



MINISTRY OF
ENVIRONMENT
ENERGY &
CLIMATE
CHANGE



GREECE



NATIONAL RENEWABLE ENERGY ACTION PLAN IN THE SCOPE OF DIRECTIVE 2009/28/EC



TABLE OF CONTENTS

1	Summary of national renewable energy policy.....	6
2	Expected Final Energy Consumption 2010-2020	17
3	Renewable energy targets and trajectories.....	20
3.1	National overall target.....	20
3.2	Sectoral targets and trajectories.....	20
4	Measures for achieving the targets	25
4.1	Overview of all policies and measures concerning the promotion of the use of energy from renewable resources.....	25
4.2	Specific measures to fulfil the requirements under Articles 13, 14, 16 and Articles 17 to 21 of the Directive 2009/28/EC	30
4.2.1	Administrative procedures and spatial planning (Article 13(1))	30
4.2.2	Technical specifications (Article 13(2) of Directive 2009/28/EC).....	42
4.2.3	Buildings (Article 13(3) of Directive 2009/28/EC).....	43
4.2.4	Information provisions (Articles 14(1), 14(2) and 14(4) of Directive 2009/28/EC)	48
4.2.5	Certification of installers (Article 14(3) of Directive 2009/28/EC)	50
4.2.6	Electricity infrastructure development (Article 16(1) and Article 16(3) to (6) of Directive 2009/28/EC)	51
4.2.7	Electricity network operation (Article 16(2) and Article 16(7) and (8) of Directive 2009/28/EC)	60
4.2.8	Biogas integration into the natural gas network (Article 16(7) and Article 16(9) and (10) of Directive 2009/28/EC)	62
4.2.9	District heating and cooling infrastructure development (Article 16(11) of Directive 2009/28/EC)	64
4.2.10	Biofuels and other bioliquids – sustainability criteria and verification of compliance (Articles 17 to 21 of Directive 2009/28/EC)	65
4.3	Support schemes for the promotion of the use of energy from renewable resources in electricity applied by the Member State or a group of Member States.....	70



4.4	Support schemes for the promotion of the use of energy from renewable resources in heating and cooling applied by the Member State or a group of Member States	80
4.5	Support schemes for the promotion of the use of energy from renewable resources in transport applied by the Member State or a group of Member States	83
4.6	Specific measures for the promotion of the use of energy from biomass	88
4.6.1	Biomass supply: both domestic and trade	88
4.6.2	Measures to increase biomass availability, taking into account other biomass users (agriculture and forest-based sectors)	92
4.7	Planned use of statistical transfers between Member States and planned participation in joint projects with other Member States and third countries	97
4.7.1	Procedural aspects	97
4.7.2	Estimated excess production of renewable energy compared to the indicative trajectory which could be transferred to other Member States.....	98
4.7.3	The estimated potential for joint projects.....	98
4.7.4	The estimated demand for renewable energy to be satisfied by means other than domestic production.....	99
5	Assessments	101
5.1	Total contribution expected of each renewable energy technology to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in electricity, heating and cooling and transport	101
5.2	Total contribution expected from energy efficiency and energy saving measures to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in electricity, heating and cooling and transport.....	108
5.3	Assessment of the impacts (Optional).....	108
5.4	Preparation of the national Renewable Energy Action Plan and the following up of its implementation	110



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List of Acronyms

CAP	Common Agricultural Policy
CHP	Combined Heat and Power
CRES	Centre for Renewable Energy Source and Saving
CSP	Concentrated Solar Power
DESFA	Hellenic Gas Transmission System Operator S.A
DESMIE S.A	Transmission System Operator of the Greek Electricity Transmission System
DHW	Domestic Hot Water
ETA	Environmental Terms Approval
ELOT	Hellenic body for standardisation
ENTSO	European Network of Transmission System Operators
ESCO	Energy Service Company
ESYD	Hellenic Accreditation System S.A.
FIT	Feed in tariff
GHG	Greenhouse gas emissions
GPS	General City Plans / General Urban Plans
HTSO	Hellenic Transmission System Operator
IMB	Intermediate Management Bodies
JMD	Joint Ministerial Decree
KENAK	Energy Performance of Buildings Regulation
LFA s	Low Fertility Areas
MECS	Ministry of Economy Competitiveness and Shipping
MEECC	Ministry of the Environment, Energy and Climate Change
MWTP	Municipal wastewater treatment plants
NEEAP	National Energy Efficiency Action Plan
NREAP	National Renewable Energy Action Plan
NSRF	National Strategic Reference Framework
NTDP	National Transmission Development Plan
NTUA	National Technical University of Athens
OPC	Operational Programme for Competitiveness
OPE	Operational Programme for Energy
OPEKEPE	Agency for Payments and Control of Community Guidance and Guarantee Aid



List of Acronyms (continued)

OG	Official Gazette
PECHP	Zones for Special Physical Interventions
POAPD	Zones for Organized Development of Productive Activities
PPA	Power Purchase Agreement
PPC	Public Power Corporation
PRDG	Programme of Rural Development of Greece
PV	Photovoltaic
RAE	Regulatory Authority for Energy
RES	Renewable Energy Sources
SCC	Supreme Chemical Council
SCHOAP	Plans for Physical Planning and Urban Organization for the Open City
SOAP	Plans for Integrated Urban Interventions
SPPF-RES	Special Physical Planning Framework for the development of RES and land management
SPS	Special Protection Schemes
SWL	Solid waste landfills
UCTE	Union for the Coordination of Transmission of Electricity
WT	Wind Turbine
ZOE	Zones for Urban Control



1 SUMMARY OF NATIONAL RENEWABLE ENERGY POLICY

The new Government formed after the parliamentary elections of October 4th, 2009 has set as one of its main overarching policy initiatives “green” sustainable development. This political choice has been translated in institutional reform and policy measures that include:

- The establishment of a new Ministry for the Environment, Energy and Climate Change (MEECC) in order to bring under a single administrative structure the respective bodies involved in the licensing of power plants taking into account energy, environment and fiscal considerations including the long term requirements to address climate change. The new Ministry is replacing two previous Ministries: the Ministry of Environment, Physical Planning & Public Works and the Ministry of Development. One of the aims of this restructuring is to facilitate the effective utilization of the considerable existing renewable energy potential while safeguarding the natural environment of Greece.
- The formal acknowledgment of the priority given to achieving the targets set by Directive 2009/28/EC and by international commitments of the country for the protection of the environment (Prime Minister’s speech in Parliament on the Stability, Development and Reconstruction Program vote, March 22nd 2010).
- The recent adoption by Parliament of Law L3851/2010 which came into effect on 4th June 2010 and in which ambitious national targets for RES (namely 20% on final energy consumption, 2% above the mandatory level of 18% set by Directive 2009/28/EC) are specified.

The triple targets of the 20-20-20 package are considered by the Greek Government as both obligations and opportunities. It is envisioned that they will play a key role in ensuring energy security, reducing national GHG emissions and boosting the competitiveness of the economy and attracting investment capital and technical knowhow. It is also estimated that they will assist in the economic improvement of conditions in rural areas and in boosting eco-industry that utilizes comparative advantages of local agricultural production and food industry.

The target of a 20% share of renewable energy in the gross final energy consumption in 2020 will be achieved through the combination of measures for energy efficiency as well as for the enhanced penetration of RES technologies in electricity production, heat supply and transport. A major role in this respect will be played by the streamlining of the existing framework of licensing regulations and the rationalization of the terms and conditions of land management.

The contribution of RES to the national energy balance in 2008 was approximately 7.8% of gross final energy consumption and around 16.3%, of primary energy production. Primary energy produced from RES in 2008 was 1.64 Mtoe. Out of these, biomass use in households accounts for 600ktoe, and the use of biomass in industry for 265 ktoe. Moreover, 285 ktoe are produced by hydroelectric plants, 193 ktoe from wind power plants, 174 ktoe from solar thermal systems, 63 ktoe from biofuels, 35 ktoe from biogas, mainly for electricity generation and 17 ktoe from geothermal energy. Greece has considerable wind and solar energy potential, which has already attracted investment interest, as well as a promising biomass and geothermal potential, which, however, still remains untapped. Most of the existing hydro potential is largely exploited but a further addition of some large



hydro plants including one or two with pumped storage capability and of a number of smaller (i.e. of less than 15MW capacity) ones are currently under consideration.

Meeting the targets set within the RES roadmap until 2020 calls for the elaboration of policies and measures, which aim at the simultaneous fulfilment of the "20-20-20" obligations and the acceleration of the Greek economy through "green" development and enhanced competitiveness of the private sector. In the last three months, a number of major legislative initiatives have been proposed by MEECC and approved by the Greek Parliament. Among them, L3851/2010 (OG A/85/4th June 2010) on "Accelerating the development of Renewable Energy Sources to deal with climate change and other regulations in topics under the authority of the Ministry of Environment, Energy and Climate Change" is of particular importance and it amends significant provisions of the currently applicable legislation, aiming at simplifying the licensing procedure, at rationalizing the feed-in-tariff scheme, at tackling existing barriers at local level, as well as at establishing specific regulations for the use of RES in buildings in accordance with the recently approved "Energy Performance of Buildings Regulation" - KENAK (OG 407/B/2010). Additionally, L3851/2010 sets specific targets for 2020 regarding the share of RES in final energy consumption, electricity generation and contribution in heating, cooling and transport.

However, in addition to a favourable legal regime, it is essential that substantial changes, technical as well as regulatory, are carried out in the Greek energy system. These are describe below and listed in Section 4.1 in the main body of this Report.

RES-Electricity

Higher penetration of RES in the electricity generation will be achieved through the implementation of coordinated fiscal, regulatory, physical planning and technical measures that are targeted to exploit the economic potential for development of large RES plants, to complete the necessary grid infrastructure works, to work towards the establishment of a distributed power generation structure in the planning of new power plants and to facilitate the gradual decommissioning of the old inefficient thermal power plants.

