Part B of Annex I to Directive 2009/28/EC. The surplus RES energy in the two-year period 2015-2016 relates to heating-cooling.

The estimated surplus shown for the years 2017-2019 is the same as that shown in Table 9 of the National Action Plan, as Cyprus' estimates concerning the calculation and production of RES energy are not yet modified compared to the National Action Plan.

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

In the two-year period 2015-2016, the Republic of Cyprus has not concluded any agreement on statistical transfers, joint projects or joint support schemes with other States.

The national procedures and arrangements on statistical transfers, joint projects and joint support schemes are set out in Articles 15-18 of the Promotion and Encouragement of the Use of Renewable Energy Sources Act of 2013 (Act 112(I)/2013).

²⁴ 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 to 2020. In each report the Member State may correct the data of the previous reports.

²⁵ When filling in the table, for deficit production please mark the shortage of production using negative numbers (e.g. – x ktoe).

In accordance with the national legislation, the Council of Ministers, following a proposal from the Minister for Energy, Commerce, Industry and Tourism:

- Makes decisions on the conclusion of bilateral agreements for the statistical transfer of a specific amount of RES energy from the Republic of Cyprus to another Member State and/or vice versa.
- Makes decisions on the conclusion of bilateral or multilateral agreements with other Member States for joint projects relating to the production of electricity, heating or cooling from RES. The proposals for joint RES electricity generation are prepared following consultation with CERA.
- Makes decisions on the conclusion of bilateral or multilateral agreements with one or more third countries and/or in cooperation with one or more Member States for joint projects relating to RES energy generation in third countries.
- May conclude bilateral or multilateral agreements with other Member States for partially unifying or coordinating the national support schemes.

The private bodies and local administrations may propose to the Minister for Energy, Commerce, Industry and Tourism the technology to be developed in the context of joint projects, the installed capacity and the place where the projects are to be implemented, subject to such conditions as laid down in the agreements to be approved by the Council of Ministers.

12. Please provide information on how the share of 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 the two-year period 2015-2016, waste (dried sewage sludge, ASF, RDF, tyres) was used by the cement production industry to generate heating. The biomass fraction of specific alternative fuels was determined by analyses carried out by laboratories accredited according to EN ISO/IEC 17025. No electricity is currently produced in Cyprus from household/industrial waste.

13. Please provide the amounts of biofuels and bioliquids in energy units (ktoe) corresponding to each category of feedstock group listed in part A of Annex VIII taken into account by that Member State for the purpose of complying with the targets set out in Article 3(1) and (2), and in the first subparagraph of Article 3(4).

Feedstock group	Year 2015	Year 2016
Cereals and other starch-rich crops	0	0
Sugars	0	0
Oil crops	3.51	0.54

Please note that in the first progress report (2011 report) Member States are invited to outline their intentions with regard to the questions addressed in Article 22(3(a) to (c). In addition, Member States are also welcome to provide any other information considered relevant to the specific situation of developing renewable energy of in the Member State concerned.

Article 22(3)(c): The Member State shall outline whether it intends to indicate geographical locations suitable for exploitation of energy from renewable sources in land-use planning and for the establishment of district heating and cooling.

Please note the following regarding the issues covered by Article 22(3)(c):

With a view to ensuring an in-depth and detailed energy analysis of local areas with increased concentrated needs for heating and cooling, the Ministry of Energy, Commerce, Industry and Tourism appointed an external consultant to prepare a study for identifying the optimal method in terms of cost-effectiveness and primary energy savings. The study results, which are currently being evaluated, indicated that there is limited potential for setting up a district heating/cooling system. The areas with such potential are primarily those with an increased concentration of hotel units.

The implementation of the general development strategy for development plans aims to fulfil, inter alia, the objective of planning, organising and programming infrastructure projects with due account taken of their social, financial and environmental impact. The development plans include a physical planning policy for infrastructure projects, including RES installations, which aims to introduce flexible provisions to address the needs at hand each time for the implementation of infrastructure projects in line with the principles of sustainability/viability and management of the environment, and especially of the natural resources, cultural heritage and landscape. The physical planning policy includes both general and specific policy provisions, with reference made to the relevant orders of the Minister for Interior.