In determining the mix of different RES technologies, a number of considerations should be taken into account. These include cost-effectiveness, domestic value added and security of energy supply. These plus socio-economic and demographic factors as well as the installation costs associated with each RES technology have been included in constructing possible scenarios for the development of the energy sector until 2030 in the elaboration of the Greek NREAP.

Moreover, the productive and balanced exploitation of RES requires the successful tackling of already identified barriers, which include social opposition at local level, bureaucratic constraints and lengthy timeframes for the licensing procedure, investment climate and feasibility and deficiencies in the physical planning.

The results of the energy sector modelling carried out in the scope of compiling the Greek NREAP show that a near tripling of the contribution of RES plants in power generation is necessary for meeting the 20-20-20 targets and requires the use of all RES technologies to match the available potential. In the beginning of the 10-year period to 2020, the technologies and related investment projects with the higher maturity and potential for contribution to the electricity generation have been considered first. In view of the local technical potential and resources and the current nature of the Greek electricity system,



which includes a large number of autonomous grids on the islands large and small, measures and targets are divided into two parts:

A. ELECTRICITY – INTERCONNECTED SYSTEM

Measures that are planned for the electricity production in the interconnected system will be based on the power production from:

- Lignite power plants, which will be modernized using “CCS ready” technology, as well as adapting new technologies for biomass residues exploitation, through co-firing and CO₂ emissions reduction, in conjunction with the gradual decommissioning of the less efficient and more pollutant ones.
- Large scale RES plants , mainly wind farms and large hydro plants (also CSP plants), together with medium/small scale RES plants (photovoltaic plants, small hydro, biogas, geothermal plants, biomass co-generation, and RES applications for electricity generation in the residential and tertiary sector buildings)
- New hydroelectric pumped storage plants, which will become operational, contributing to grid stability and reduced wind energy curtailment
- Some additional natural gas combined cycle plants and to a smaller extent, gas turbines.
- CHP plants

They also include the development and utilization of smart grids along with intelligent monitoring, control, and communication technologies in order to reduce network losses and improve demand management

B. ELECTRICITY – NON-INTERCONNECTED ISLANDS

The main priority for the non-interconnected islands is their gradual interconnection to the mainland grid, resulting in decommissioning of the local oil-fired plants. In addition, other priorities include:

- Development of local RES plants (high potential of wind, solar and in some cases geothermal energy) and supply of the excess electricity to the mainland via the new grid connections
- Development of local hybrid RES plants, where appropriate in view of the local resources and needs
- Development and exploitation of offshore wind parks, development of concentrated solar power plants.
- Design of RES energy autonomous systems and pilot implementation on small islands, whose connection may be difficult or not cost-effective.



RES-Heat

In order to fully implement the National Renewable Energy Action Plan and to meet the “20-20-20” targets new financial incentives for the support of the heat production from biomass and geothermal energy have been put in place or are planned. Also, the implementation of all the technical measures that are described in the newly approved Energy Performance of Buildings Regulation (KENAK), aiming to achieve significant energy savings is expected to commence in 2010. Although solar thermal applications already have a significant penetration in the Greek building sector, new legislative framework passed in 2010 along with the technical requirements that are set by KENAK on minimum required contribution of solar thermal systems for all new buildings, is expected to contribute further. The new building regulation will act as the main legislative tool for the promotion of RES systems for heating and cooling at the tertiary and residential sector but also in industry and the agricultural sector.

Furthermore, the successful implementation of end-use energy saving measures, along with the development of new market mechanisms (e.g. Energy Service Companies-ESCOs) for both the public and private sector as called for in Directive 2006/32/EC, which was transposed into Greek law in 2010, are considered essential in order to achieve the projected RES share in heating and cooling.

RES-Transport

The penetration of biofuels to meet the 20-20-20 target in the transport sector will be achieved through a combination of regulatory actions targeted to promote both the use of more energy-efficient vehicles and the consumption of biofuels in substitution of fossil transport fuels. Emphasis will be put on the domestic production of the required amounts of biodiesel, on the exploitation of the local biomass potential with the cultivation of energy crops for biofuels and on the development of the necessary supply chains in order to assure a significant contribution of the domestic agricultural production

Trajectory for RES utilization

The new law L3851/2010 states that the protection of the climate, through the promotion of electrical energy production from RES, which reduces GHG emissions, constitutes an environmental and energy priority of the highest significance for the country. It further sets specific targets for RES electricity share (40%), RES heating and cooling share (20%), and RES transport share (10%) in order to achieve the national target of 20% contribution of the energy produced from RES to the gross final energy consumption.

This target will be achieved through a combination of measures for energy efficiency and for the large penetration of RES technologies in electricity production, heat supply and transport sector.

In this respect, specific targets for each of the main and most promising RES technologies have been chosen, based on energy modelling calculations, taking into consideration the



targets of the Greek NEEAP in energy efficiency, the national targets for the non-ETS sector's emissions reductions and finally the anticipated gross final energy consumption, i.e. beyond 18% (which is the binding target for Greece in the RES directive), in this report specific targets are set by RES technology.

BOX-1 Methodology and energy model analysis for the development of NREAP

The approach adopted for the development of the Greek NREAP included an analysis of the National Energy System, the implementation of energy models for evaluating the energy policy scenarios developed as well as a sensitivity analysis taking into account different evolution paths of fiscal/regulatory parameters.

The plan for compliance with the 20-20-20 targets evaluates the required market share for technologies and fuels in order to achieve these targets. It was developed on the basis of the results of a number of energy models, including TIMES-MARKAL and ENPEP (for policies assessment) that use input from the models WASP (for optimum electricity generation planning) and COST (for the stochastic simulation of Electricity Generation System) for a number of policy and economic development scenarios developed for this purpose. Detailed information on the scenarios considered, the main parameters and the evolution of a number of crucial variables included in the various scenarios such as the Greek economic outlook, the population increases, the technology cost evolution as well as the alternative options for various parameters for these scenarios can be found in the Committee's Working Paper (available at <http://www.ypeka.gr/Default.aspx?tabid=285>). The Working Paper also provides the detailed background information on existing installations and grid limitations and future expansion plans that were taken into consideration in order to perform the energy model analysis, the assumptions made, as well as the results of the sensitivity analysis performed in order to arrive at the final RES trajectory and the corresponding shares in the final energy consumption presented in this report.

For RES-E, the installation of almost 7,5GW of wind energy plants is foreseen, together with 2,2GW of PVs, 250MW of CSP plants, 120 MW of geothermal energy, 250MW of bio-energy installations (biogas and solid biomass), 250MW of small hydro plants and an additional capacity of large hydro plants (350 MW) and pumped storage plants (880 MW), resulting in a 40% RES share in electricity production.

The RES-H target will be achieved mainly through the continuous growth of solar thermal installations in the residential and tertiary sector, the stabilisation of the biomass share in the residential sector, and the gradual penetration of heat pumps.

Figure 1 below shows the RES utilization trajectory between 2010 and 2020 for Greece, with the minimum RES trajectories specified in the RES Directive 2009/28/EC presented with green bars and the surplus based on the national RES target as set in Law L3851/2010 presented with blue.

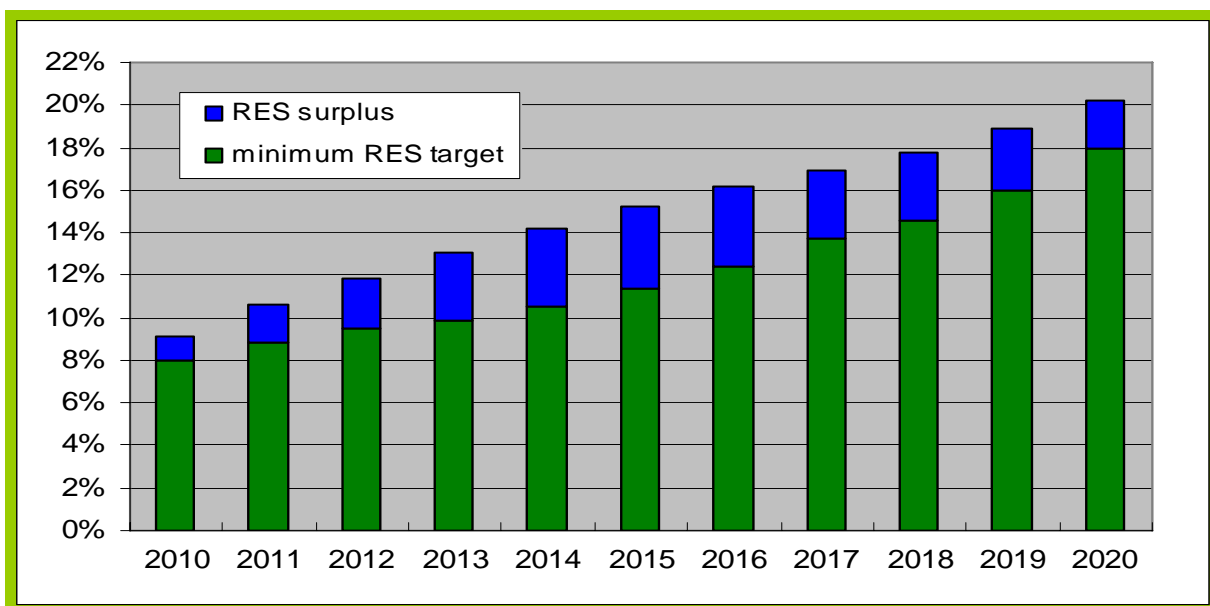


Figure 1. Trajectory of RES in gross final energy consumption until 2020.

These overall percentages of RES given in **Figure 1**, broken down by sector application (i.e. heating/cooling, electricity and transport), along with the projected surplus, in the gross national final energy consumption are shown in **Figure 2** below.