Order 2/2006 of the Minister for Interior covers primarily RES installations, including wind turbines, anemometers, wind farms and photovoltaic installations. The physical planning policy aims to establish restrictions and requirements with a view to ensuring that RES installations are aesthetically integrated in the natural landscape with minimum impact on the broader environment and nearby land uses. The restrictions and requirements concern areas that are important and sensitive both at national and European levels (State forest, archaeological sites, Natura 2000 network, etc.). Reference is made to the requirements that should be met by each RES energy generation facility (anemometer, wind turbine, wind farm, photovoltaic plant) in order to be lawfully included in the physical planning, such as the required distance from important protected areas and existing infrastructures, terms for better aesthetic integration in the natural and built environment, the noise pollution limits in different land uses and specific terms in case of issuing a town planning permit. Provisions on the above-mentioned forms of energy also apply to other renewable energy sources, such as solar, geothermal, wave, tidal and

hydroelectric energy and energy from biomass and biogas from municipal waste and sewage treatment plants.

Order1/2014 aims to create the conditions for encouraging natural and legal persons in the private sector (and/or bodies in the broader public sector) to produce energy from renewable energy sources (RES), in particular to set up photovoltaic installations and solar thermal systems in different types of developments, and concerns:

(a) all types of developments falling within the development boundaries, except for those falling within specifically designated areas, controlled areas of the Department of Antiquities or other specific areas that are subject to the scope of the protection provisions of the relevant development plans;

(b) sizeable composite use developments, sizeable composite urban use developments and special developments of the relevant development plans, outside urban development areas and boundaries.

The Order includes a relevant table listing the relevant incentives and requirements and describes the licensing procedure for the development.

Description of the methodology used to estimate net greenhouse gas emission savings due to the use of (a) electricity from renewable energy sources, (b) renewable energy sources in heating-cooling, and (c) renewable energy sources in transport.

1. Introduction

The estimate of net greenhouse gas emission savings due to use of (a) electricity generation from renewable energy sources and (b) renewable energy sources in heating-cooling was made by the department responsible for calculating greenhouse gas emissions, i.e. the Department of Environment of the Ministry of Agriculture, Natural Resources and Environment. The estimate of the net greenhouse gas emission savings due to use of renewable energy in transport was made by the Energy Service of the Ministry of Energy, Commerce, Industry and Tourism.

2. Methodology

The steps taken to calculate savings referred to under points (a) and (b) are:

- (a) Collection of RES energy consumption data.
- (b) Collection of data on energy sources that would have been used if no renewable energy sources were available.
- (c) Collection of greenhouse gas emission coefficients for energy sources that would have been used if no renewable energy sources were used.
- (d) Conversion of energy consumption into TJ.
- (e) Calculation of greenhouse gas emissions.
- (f) Conversion of greenhouse gas emissions into carbon dioxide equivalent (tonnes).
- (g) Calculation of total savings.

Transport

The net greenhouse gas emission reduction (savings) due to the use of biofuels in road transport was estimated as the difference between the emissions produced by the use of diesel and those produced by the use of a biodiesel mixture of specific proportions, using the typical greenhouse gas emission reduction values set out in the biofuel sustainability certificates.

A detailed presentation of the steps followed to calculate the net reduction (savings) in greenhouse gas emissions due to the use of biofuels in road transport is shown below:

- (a) The energy from biofuels consumed in transport was calculated in MJ.
- (b) Greenhouse gas emissions from the aforementioned volume were assumed to be equivalent to the same volume of conventional fuel. Currently, only biodiesel is mixed with diesel in Cyprus, and therefore said quantity was treated as if it were diesel.
- (c) Having calculated greenhouse gas emissions from the aforementioned volume of diesel fuel, the net greenhouse gas emission savings were estimated as if the volume consisted of a mixture of biofuels in specific proportion, using the typical greenhouse gas emission savings value for each biofuel, as set out in the biofuel sustainability certificates.