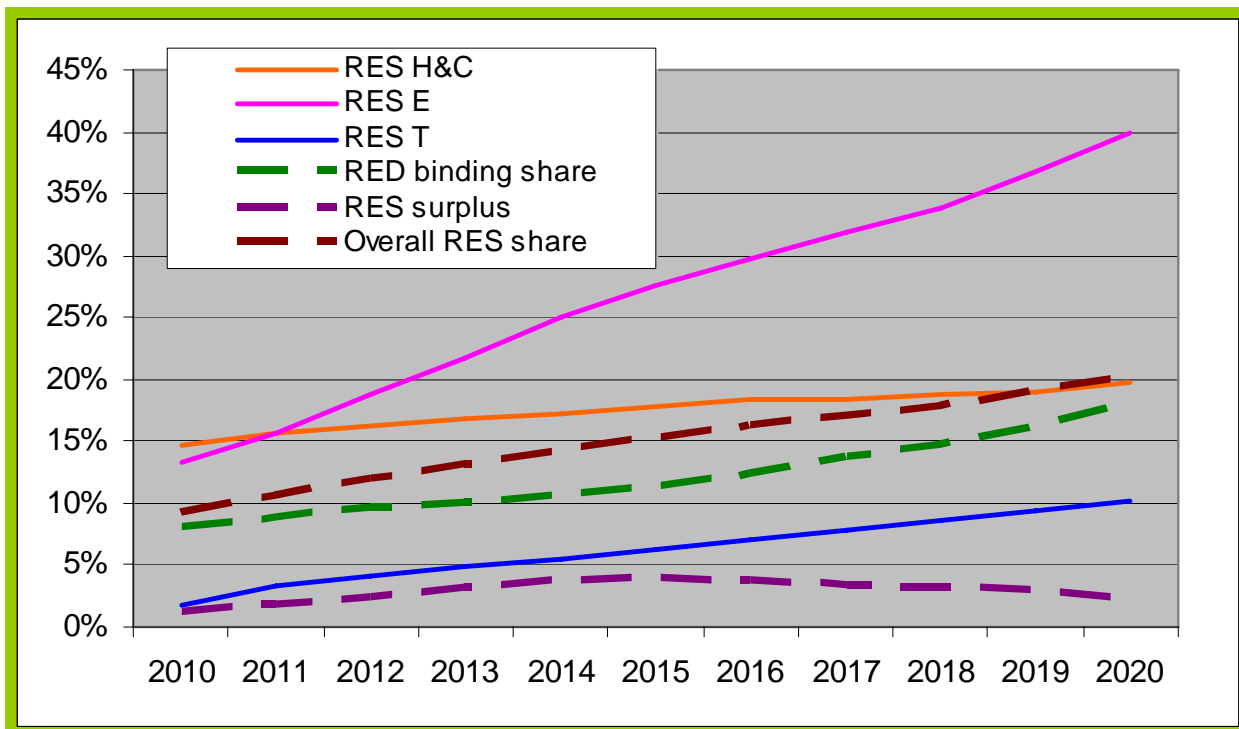


Figure 2. Projections of the share projection of RES in the final consumption of the three main sectors (electricity, heat & cooling, transport) and the overall share of RES as well as the expected surplus in gross final energy consumption to 2020.



The projected contribution of the different technologies, RES and conventional and fuels in electricity production is presented in **Figure 3**, while **Figures 4 & 5** present the required installed capacity of power plants overall and the RES plants respectively.

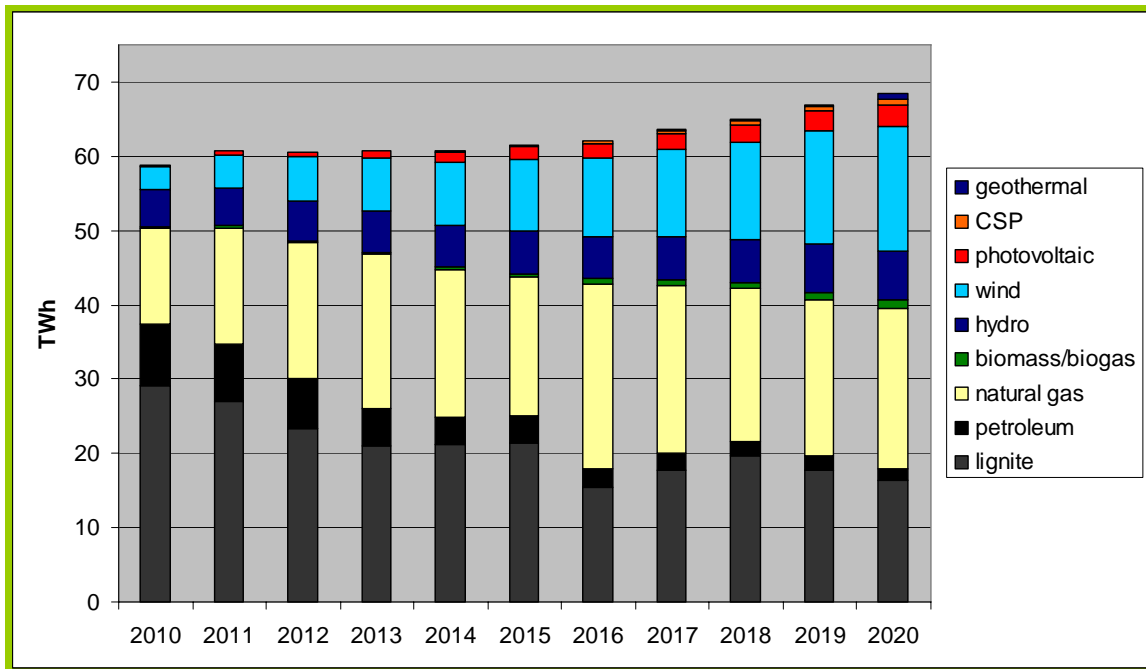


Figure 3. Estimated electricity generation from the different technologies/fuels to 2020.

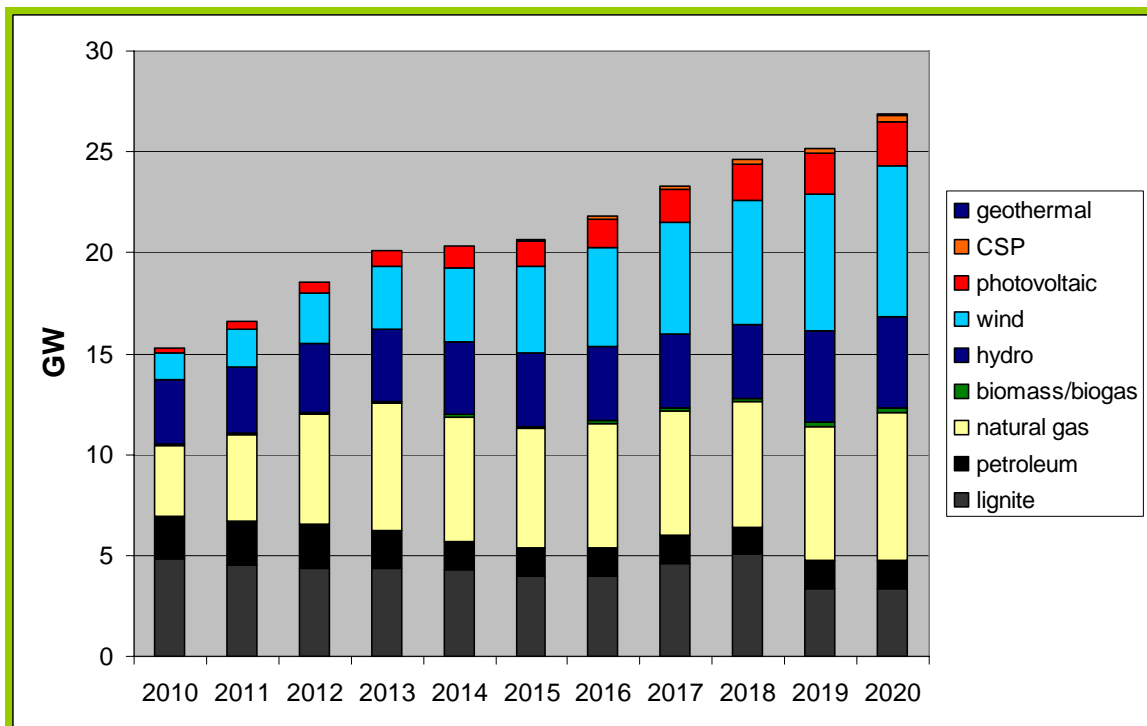


Figure 4. Estimated installed capacity of the different RES technologies for electricity.



It is clear from **Figure 5** that the rate for installation of wind and PV is substantial and will require considerable effort. Of interest is also the evolution of the technology mix for the generation of electricity shown in **Figure 3**. Major changes between 2010 and 2020, besides the large increase of RES, include the increase in natural gas utilization between 2010 and 2015 and the large percentage decrease of fuel oil use and to a lesser extent lignite in the same period. Of note is also the increase in total electricity consumption past 2016 which is the result of the economic recovery that is projected after 2014.

The installed capacity to generate this electricity production is given in **Figure 5** below. Here the trends pointed out before are also present. The large rate of increase of installed capacity is mostly due to RES, which in view of the small overall capacity factor require substantially more new installations. The levelling out in the middle of the 10-year period is mostly due to the similar trend for natural gas installation rather than the installation of RES, which maintains a rather steady rate throughout this period.

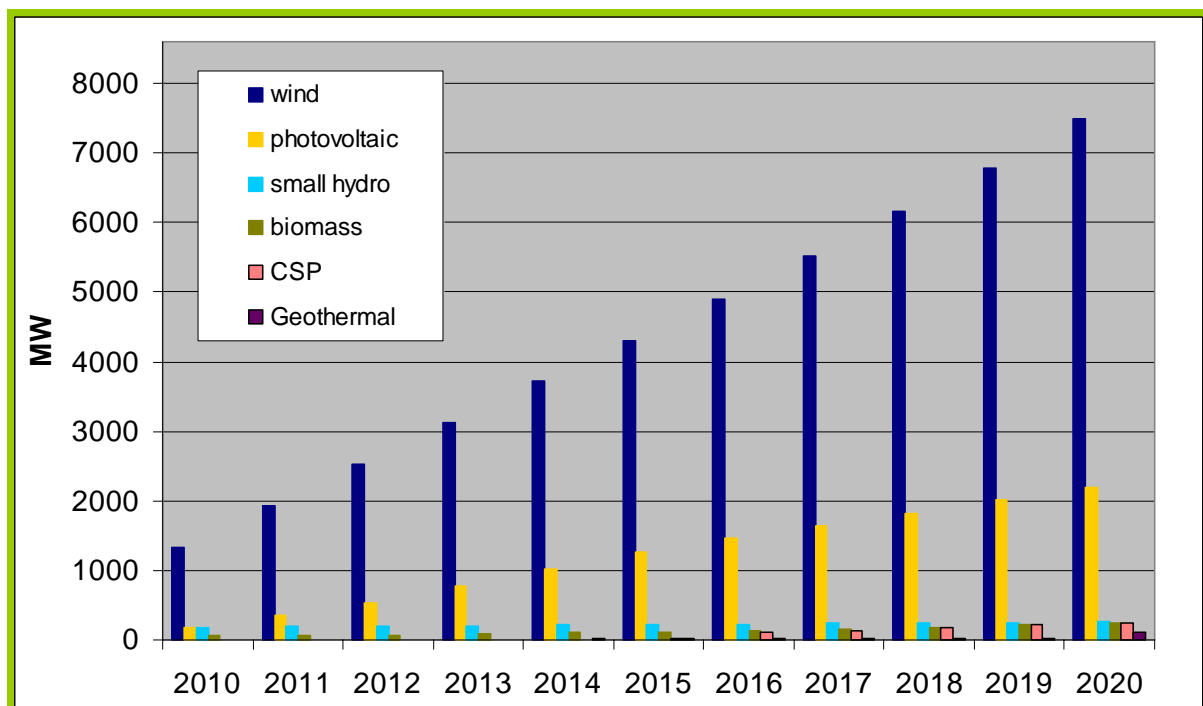


Figure 5. Estimated installed capacity from the different RES technologies/fuels to 2020.

Finally, in order to meet the RES Heat and Cooling target the contribution of different technologies is presented in **Figure 6**, which leads to a final share of 20% RES in heating and cooling. Here the preponderance of biomass use remains throughout the period with the contribution of solar thermal energy also contributing considerably. The major increase in this period comes from the enhanced use of heat pump systems, which by 2020 rival the contribution of solar thermal systems, a technology widely used in Greece its with substantial local industrial base.

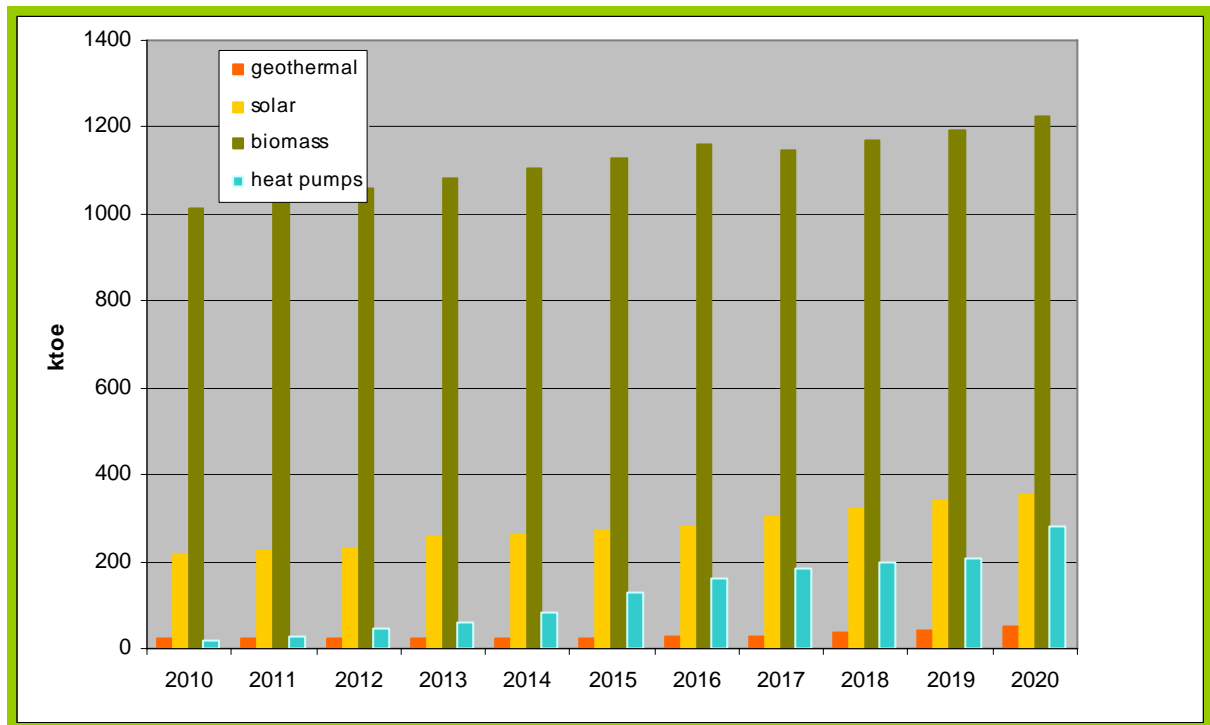


Figure 6. Estimated contribution of the different RES technologies for heating and cooling to 2020

The elements of the National Renewable Energy Policy presented in this Report are based on economic forecasts that are those agreed for the Stability, Development and Reconstruction Program (Greek recovery plan) in which the growth rates for the next 3 years are clearly defined. After this initial period of stabilization, the economy is expected to grow with moderate rates peaking at about 2.7% in 2015 and remaining at that level with a slight increase to 2.9 by 2020 and a slight decrease later on towards 2030. Yet, different analyses of the results of the very drastic measures already announced and adopted by Parliament indicate that these estimates of mid and long-term growth rates may be overly pessimistic. For this reason, a scenario with accelerated recovery rates was also examined. Under this scenario the growth rates after 2015 increase to about 4% to make up for the reduction in demand in the current 5-year period and remain at that or slightly lower level throughout most of the rest of the period under consideration. This increased growth will have an effect on final energy consumption, even though energy efficiency is expected to increase thus further decoupling economic growth from energy use. The additional growth of energy use will require even larger amounts of RES utilization to meet the target of 20% as the absolute amount of RES contribution will increase proportionally to the final use. The possibility of meeting the 20% with this optimistic economic outcome was also examined and the results are shown ("Accelerated Recovery" scenario) together with the equivalent results for the conventional economic recovery one ("Compliance" scenario) and the reference scenario in **Figure 7** below. It should be mentioned here that the Reference scenario differs from the "Compliance" scenario, i.e. the scenario that leads to Greece meeting its targets and being in compliance with its 20-20-20 obligations.

The comparison of the 3 scenarios shows clearly the increase (rather than the decrease in the "Compliance" scenario) in energy consumption in the "Accelerated Recovery" scenario



which ends up higher than the Reference scenario even though, as already mentioned, the targets for energy efficiency set out in the NEEAP are met.

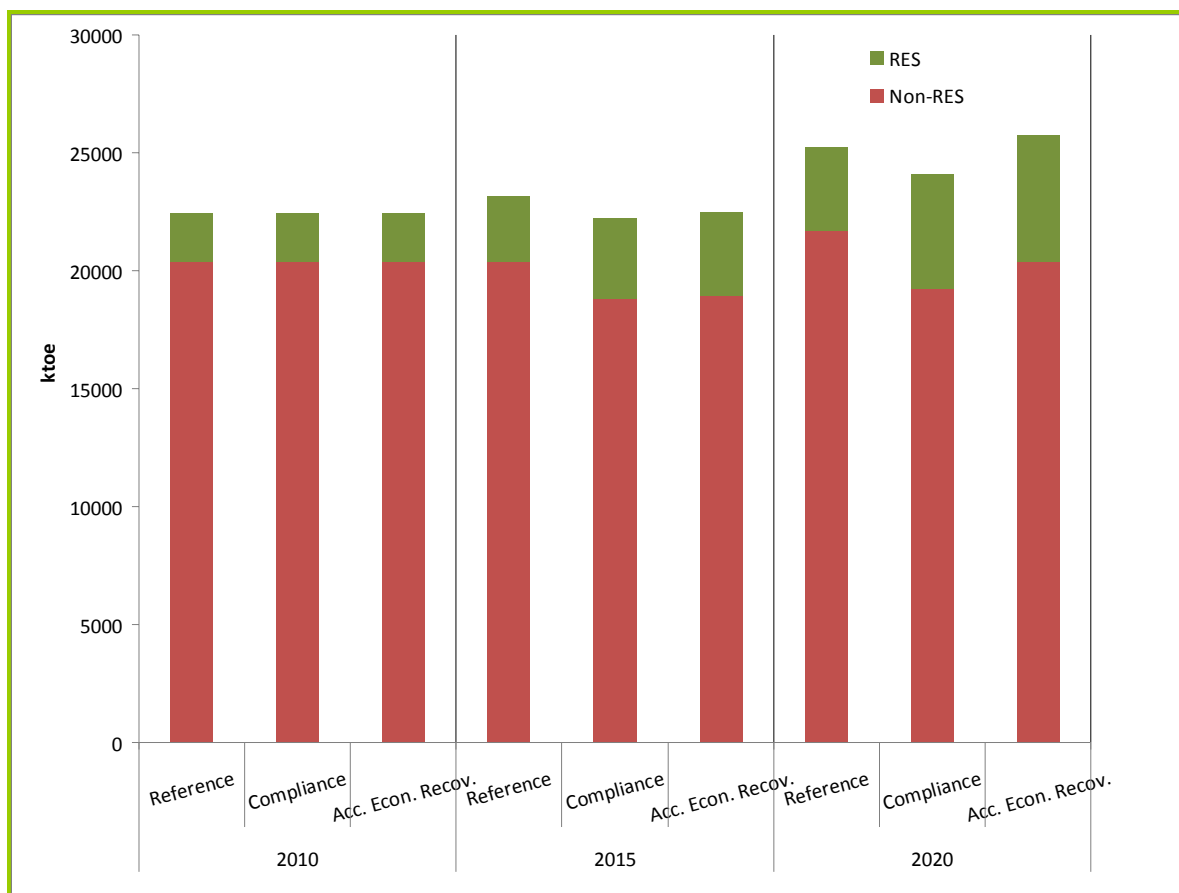


Figure 7. Gross final energy consumption analysis for the three scenarios, Reference, Compliance and Compliance under Accelerated Economic Growth until 2020.