3. Results

(a) Collection of RES energy consumption data

The source of renewable energy consumption data is the national energy balance prepared annually by the Energy Service of the Ministry of Energy, Commerce, Industry and Tourism²⁶. The data for the years 2015 and 2016 are shown in Table 1.

Please note the following regarding biomass:

- Biomass consumed by the cement plant is solid and liquid waste.
- Biomass used for heating purposes in houses and services is composed of wood and wood residues.
- Biomass used for cooking purposes is charcoal.
- Biomass used in agriculture comes from cogeneration of heat and power from anaerobic livestock waste processing plants.
- Biomass used in industry comes from wood residues and olive pit.

Table 1. Consumption of renewable energy in 2015 and 2016 in toe.

Electricity (toe)	2015	2016
Electricity from biomass		
- Consumption in agriculture	1 189	1 325
- Fed into the electricity grid	3 217	3 148
Electricity from photovoltaic systems		
- Consumption in the residential sector	1 432	1 829
- Consumption in the tertiary sector	6	6
- Fed into the electricity grid	9 455	10 864
Electricity from wind power		
- Consumption in the tertiary sector	37	37
- Fed into the electricity grid	19 043	19 459
Total	34 379	36 668

²⁶ Energy Service, 2017, national energy balance 2015/2016, Ministry of Energy, Commerce, Industry and Tourism.

Thermal energy (toe)	2015	2016
Solar thermal		
- Residential sector (hot water)	57 678	58 621
- Tertiary sector (room heating)	10 179	10 345
Geothermal		
- Residential sector	1 551	1 551
Biomass		
- Cement industry	10 234	11 529
- Residential sector (cooking)	8 329	8 027
- Other industries	1 690	1 718
- Tertiary sector	5 108	5 748
- Agriculture	4 445	4 441
Total	99 214	101 980

(b) Collection of data on energy sources that would have been used if no renewable energy sources were available.

It was acknowledged that, if no RES had been used, the energy produced would have come from the sources presented in Table 2. The data for the cement industry are based on the annual reports submitted by the plant under Act 110(I)/2011²⁷ for the years 2015 and 2016.

Table 2. Energy sources that would have been used if no renewable energy sources were available in 2015 and 2016 in %.

Electricity	Electr.	Diesel	Pet-coke	RFO	LPG	Coal
Agriculture, residential sector, industry, services	100 %					

Thermal energy (toe)						
Solar thermal - hot water	100 %					
Solar thermal - room heating		100 %				
Geothermal		100 %				
Biomass						
Cement industry (2015)		0.003 %	95.32 %	0.66 %	0.39 %	3.63 %
Cement industry (2016)		0.035 %	98.30 %	0.85 %	0.31 %	0.51 %
Residential sector (cooking)	100 %					
Residential sector (heating), industry, services, agriculture		100 %				

²⁷ The Establishment of a Scheme for Greenhouse Gas Emission Allowances Trading Act of 2011 (No 110(I)/2011)

(c) Collection of greenhouse gas emission coefficients for energy sources that would have been used if no renewable energy sources were used.

Greenhouse gas emission coefficients used to calculate emissions are shown in Table 3.

Table 3. Greenhouse gas emission coefficients per type of gas for 2015 and 2016 in kg/TJ.