The comparison of the basic results for the final energy consumption, the RES contribution and the amount of RES installations required between the three scenarios is given in more detail in the following Table A. One should note that the secondary targets set by recent Greek legislation, especially that for 40% of RES on electricity generation are also met in the Accelerated Economic Growth case.



Table A: Summary of results for energy consumption and RES utilization for the three basic scenarios examined for the compilation of the Greek NREAP

	2010			2015			2020		
	Reference	Compliance	Accelerated Economic Recovery	Reference	Compliance	Accelerated Economic Recovery	Reference	Compliance	Accelerated Economic Recovery
Electricity Production (TWh)	58,86	58,86	58,86	64,13	61,47	62,09	72,18	68,46	72,48
<i>Total RES Electricity</i>	7,84	7,84	7,84	14,16	16,97	18,26	20,23	27,27	29,74
<i>%RES in Electricity Production</i>	13%	13%	13%	22%	28%	29%	28%	40%	41%
RES Installed Capacity (GW)	4,11	4,11	4,11	7,13	8,66	9,33	9,91	13,27	14,72
<i>Of which</i>									
<i>Biomass/Biogas</i>	0,06	0,06	0,06	0,05	0,12	0,12	0,05	0,25	0,25
<i>Hydro (excluding Pumping)</i>	2,54	2,54	2,54	2,89	2,92	2,91	2,91	2,95	2,95
<i>Wind</i>	1,33	1,33	1,33	3,78	4,30	4,74	6,25	7,50	8,25
<i>Solar PV</i>	0,18	0,18	0,18	0,41	1,27	1,51	0,70	2,20	2,90
<i>CSP</i>	0,00	0,00	0,00	0,00	0,03	0,03	0,00	0,25	0,25
<i>Geothermal</i>	0,00	0,00	0,00	0,00	0,02	0,02	0,01	0,12	0,12
Final Energy Consumption (Mtoe)	21,53	21,53	21,53	22,20	21,33	21,56	24,19	23,08	24,64
<i>Of which RES</i>									
<i>Biomass/Biogas</i>	1,01	1,01	1,01	0,88	1,13	1,13	0,93	1,22	1,29
<i>Solar Heat</i>	0,22	0,22	0,22	0,24	0,27	0,22	0,27	0,36	0,41
<i>Geothermal</i>	0,02	0,02	0,02	0,00	0,02	0,03	0,00	0,05	0,06
<i>Ambient Heat</i>	0,02	0,02	0,02	0,12	0,13	0,21	0,19	0,28	0,36
<i>Biofuels in transport</i>	0,11	0,11	0,11	0,28	0,39	0,39	0,41	0,62	0,69
<i>% RES in Gross Final Energy Consumption</i>	9%	9%	9%	12%	15%	16%	14%	20%	21%



2 EXPECTED FINAL ENERGY CONSUMPTION 2010-2020



Table 1: Expected gross final energy consumption of Greece in heating and cooling, electricity and transport up to 2020 taking into account the effects of energy efficiency and energy saving measures ⁽¹⁾ 2010-2020 (ktoe)

	2005	2010		2011		2012		2013		2014	
	base year	reference scenario	additional energy efficiency	reference scenario	additional energy efficiency	reference scenario	additional energy efficiency	reference scenario	additional energy efficiency	reference scenario	additional energy efficiency
(1) heating and cooling ⁽²⁾	8355	8644	8644	8401	8375	8439	8376	8464	8474	8595	8517
(2) electricity ⁽³⁾	5486	5061	5061	5348	5215	5376	5209	5429	5227	5456	5217
(3) transport as in Article 3(4)a ⁽⁴⁾	6568	6774	6528	6769	6436	6779	6324	6816	6233	6828	6214
(4)Gross final energy consumption ⁵	21649	22714	22418	22424	21964	22516	21864	22670	21917	22860	21960
<i>The following calculation is needed only if final energy consumption for aviation is expected to be higher than 6.18% (4.12% for Malta and Cyprus):</i>											
Final consumption in aviation		1187	1187	1166	1166	1176	1176	1195	1195	1212	1212
Reduction for aviation limit ⁶ Art. 5(6)			N/A		N/A		N/A		N/A		N/A
TOTAL consumption after reduction for aviation limit			22418		21964		21864		21917		21960

¹ These estimates on energy efficiency and energy savings shall be consistent with other such estimates that Member States notify to the Commission, notably in Action Plans under the Energy Services Directive and the Energy Performance of Buildings Directive. If different units are used in those Action Plans the conversion factors applied should be indicated.

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

³ The gross electricity consumption is national gross electricity production, including auto-production, plus imports, minus exports

⁴ Transport consumption as defined in Article 3(4)(a) of Directive 2009/28/EC. Renewable electricity in road transport for this figure should be multiplied by a factor of 2,5, as indicated by Article 3(4)(c) of Directive 2009/28/EC.

⁵ As defined in Article (2)(f) of Directive 2009/28/EC. This comprises final energy consumption plus network losses and own use of heat and electricity at electricity and heating plants (NB: this does not include consumption of electricity for pumped hydro storage or for transformation in electrical boilers or heat pumps at district heating plants).

⁶According to Article 5.6 consumption for aviation has to be considered only up to 6.18% (Community average), for Cyprus and Malta up to 4.12% of gross final energy consumption.



	2015		2016		2017		2018		2019		2020	
	reference scenario	additional energy efficiency	reference scenario	additional energy efficiency	reference scenario	additional energy efficiency	reference scenario	additional energy efficiency	reference scenario	additional energy efficiency	reference scenario	additional energy efficiency
(1) heating and cooling ⁽⁷⁾	8743	8658	8875	8859	9070	9013	9228	9166	9423	9401	9600	9674
(2) electricity ⁽⁸⁾	5480	5285	5586	5345	5727	5470	5842	5583	6053	5752	6179	5887
(3) transport as in Article 3(4)a ⁽⁹⁾	6864	6253	6945	6279	7037	6267	7094	6279	7180	6309	7257	6336
(4) Gross final energy consumption ¹⁰	23150	22251	23539	22596	24007	22903	24377	23216	24826	23614	25262	24114
<i>The following calculation is needed only if final energy consumption for aviation is expected to be higher than 6.18% (4.12% for Malta and Cyprus):</i>												
Final consumption in aviation	1239	1239	1268	1268	1298	1298	1327	1327	1357	1357	1392	1392
Reduction for aviation limit ¹¹ Art. 5(6)		N/A		N/A		N/A		N/A		N/A		N/A
TOTAL consumption after reduction for aviation limit		22251		22596		22903		23216		23614		24114

⁷ It is the final energy consumption of all energy commodities except electricity for purposes other than transport, plus the consumption of heat for own use at electricity and heat plants and heat losses in networks (items '2. Own use by plant' and '11. Transmission and distribution losses' of Regulation (EC) No 1099/2008 (p. 23-24).

⁸ The gross electricity consumption is national gross electricity production, including auto-production, plus imports, minus exports

⁹ Transport consumption as defined in Article 3(4)(a) of Directive 2009/28/EC. Renewable electricity in road transport for this figure should be multiplied by a factor of 2,5, as indicated by Article 3(4)(c) of Directive 2009/28/EC.

¹⁰ As defined in Article (2)(f) of Directive 2009/28/EC. This comprises final energy consumption plus network losses and own use of heat and electricity at electricity and heating plants (NB: this does not include consumption of electricity for pumped hydro storage or for transformation in electrical boilers or heat pumps at district heating plants).

¹¹ According to Article 5.6 consumption for aviation has to be considered only up to 6.18% (Community average), for Cyprus and Malta up to 4.12% of gross final energy consumption.



3 RENEWABLE ENERGY TARGETS AND TRAJECTORIES

3.1 National overall target

Table 2: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020:

(A) Share of energy from renewable sources in gross final consumption of energy in 2005 (S_{2005}):	6,9 %
(B) Target of energy from renewable sources in gross final consumption of energy in 2020 (S_{2020}):	18 %
(C) Expected total adjusted energy consumption in 2020 (from table 1, last cell)	24114 ktoe
(D) Expected amount of energy from renewable sources corresponding to the 2020 target (calculated as B x C)	4341 ktoe

3.2 Sectoral targets and trajectories



Table 3

National 2020 target and estimated trajectory of energy from renewable sources in heating and cooling, electricity and transport

%	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
RES-H&C ¹²	12,76%	14,7%	15,7%	16,2%	16,8%	17,3%	17,9%	18,3%	18,4%	18,8%	18,9%	19,7%
RES-E ¹³	8,03%	13,3%	15,7%	18,8%	21,8%	25,1%	27,6%	29,7%	31,8%	33,7%	36,7%	39,8%
RES-T ¹⁴	0,02%	1,7%	3,3%	4,1%	4,8%	5,6%	6,3%	7,1%	7,8%	8,6%	9,4%	10,1%
Overall RES share ¹⁵	6,96%	8,0%	8,8%	9,5%	9,9%	10,5%	11,4%	12,4%	13,7%	14,6%	16,0%	18,0%
<i>Of which from cooperation mechanism¹⁶</i>												
<i>Surplus for cooperation mechanism¹⁶</i>		1,2%	1,8%	2,3%	3,1%	3,7%	3,9%	3,8%	3,3%	3,2%	2,9%	2,2% ¹⁷

¹² Share of renewable energy in heating and cooling: gross final consumption of energy from renewable sources for heating and cooling (as defined in Articles 5(1)(b) and 5(4) of Directive 2009/28/EC) divided by gross final consumption of energy for heating and cooling. Line (A) from Table 4a divided by line (1) of Table 1.