Emission coefficient (kg/TJ)	2015	2016	Source
Electricity generation			
CO ₂	77 741	78 045	Annual ETS report from the plant ^a
CH ₄	3	3	IPCC 2006 GHG guidelines ^b
N ₂ O	0.6	0.6	IPCC 2006 GHG guidelines ^b
Cement production			
<i>Liquid fuel</i>			
CO ₂ Diesel	74 100	74 100	IPCC 2006 GHG guidelines ^d
CO ₂ Petcoke	92 218	92 815	Annual ETS report from the plant ^c
CO ₂ RFO	77 400	77 400	IPCC 2006 GHG guidelines ^d
CH ₄ Diesel, Petcoke, RFO	3	3	IPCC 2006 GHG guidelines ^d
N ₂ O Diesel, Petcoke, RFO	0.6	0.6	IPCC 2006 GHG guidelines ^d
CO ₂ LPG	63 100	63 100	IPCC 2006 GHG guidelines ^d
CH ₄ LPG	1	1	IPCC 2006 GHG guidelines ^d
N ₂ O LPG	0.1	0.1	IPCC 2006 GHG guidelines ^d
<i>Coal</i>			
CO ₂	94 880	94 881	Annual ETS report from the plant ^c
CH ₄	10	10	IPCC 2006 GHG guidelines ^d
	1.5	1.5	IPCC 2006 GHG guidelines ^d
Other industries (diesel)			
CO ₂	74 100	74 100	IPCC 2006 GHG guidelines ^e
CH ₄	3	3	IPCC 2006 GHG guidelines ^d
	0.6	0.6	IPCC 2006 GHG guidelines ^d
Services, agriculture (diesel)			
CO ₂	74 100	74 100	IPCC 2006 GHG guidelines ^e
CH ₄	10	10	IPCC 2006 GHG guidelines ^d
N ₂ O	0.6	0.6	IPCC 2006 GHG guidelines ^d

^a Based on the reports submitted as part of the implementation of the Establishment of a Scheme for Greenhouse Gas Emission Allowance Trading Act of 2011 (Act 110(I)/2011). This was calculated by dividing the total CO₂ emissions by the total electricity production for the year, from the three power plants.

^b IPCC, 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol. 2, pg. 2.16.

^c Based on the reports submitted as part of the implementation of the Establishment of a Scheme for Greenhouse Gas Emission Allowance Trading Act of 2011 (Act 110(I)/2011). Coefficients used for the cement production plant using biomass.

^d IPCC, 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol. 2, pg. 2.18.

^e IPCC, 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol. 2, pg. 2.20.

(d) *Conversion of energy consumption into TJ.*

Energy consumption was converted from toe to TJ applying the following formula:

$$ECTJ = EC_{toe} \times 41\,868/1\,000$$

where ECTJ is energy consumption in TJ, EC_{toe} is energy consumption in toe and 41 868 is the conversion coefficient from toe to TJ.²⁸

(e) *Calculation of greenhouse gas emissions.*

Greenhouse gas emissions were calculated by applying the following formula:

$GHG_x = E_{Fx} \times ECTJ / 1000$ where GHG_x is emissions of greenhouse gas x in tonnes, E_{Fx} is the coefficient of the greenhouse gas x in kg/TJ, and ECTJ is energy consumption in TJ.

The results of the application of the aforementioned formula are shown in Table 4.

Table 4. Greenhouse gas emission savings due to use of renewable energy in 2015 and 2016, in tonnes of CO₂, CH₄ and N₂O

	2015 (t)			2016 (t)		
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O
Electricity						
Electricity from biomass	14 341	0.55	0.11	14 616	0.56	0.11
- Consumption in agriculture	3 870	0.15	0.03	4 330	0.17	0.03
- Fed into the electricity grid	10 471	0.40	0.08	10 286	0.40	0.08
Electricity from photovoltaic systems	35 455	1.37	0.27	41 495	1.60	0.32
- Consumption in the residential sector	4 661	0.18	0.04	5 976	0.23	0.05
- Consumption in the tertiary sector	20	0.001	0.000	20	0.00	0.00
- Fed into the electricity grid	30 775	1.19	0.24	35 499	1.36	0.27
Electricity from wind power	62 103	2.40	0.48	63 705	2.45	0.49
- Consumption in the tertiary sector	120	0.00	0.00	121	0.00	0.00
- Fed into the electricity grid	61 982	2.39	0.48	63 584	2.44	0.49
Total	111 899	4.32	0.86	119 816	4.61	0.92

Thermal energy						
Solar thermal	219 313	11.51	1.70	223 644	11.69	1.73
- Residential sector (hot water)	187 734	7.24	1.45	191 549	7.36	1.47
- Tertiary sector (room heating)	31 580	4.26	0.26	32 095	4.33	0.26
Geothermal	4 812	0.65	0.04	4 812	0.65	0.04
- Residential sector	4 812	0.65	0.04	4 812	0.65	0.04
Biomass	101 454	6.66	0.76	107 865	6.96	0.79
- Cement industry	39 464	1.40	0.27	44 695	1.47	0.29
- Residential sector (cooking)	27 110	1.05	0.21	26 229	1.01	0.20
- Other industries	5 243	0.21	0.04	5 330	0.22	0.04
- Tertiary sector	15 847	2.14	0.13	17 833	2.41	0.14
- Agriculture	13 790	1.86	0.11	13 778	1.86	0.11
Total	325 580	18.81	2.51	336 320	19.30	2.56

(f) *Conversion of greenhouse gas emissions into carbon dioxide equivalent (tonnes).*

To calculate greenhouse gas emission savings due to use of renewable energy in 2015 and 2016 in tons of CO₂, equivalent, CH₄ and N₂O emissions were multiplied by the global warming

²⁸ IPCC, 1996, Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, introduction, pg 5

potential of each gas. The coefficient for methane is 25 and for dinitrogen monoxide it is 298²⁹. Table 5 shows the greenhouse gas emission savings due to use of renewable energy in 2015 and 2016, in tonnes of CO₂ equivalent for each gas.

Table 5. Greenhouse gas emission savings due to use of renewable energy in 2015 and 2016 in tons of CO₂ equivalent

	2015 (t CO ₂ eq.)			2016 (t CO ₂ eq.)		
	CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O
Electricity						
Electricity from biomass	14 341	13.8	33.0	14 616	14.0	33.5
- Consumption in agriculture	3 870	3.7	8.9	4 330	4.2	9.9
- Fed into the electricity grid	10 471	10.1	24.1	10 286	9.9	23.6
Electricity from photovoltaic systems	35 455	34.2	81.5	41 495	39.9	95.1
- Consumption in the residential sector	4 661	4.5	10.7	5 976	5.7	13.7
- Consumption in the tertiary sector	20	0.0	0.0	20	0.0	0.0
- Fed into the electricity grid	30 775	29.7	70.8	35 499	34.1	81.3
Electricity from wind power	62 103	59.9	142.8	63 705	61.2	145.9
- Consumption in the tertiary sector	120	0.1	0.3	121	0.1	0.3
- Fed into the electricity grid	61 982	59.8	142.6	63 584	61.1	145.7
Total	111 899	108.0	257.4	119 816	115.1	274.5

²⁹ Decision 24/CP.19 Revision of the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention

Thermal energy						
Solar thermal	219 313	287.7	508.0	223 644	292.4	516.3
- Residential sector (hot water)	187 734	181.1	431.8	191 549	184.1	438.8
- Tertiary sector (room heating)	31 580	106.5	76.2	32 095	108.3	77.4
Geothermal	4 812	16.2	11.6	4 812	16.2	11.6
- Residential sector	4 812	16.2	11.6	4 812	16.2	11.6
Biomass	101 454	166	227	107 865	174	236
- Cement industry	39 464	34.9	80.6	44 695	36.7	86.8
- Residential sector (cooking)	27 110	26.2	62.4	26 229	25.2	60.1
- Other industries	5 243	5.3	12.7	5 330	5.4	12.9
- Tertiary sector	15 847	53.5	38.2	17 833	60.2	43.0
- Agriculture	13 790	46.5	33.3	13 778	46.5	33.2
Total	325 580	470.3	746.7	336 320	482.5	763.9

(g) *Calculation of total savings.*

Greenhouse gas emission savings due to use of renewable energy in 2015 and 2016 were as follows:

- From the use of electricity produced from renewable sources: 112.3 kt CO₂ eq. for 2015 and 120.2 t CO₂ eq. for 2016.
- From use of renewable energy sources in heating-cooling: 326.8 kt CO₂ eq. for 2015 and 337.6 t CO₂ eq. for 2016.