¹³ Share of renewable energy in electricity: gross final consumption of electricity from renewable sources for electricity (as defined in Articles 5(1)(a) and 5(3) of Directive 2009/28/EC) divided by total gross final consumption of electricity. Row (B) from Table 4a divided by row (2) of Table 1.

¹⁴ Share of renewable energy in transport: final energy from renewable sources consumed in transport (cf. Article 5(1)(c) and 5(5) of Directive 2009/28/EC) divided by the consumption in transport of 1) petrol; 2) diesel; 3) biofuels used in road and rail transport and 4) electricity in land transport (as reflected in row 3 of Table 1). Line (J) from Table 4b divided by row (3) of Table 1.

¹⁵ Share of renewable energy in gross final energy consumption. Row (G) from Table 4a divided by row (4) of Table 1.

¹⁶ In percentage point of overall RES share.

¹⁷ Because of the new target set by the Greek government to 20%, the trajectory presents a surplus. Row D, at Table 4a presents the contribution for the 20% share (national target), while row G the contribution to meet the 18% share (RE Directive target).



As part B of Annex I to the Directive			2011-2012	2013-2014	2015-2016	2017-2018		2020
			$S_{2005} + 20\%$ ($S_{2020} - S_{2005}$)	$S_{2005} + 30\%$ ($S_{2020} - S_{2005}$)	$S_{2005} + 45\%$ ($S_{2020} - S_{2005}$)	$S_{2005} + 65\%$ ($S_{2020} - S_{2005}$)		S_{2020}
RES minimum trajectory ¹⁸ %			9,12%	10,23%	11,90%	14,12%		18,00%
RES minimum trajectory (ktoe)			1999	2244	2667	3255		4341

¹⁸ As defined in Annex I.B of the Directive 2009/28/EC.



Table 4a

Calculation table for the renewable energy contribution of each sector to final energy consumption

(ktoe)	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
(A) Expected gross final consumption of RES for heating and cooling	1066	1269	1312	1358	1423	1471	1548	1624	1658	1727	1780	1908
(B) Expected gross final consumption of electricity from RES	440	674	818	978	1138	1308	1459	1588	1742	1883	2111	2345
(C) Expected final consumption of energy from RES in transport	1	110	214	258	300	345	393	441	486	534	584	634
(D) Expected total RES consumption ¹⁹	1507	2050	2341	2590	2856	3118	3393	3644	3876	4132	4461	4870
(E) Expected transfer of RES to other Member States		257	408	513	686	812	856	842	737	743	683	529
(F) Expected transfer of RES from other Member States and 3rd countries												
(G) Expected RES consumption adjusted for target (D)-(E)+(F)	1507	1793	1933	2077	2170	2306	2537	2802	3139	3389	3778	4341

¹⁹ According to Article 5(1) of Directive 2009/28/EC gas, electricity and hydrogen from renewable energy sources shall only be considered once. No double counting is allowed.



Table 4b
Calculation table for the renewable energy in transport share

(ktoe)	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
(C) Expected RES consumption in transport ²⁰	1,19	110	214	258	300	345	393	441	486	534	584	634
(H) Expected RES electricity in road transport ²¹	0	0,6	0,7	0,8	1,0	1,1	1,2	1,4	1,6	3,3	4,4	5,1
(I) Expected consumption of biofuels from wastes, residues, non-food cellulosic and lingo-cellulosic material in transport	0	0	0	0	0	0	0	0	0	0	0	0
(J) Expected RES contribution to transport for the RES-T target: (C) + (2,5 - 1) x (H) + (2 - 1) x (I)	1,19	110,7	215,2	259,1	301,7	346,2	395,0	442,9	488,0	538,8	591,0	641,3

²⁰ Containing all RES used in transport including electricity, hydrogen and gas from renewable energy sources, and excluding biofuels that do not comply with the sustainability criteria (cf. Article 5(1) last subparagraph). Specify here actual values without using the multiplication factors.

²¹ Specify here actual values without using the multiplication factors.



4 MEASURES FOR ACHIEVING THE TARGETS

4.1 Overview of all policies and measures concerning the promotion of the use of energy from renewable resources

Table 5: Overview of all policies and measures

	Name and reference of the measure	Type of measure	Expected result	Targeted group or activity	Existing or planned	Start and end dates of the measure
1	Application of L.2773/99 “Liberalisation of the Electricity Market-Regulation of energy policy issues and other provisions”, L.2244/94 “Regulation of power generation issues from renewable energy sources and conventional fuels and other provisions” and L.3468/06 “Generation of electricity from renewable energy sources and through high-efficiency co-generation of electricity and heat and miscellaneous provisions”	Regulatory		Investors, public administration	existing	1994-2020
2	L.3734/2009 “Promotion of co-generation of two or more energy sources, regulation of issues related to Mesochora hydroelectric plant and other provisions” and L.3851/2010 “Accelerating the development of Renewable Energy Sources to deal with climate change and other regulations in topics under the authority of MEECC”	Regulatory		Investors, public administration	existing	2009-2020
3	Feed-in-tariff scheme per kWh of electricity produced by RES (Laws.2244/1994, 3468/2006, 3851/2010)	Financial		Investors	existing	1994-2020
4	Development Law 1892/90, 2601/1998 and 3299/2004 (amended by the L.3522/06 and ministerial decree, Gazette B’ 1292/25.07.2007)	<ol style="list-style-type: none"> 1. Subsidy for the initial cost of the investment plan 2. Subsidy for leasing 3. Tax deduction 4. Subsidy for the cost of employment created by the investment plan 		Investors	Completed	1990-2009



	Name and reference of the measure	Type of measure	Expected result	Targeted group or activity	Existing or planned	Start and end dates of the measure
5	Law 3855/2010 “Measures to improve energy efficiency in end-use, energy services and other provisions”, articles for public buildings and development of the ESCO market	Regulatory		End consumers, energy companies-utilities, public administration	existing	2010-2020
6	Special Physical Planning Framework for the development of RES and land management (OG B’ 2464/2008)	Regulatory framework for defining land use requirements and environmental factors for the installation of RES plants		Investors, public administration	existing	2008-2020
7	Special Programme for the deployment of Photovoltaics up to 10kW on buildings and especially roofs(OG B’ 1079 /4.6.2009)	Feed-in tariff scheme per kWh of electricity produced from PV roof installations (max. 10kW)		End consumers, household sector, small businesses	existing	2009–2019
8	Framework for the installation of PVs on buildings and open yards (MDs 16094/8.4.2008, 16095/8.4.2008 and 29107/7.7.2009) & Framework for the installation of PVs beyond limits of existing zoning plans (29116/7.7.2009 T.A.A.Y.P. issue 344 B’)	Regulatory		Investors, public administration	existing	2009-2020
9	Mandatory deadlines for RES licensing procedure (L3734/09 & L.3851/10)	Regulatory		Investors, public administration	existing	2009-2020
10	Coverage of 60% of hot water need in new buildings though solar thermal systems after 1.1.2011 (L.3851/2010)	Regulatory		public administration, planners, architects, end users	existing	2011-2020
11	Coverage of total primary energy consumption with energy providing systems based on RES, CHP, district heating on a large area scale/ block scale as well as heat-pumps for all new buildings by 31.12.2019 and for all new public buildings by 31.12.2014 (L.3851/2010)	Regulatory		Investors, public administration, planners, architects, end users	existing	2010-2020
12	Tendering procedure for the construction and operation of off shore wind farms (L.3851/2010)	Regulatory		Investors, public administration	Planned/existing	2012-2020
13	L.3661/2008 'Measures for the building energy consumption reduction'	Regulatory		Investors, public administration,	existing	2008-2020



	Name and reference of the measure	Type of measure	Expected result	Targeted group or activity	Existing or planned	Start and end dates of the measure
				planners, architects, end users		
14	Energy Performance of Buildings Regulation KENAK (OG 407/B/2010)	Regulatory		Investors, public administration, planners, architects, end users	existing	2010-2020
15	2008 national campaign for the promotion of RES (guidebooks for assessment, evaluation, environmental impact and installation procedure for all different RES technologies)	Information campaign	Behavioural change	End users	existing	2008
16	JMD (OG 1122/B/2008) "Measures to improve energy efficiency and energy saving in the public and broader public sector"	Regulatory		Public administration	existing	2008-2020
17	Tax deduction scheme, set by L.2364/95 and L.3522/2006, that considers all small domestic RES systems to be eligible for a 20% tax deduction capped at € 700 per system.	Financial incentive		End users	existing	1995-2020
18	Application and reinforcement of the National Transmission Development Plan (NTDP), elaborated by the System Operator: a) <i>Upgrading of grid interconnections in the mainland</i> , b) <i>Interconnection of the non-interconnected islands according to strategic planning elaborated by the System Operator</i>	Technical	4.500 MW	Investors, public administration, planners	existing	2010-2016
19	NSRF National Strategic Reference Framework - 4th Framework Programme: e.g. a) <i>"Exoikonomo" Program for energy efficiency in Local Authority organizations</i> , b) <i>Exoikonomo kat' oikon" Programme</i> , c) <i>Action "Green Tourism</i> , d) <i>Action "Green Enterprise"</i>	1. Financial 2. Actions for developing and promoting RES installations		Investors, public administration, end-users, SMEs, companies, engineers	existing	2007-2013
20	Biofuels in transport (L. 3423/2005, L.3653/2008, L.3734/2009 and L.3769/2009)	Regulatory, institutional	5.75% of biofuels in consumption of transport fuels	Investors, public administration	existing	2005-2020
21	JMDs on annual quota allocation for the biodiesel production and distribution to oil refineries for blending	Regulatory	Annual percentages of	Investors, oil refineries	completed	2007-2010



	Name and reference of the measure	Type of measure	Expected result	Targeted group or activity	Existing or planned	Start and end dates of the measure
	(OG B' 33/16.01.2008, 638/10.04.2008, 1143/23.06.2008, 1626/13.08.2008, 1683/17.07.2009, 2499/18.12.2009)		biofuels in consumption of transport fuels from 2007 to 2010			
22	OPC Operational Programme for Competitiveness - 3rd Framework Programme	1. Financial 2. Actions for developing and promoting RES installations	481 MW	Investors, public administration, engineers,	completed	2000 -2006
23	OPE Operational Programme for Energy - 2nd Framework Programme	1. Financial 2. Actions for developing and promoting RES installations	278 MW	Investors, public administration, engineers,	completed	1994-2000
24	Exemption of electric and /or hybrid and/or low emission vehicles from the fuel consumption tax, the additional special tax, the circulation tax and/or the registration tax (Laws 2052/1992, 3831/2010 and 2960/2001)	Regulatory, financial		End users	existing	1992-2020
25	Exclusion of hybrid vehicles from the traffic restrictions in the city of Athens (JMD (O.G. B' 1720/19.08.2009))	Regulatory, promotional		End users	existing	2009-2020
26	Improvement of environment and country side and of the Programme of Rural Development of Greece 2007-2013 (PRDG) for developing scenarios for short rotation forestry and to perennial grasses	regulatory		Farmers, public administration	planned	2011-2013
27	Definition of technical specifications for energy efficient vehicles, share of clean vehicles, replacement of old vehicles, public procurement based on fuel economy label and training on eco-driving for application to the entire public sector (Law 3855/2010)	Regulatory		Public administration	planned	2011-2020
28	Measures for the building energy consumption reduction in the public sector (L.3855/2010)	Regulatory		Public administration	planned	2011-2020



	Name and reference of the measure	Type of measure	Expected result	Targeted group or activity	Existing or planned	Start and end dates of the measure
29	Guidelines for the licensing and development of conventional Power Producers in order for them to be flexible and support the large scale wind penetration	Regulatory		Investors, public administration, planners	planned	2012-2012
30	Reinforcement of the interconnection capacity with neighbouring countries. Further actions and projects for the integration of the electricity system into the European grid through western Balkans	Technical		Investors, public administration, planners	existing/planned	2010-2020
31	Guidelines and directions for the licensing of RES-E based on the energy mix included in the NREAP	Regulatory		Investors, public administration	existing	2010-2020
32	Exploitation of geothermal energy (L.3175/2003), and Ministerial Decisions (OG B' 1819/2009, B' 1058/2009)	Regulatory framework for the exploitation of geothermal energy		Investors, end-users, public administration	existing	2003- 2020
33	Development of storage facilities in the interconnected system by exploiting hydro pumping system at existing large hydro plants and new installations	Technical	1.580 MW	public administration, planners	existing/planned	2010-2020
34	Further development of the distribution grid based on the smart grids principles	Technical		Investors, public administration, planners	planned	2012-2020



4.2 Specific measures to fulfil the requirements under Articles 13, 14, 16 and Articles 17 to 21 of the Directive 2009/28/EC

4.2.1 Administrative procedures and spatial planning (Article 13(1))

(a) *List of existing national and, if applicable, regional legislation concerning authorisation, certification, licensing procedures and spatial planning applied to plants and associated transmission and distribution network infrastructure:*

The institutional entry of RES into Greece was realised historically by two laws, Law 1559 of 1985 and Law 2244 of 1994.

Law **L1559/1985** "*Regulation of issues of alternative forms of energy and specific issues of power production from conventional fuels and other provisions*" (OG A 135) was the first legislative effort that considered alternative forms of energy for power generation and was mainly focused on exceptions to the exclusive right of Public Power Corporation (PPC) to generate electric energy, while **L2244/1994** "*Regulation of power generation issues from renewable energy sources and conventional fuels and other provisions*" (OG A 168), which was devoted entirely to RES electricity matters, established the legislative environment for the development of RES, providing access to the grid for individual energy producers.

For the first time an element of energy market liberalisation was introduced in the generation of electricity for installations up to 50MW, which were to use RES, with the exception of small hydroelectric plants whose installed capacity could not exceed 5MW. L2244/1994 provided for RES a fixed feed-in price roughly 90% of the household electricity rate applicable at each time and made it obligatory for the PPC to buy that energy.

A specific regulatory framework for RES was introduced by **L2773/1999**, "*Liberalisation of the Electricity Market-Regulation of energy policy issues and other provisions*" (OG A 286), establishing the independent **Regulatory Authority for Energy**, the independent **Electricity Transmission System Operator** and initiating the deregulation of the electrical energy market. This law was enacted for the transposition of Directive 96/92/EC for the liberalization of the electricity market (OJ L27/30.1.1997) and later was revised by L3175/2003, "*Exploitation of the geothermal potential, district heating and other provisions*" (OG A 207) and L3426/2005, "*Precipitation of the liberalisation process of the electricity market*" (OG A 304).

The key provisions of L2773/99 concerning renewables were as follows:

- i. The Hellenic Transmission System Operator (HTSO) is obliged to grant priority access (priority in merit order) to RES power stations up to 50 MWe (and up to 10 MWe in the case of small hydroelectric units).
- ii. The HTSO is required to enter into 10-year contracts with RES-electricity producers for the purchase of electricity. The contract always includes a renewal option.



- iii. The RES-electricity production by an independent power producer, or the surplus electricity production of a RES auto-producer, is sold to the HTSO at a predetermined feed-in rate, which is a fixed percentage of the corresponding consumer electricity rate specified by the Regulatory Authority for Energy (RAE).
- iv. Every RES-electricity producer is subject to a special levy (annual fee), specified by a Joint Decree of the Ministers of Finance and Development²². When this Decree was issued, it defined the special levy at two-percent (2%) of the producer's electricity sales to the grid. This charge is collected by the HTSO and is given to the local authority, within the area of which the RES power facility operates, for the finance of local development projects.

According to this Law, an electricity generation license (production authorisation) is required to be obtained by any electricity-producing station, conventional or RES-based, in a planning/ licensing procedure that includes a pre-siting permit, a land use permit, an approval of environmental terms and conditions, an installation license, and an operation license.

The Minister of Development (now MEECC) was the competent authority for issuing the electricity generation license, after a positive recommendation by RAE, which is responsible for the evaluation of applications submitted by interested investors, on the basis of criteria laid down in the Production Authorisation Regulation, which was issued in accordance with the provisions of L2773/1999.

As already mentioned, L2773/1999 established the legislative environment for RES development but proved to be insufficient and a number of modifications and amendments were later introduced, aiming to resolve important technical and administrative issues. For a decade a number of laws, joint ministerial decisions, circular decisions etc, were issued that constituted a complicated regulatory and legislation environment for RES deployment.

Towards the further promotion of RES, the Greek Parliament passed **L3468/2006** "*Generation of electricity from renewable energy sources and through high-efficiency co-generation of electricity and heat and other provisions*" (OG A' 129).

Important features of L3468/2006 include:

- Introduction of a regime of strict follow-up procedures for the holders of electricity generation licenses, in order to keep them bound to their legal commitments and provisions for suppressing profiteering from license trading.
- Differentiation of the previous unique feed-in tariff regimes: The guaranteed feed-in tariff was increased up to five-fold for the PV systems, but was maintained at the previous level for the remaining RES technologies.

²² The term "Minister of Development" remains as such throughout the NREAP, although no Ministry of Development exists anymore. In most cases mentioned here, the competences of the Minister of Development are transferred to the Minister of Environment, Energy and Climate Change. However, as there is still a reference to the Minister of Development in Laws, Ministerial Decrees, etc, the term will not be replaced with "Minister of Environment, Energy and Climate Change", to avoid confusion.



- Revision of the feed-in tariffs set by the law yearly through a decision by the Minister of Development on the basis of the weighted average increases of the dominant utility's (PPC) electricity rates until full liberalisation of the electricity market, at which time it is set at 80 percent of the consumer price index.
- Increase of the limit of a small-scale hydroelectric plant from 10 MW to 15 MW so that a greater number of plants utilizing hydraulic power will enjoy a more favourable feed-in tariff regime plus priority in the merit order.
- Lifting of the 50MW limit of installed capacity for the application of the provisions of article 35 of L2773/1999 to grant priority to RES plants in the merit order.
- Imposition of mandatory measurements of RES potential by a certified body for generation license application.
- Requirement of an initial positive opinion by the competent authority in charge of environmental permitting for an affirmative recommendation by RAE submitted to the Minister of Development for the issuing of the electricity generation license. In that way, the environmental situation is known from the very beginning and projects with poor chances of implementation are excluded early in the licensing procedure.
- Increase of the special levy in favour of local authorities hosting RES power facilities from 2% to 3% on the gross proceeds accrued from the sale of electricity generated by RES, with the exception of PV power stations.
- Exclusion of small scale power facilities from the permitting obligation for electricity generation license in the following cases: geothermal power plants of installed power $\leq 0.5\text{MWe}$, biomass or bio-fuel plants of installed power $\leq 100\text{kWe}$, PV stations of nominal capacity $\leq 150\text{kWp}$, wind power parks of installed power ≤ 20 or 40 or 50kWe, depending on the siting of the parks (i.e. in isolated microgrids, interconnected islands, or in the interconnected system, respectively).
- In accordance with L3468/2006, a photovoltaic **energy deployment scheme** has been put in place with a Ministerial Decree, on 18/7/2007 (OG B' 694/2007). The scheme was then revised by virtue of Ministerial Decree 1276/2007 and suspended temporarily by virtue of Ministerial Decree 707/2008, in conjunction with high feed-in tariffs that are foreseen for electricity produced by PV systems.

According to this plan, a total of 540MWp is to be installed in the interconnected grid of the mainland, 200MWp in the islands and 50MWp for off-grid applications, over the period 2007-2010. A specific geographical distribution of these installations was specified (setting upper limits per region) taking into account the solar radiation distribution over the country and the technical limits set by the electricity systems of the islands. About 40% of



the target is to be covered by small scale systems (up to 150kWp), in order to have minimum environmental impact, to reduce network losses and create local jobs and sources of income.