The aforementioned data are shown in detail in Table 6.

Table 6. Total greenhouse gas emission savings due to use of renewable energy in 2015 and 2016 in tons of CO₂ equivalent

	2015 (t CO ₂ eq.)	2016 (t CO ₂ eq.)
Electricity		
Electricity from biomass	14 388	14 663
- Consumption in agriculture	3 883	4 344
- Fed into the electricity grid	10 505	10 320
Electricity from photovoltaic systems	35 571	41 630
- Consumption in the residential sector	4 676	5 996
- Consumption in the tertiary sector	20	20
- Fed into the electricity grid	30 875	35 615
Electricity from wind power	62 305	63 912
- Consumption in the tertiary sector	121	121
- Fed into the electricity grid	62 185	63 791
Total	112 264	120 206

Thermal energy	2015 (t CO ₂ eq.)	2016 (t CO ₂ eq.)
Solar thermal	220 109	224 452
- Residential sector (hot water)	188 347	192 172
- Tertiary sector (room heating)	31 762	32 280
Geothermal	4 840	4 840
- Residential sector	4 840	4 840
Biomass	101 848	108 275
- Cement industry	39 580	44 819
- Residential sector (cooking)	27 198	26 314
- Other industries	5 261	5 348
- Tertiary sector	15 939	17 936
- Agriculture	13 870	13 858
Total	326 797	337 567

Description of methodology for estimating net greenhouse gas savings due to the use of energy from renewable sources in transport.

The following factors were taken into account to estimate greenhouse gas savings in transport due to use of renewable energy sources (biofuels):

- CO₂ savings are calculated over the useful life of fuel and not on combustion.
- CO₂ emissions from the biofuels used in transport were determined on the basis of biofuel sustainability certificates provided by the suppliers of transport fuel (oil companies) for the biofuels they placed on the market.
- In the two-year period 2015-2016, the entire amount of biofuels consumed was used for mixing with diesel. Consequently, the use of biofuels was replaced by the use of amounts of diesel only.
- Greenhouse gas emissions from the use of diesel are determined at 95.1 gCO₂eq/MJ in accordance with Council Directive (EU) 2015/652 of 20 April 2015 laying down calculation methods and reporting requirements pursuant to Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels. It was assumed that the amounts of other greenhouse gases produced in transport are negligible, and therefore only CO₂ savings were calculated.

The net greenhouse gas emissions savings from the use of biofuels in transport was estimated as the difference between the emissions produced by the use of diesel and those produced by the use of biodiesel. The calculations for 2015 and 2016 are shown in the tables below.

2015

Table of calculated greenhouse gas savings due to the use of energy from renewable sources in transport in 2015

Feedstock used in biofuel production	Amount of biofuels used (MT)	Energy content by weight, based on Annex III to Directive 2009/28/EC (MJ/kg)	Energy (MJ)	Value for calculating greenhouse gas emissions from the use of biofuels, in accordance with sustainability certificates (gCO ₂ eq/MJ)	gCO ₂ eq from the use of biofuels	Value for calculating greenhouse gas emissions from the use of diesel, in accordance with Directive (EU) 2015/652 (gCO ₂ eq/MJ)	gCO ₂ eq if diesel was used instead of biofuels	Greenhouse gas emissions savings (gCO ₂ eq)	CO ₂ savings, in %
Used cooking oil	6 709	37	248 233 000	14	3 475 262 000	95.1	23 606 958 300	20 131 696 300	85.3 %
SUNFLOWER OIL	2 953	37	109 261 000	41	4 479 701 000	95.1	10 390 721 100	5 911 020 100	56.9 %
RAPESEED OIL	991	37	36 667 000	52	1 906 684 000	95.1	3 487 031 700	1 580 347 700	45.3 %
TOTAL	10 653		394 161 000		9 861 647 000		37 484 711 100	27 623 064 100	

2016

Table of calculated greenhouse gas savings due to the use of energy from renewable sources in transport in 2016

Feedstock used in biofuel production	Amount of biofuels used (MT)	Energy content by weight, based on Annex III to Directive 2009/28/EC (MJ/kg)	Energy (MJ)	Value for calculating greenhouse gas emissions from the use of biofuels, in accordance with sustainability certificates (gCO ₂ eq/MJ)	gCO ₂ eq from the use of biofuels	Value for calculating greenhouse gas emissions from the use of diesel, in accordance with Directive (EU) 2015/652 (gCO ₂ eq/MJ)	gCO ₂ eq if diesel was used instead of biofuels	Greenhouse gas emissions savings (gCO ₂ eq)	CO ₂ savings, in %
Used cooking oil 1	8 467	37	313 279 000	14	4 385 906 000	95.1	29 792 832 900	25 406 926 900	85.3 %
Used cooking oil 2	500	37	18 500 000	6.58	121 730 000	95.1	1 759 350 000	1 637 620 000	93.1 %
Used cooking oil 3	351	37	12 987 000	7	90 909 000	95.1	1 235 063 700	1 144 154 700	92.6 %
SUNFLOWER OIL	604	37	22 348 000	41	916 268 000	95.1	2 125 294 800	1 209 026 800	56.9 %
TOTAL	9 922		367 114 000		5 514 813 000		34 912 541 400	29 397 728 400	

ANNEX II

Updated NAP for the period 2015-2020 for the part that relates to electricity generation

Two alternative scenarios were developed based on the date of inclusion of RES in the competitive electricity market. The substantial inclusion of RES plants in the competitive electricity market is expected to take place in 2018 under the first scenario, or in 2020 under the second scenario.

Scenario 1: BASELINE SCENARIO - RES PENETRATION 2015-2020

Year	Forecasted electricity supply (GWh)	Installed capacity (MW)				Total RES production with solar thermal plants (GWh)	Percentage electricity generated from RES
		Biofuel	Photovoltaic	Wind farm	Solar thermal		
2015	4 475.00	10	90	157.5	0	397	9 %
2016	4 530.00	15	123.7	157.5	0	473	10 %
2017	4 670.00	15	137.2	167.5	0	508	11 %
2018	4 810.00	15	170.2	167.5	0	562	12 %
2019	4 950.00	The amounts of the various technologies relating to new RES projects, to fulfil national objectives, will be defined in the context of the competitive electricity market.			>50*	743*	15 %
2020	5 100.00					816	16 %

* In scenario 1 it was assumed that, from 2019 onwards, in addition to the operation of a solar thermal plant (50MW) using STIRLING ENGINES, other RES technologies will also be included in the network in accordance with the market rules and the requirements of CTSO/TSO. It is understood that all projects installed under support schemes (FiT) will continue under the current status quo until the end of the relevant contracts.

Scenario 2: OPERATION OUTSIDE COMPETITIVE ELECTRICITY MARKET - BASELINE SCENARIO - RES PENETRATION 2015-2020 WITH ONE SOLAR THERMAL PLANT (STIRLING ENGINES)

Year	Forecasted electricity supply (GWh)	Installed capacity (MW)				Total RES production with solar thermal plants (GWh)	Percentage electricity generated from RES
		Biofuel	Photovoltaic	Wind farm	Solar thermal		
2015	4 475.00	10	90	157.5	0	397	9 %
2016	4 530.00	15	123.7	157.5	0	473	10 %
2017	4 670.00	15	137.2	167.5	0	508	11 %
2018	4 810.00	15	170.2	167.5	0	562	12 %
2019	4 950.00	15	204.2	175	50	723	15 %
2020*	5 100.00	15	288.2	175	50	791	16 %

* As RES technologies to be included in the system in 2020 will be installed gradually in the course of the year, it was assumed that the annual electricity output will represent 50 % of the total energy output that would be generated if the RES technologies were included at the start of the year. Also, contributions from the second solar thermal park (50MW) are anticipated. According to existing timetables it is expected to be commissioned in June 2020.