In 2009, **L3734/2009 “Promotion of co-generation of two or more energy sources, regulation of issues related to Mesochora hydroelectric plant and other provisions”** came into effect and amended in a number of key points L3468/2006 especially as regards PV. L3734/2009 constitutes the main legislative instrument for the transposition in the Greek legislation of Directive 2004/8/EC concerning the promotion of cogeneration and aims to provide a significant stimulus for CHP installations in Greece and to tackle barriers for this type of installations. More specifically, this law specifies in detail the licensing procedure of CHP plants, the related guarantees of origin, as well as a series of other issues that acted as barriers related to the promotion of RES in the Greek energy market.

In summary, this legislation aims to:

- simplify the licensing procedure (production and operation licences);
- address, through a revocation process, the problem of long standing production licenses which did not result in actual construction of power plants
- rationalize the production licence amendment procedure;
- streamline issue process for issuing operation and installation licences; and
- ensure the availability of the necessary capacity in the Greek electricity grid system for new RES power plants.

Additionally, L3734/2009 amended L3468/2006 as regards PV introducing among others:

- A new feed-in tariff regime for energy produced by PV with gradually falling prices reflecting the technology learning curve, thus enabling the revision of the deployment scheme in terms of the cap set by it for the installed PV capacity.

Other important institutional initiatives, regarding PV, are as following:

- **Framework for the installation of PVs on buildings and open yards** by virtue of Ministerial Decrees 16094/8.4.2008 (OG B 917), 16095/8.4.2008 (OG B 925) and 29107/7.7.2009 (OG B 344).
- **Framework for the installation of PVs beyond limits of existing zoning plans** (29116/7.7.2009 OG B 344).
- **Special Programme for the deployment of Photovoltaics up to 10kW on buildings and especially roofs** (Ministerial Decree OG B1079/4.6.2009).

Finally, as described in more detail in section 4.2.1.c, **L3851/2010** introduces some further changes mainly in the licensing procedure and feed-in tariff scheme for all the RES-E applications, aiming to simplify and rationalise the existing administrative and fiscal framework.



The main legislative instrument for the physical planning as regards RES installations, is the "**Special Physical Planning Framework for the development of RES and land management**" (SPPF-RES) approved by a JMD (OG B 2464/2008) and currently administered by MEECC.

The SPPF-RES sets out Physical Planning policies for RES per category of activity and location for the first time in Greece aiming at prioritizing the utilization of RES over other land uses and facilitating the environmental permitting of RES projects all over Greece. It provides for specific steps for applications that concern land use, among others, in areas characterized as forests or scrublands, high productivity cultivation areas, areas neighbouring to sensitive/special facilities or restricted areas (airports, military stations), wildlife areas/NATURA areas, and sites of archaeological interest including the specification of exclusion zones.

Especially for the wind energy, quantitative requirements for maximum coverage per municipality area are set, while three (3) regions were identified and characterised as priority areas for wind energy development.

(b) Responsible Ministry(/ies)/authority(/ies) and their competences in the field:

Effective from November 2009, a new **Ministry for the Environment, Energy and Climate Change** with specific competencies has been established, bringing together the agencies involved in the largest part of RES licensing procedure, namely energy, environmental and forestry policies. The new Ministry has replaced the Ministry of Environment, Physical Planning & Public Works and the Ministry of Development, that were formerly in charge of environmental and energy affairs respectively, but often promoted contradictory policies.

The **Regulatory Authority for Energy** (RAE) is an independent administrative authority, having financial and administrative independence, as defined by the provisions of its founding legislation, L2773/1999, which was issued within the framework of the harmonisation of the Greek Law to the provisions of Directive 96/92/EC for the liberalization of the electricity market. New competences and duties have been assigned to RAE with respect to electricity and natural gas sectors by Laws, L3426/2005 and L3428/2005, aligning it with the relevant provisions of the EC Directives 2003/54 and 2003/55, in particular with respect to access tariffs to electricity and gas networks, terms and conditions for the provision of balancing services in natural gas, as well as on issues related to security of electricity and natural gas supply. Furthermore, on the basis of the modifications introduced with the abovementioned laws, RAE acts as a dispute settlement authority with respect to complaints against transmission or distribution system operators in both electricity and natural gas sectors.

The Transmission System Operator of the Greek Electricity Transmission System (DESMIE S.A.), was created by L2773/1999 which transferred the responsibility for the operation of the transmission system for electricity from PPC to the operator. DESMIE ensures that electricity is supplied to all customers with security and reliability, utilizing electricity from all producers (PPC and independent producers) in the most cost efficient way. It is also responsible for managing the operation and accounting of the daily market, with transparency and accuracy.



The Public Power Corporation (PPC), which is the System Operator at the non-interconnected islands and is responsible for the electricity supply and for utilizing electricity from the other locally based power producers.

The Centre for Renewable Energy Sources and Saving (CRESS) is the national centre for Renewable Energy Sources, Rational Use of Energy & Energy Saving. Founded by Presidential Decree in 1987, CRESS is supervised by the Minister of Environment, Energy and Climate Change and has financial and administrative independence. The mission of CRESS is to promote RES/RUE/ES applications at a national level, and under article 30 of L3734/2009, to facilitate the national energy planning, assist in the formulation of energy policies and foster the development of research and development activities in the field of RES/ES.

Regional administration units at municipal, prefecture and regional level involved in approving specific aspects of licensing including environmental, archaeological, communications, land use and forestry concerns.

(c) Revision foreseen with the view to take appropriate steps as described by Article 13(1) of Directive 2009/28/EC by: [June 2010]

Directive 2009/28/EC "On the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC" defines mandatory RES targets for each member-state and sets the mandatory RES target for Greece to a 18% of total national energy consumption.

Greek government came to the conclusion, by examining means to reach the mandatory RES target of 18%, that the administrative and planning procedures introduced by the legal structure prior to 2009 were overly complicated and extremely bureaucratic, restraining the sustainable development of RES in the country.

After a public consultation, the government in April 2010 tabled a law to simplify the regulations governing RES. According to this new L3851/2010 (OG A/85/4th June 2010) "Accelerating the development of Renewable Energy Sources to deal with climate change and other regulations in topics under the authority of MEECC", the national target for RES is set at 20% of final energy consumption by 2020 (increased from the 18% set out in EU regulation Directive 2009/28/EC). The most important elements of the new RES institutional framework law, which amends significant provisions of the currently applicable legislation, are:

- Simplification of licensing procedures and designation of shorter issuing deadlines.
- The electricity generation license from renewables or high efficiency cogeneration, i.e. the first main license in the related licensing process and a prerequisite for the environmental terms of approval of the project in question, will henceforth be granted by the Regulatory Authority for Energy (RAE) instead of by the Minister. RAE issues the electricity generation license based on technical and economic criteria only, without requiring a preliminary environmental impact assessment of the project.
- Unification of the previously separate requirements of preliminary environmental impact assessment and evaluation and final environmental terms approval into a single process, reducing the time as well as expenses for issuing the relevant license by the competent authority. Environmental terms approvals remain a prerequisite for



the installation license as well as the final grid connection requirements in the form of an offer.

- Rationalisation of feed-in-tariffs with a view to providing better economic incentives.
- Half of the renewable energy special levy retained by the HTS Operator from the gross revenues from electricity sales of renewable energy installations (with the exception of photovoltaics), i.e., 3% before VAT, is redirected from the current local authorities in the area of which the RES projects are installed, to the individual citizens of the local communities concerned and the Greek Fund for NATURA 2000 areas.

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

The framework that sets the guidelines for the development and planning of RES installations at regional and local level is the Special Physical Planning Framework for the development of RES and land management (SPPF-RES). (OG B' 2464/2008) This framework indicates restrictions or specific requirements for RES applications that concern land use and also sets and maps out some specific regions as priority zones for the development of RES plants.

Additionally, L3851/2010 specifies that regional land management and development plans need to be in concert with SPPF-RES and to provide for maximum allowable utilization of RES potential as a measure to address climate change which is given high priority also in case of court deliberations involving other social concerns and rights. In case of existing regional framework plans for land planning and development that are not in accordance with the directions of SPPF-RES, must be modified accordingly. Until then, the siting of RES power plants is carried out by direct and exclusive application of the directions of SPPF-RES.

In addition, L3851/2010 introduces a change in the criteria of land use for development of RES plants as it allows installation of PV plants on high-productivity land provided that the cumulative area covered does not exceed 1% of the total cultivated land of the prefecture. The license is issued by the Division of Agricultural Development of the local Prefecture.

(e) Are there unnecessary obstacles or non-proportionate requirements detected related to authorisation, certification and licensing procedures applied to plants and associated transmission and distribution network infrastructure for the production of electricity, heating or cooling from renewable sources, and to the process of transformation of biomass into biofuels or other energy products? If so, what are they?

The most important problems of this type in Greece are related to the development of RES-E plants. In order to accomplish significant growth of RES installation, successful tackling of identified barriers, related to social opposition at local level, bureaucratic constraints, lengthy timeframes for the licensing procedure of both RES plants and grid infrastructure works, and deficiencies in the physical planning, is required. The Greek government recognised that in general the administrative and planning procedures remain



complicated; the regulatory and legislation environment is extremely bureaucratic thus restraining the sustainable development of RES in the country.

For this purpose L3851/2010 was recently enacted. Moreover, within this law for the first time in Greece, the very important barrier of the social opposition at local level is addressed with the provision of redirecting a significant percentage of the renewable energy special levy retained by HTSO from the gross revenues from electricity sales of renewable energy facilities (with the exception of PVs), i.e. 3% before VAT, to the local communities.

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

RAE grants a Generation License pursuant to EU Directive 2001/54/EC, which is the first of the basic permits in the series of central government and local authorities' approvals. The evaluation process includes a number of objective criteria such as the investor's technical and financial capability, project's viability and compliance with two basic provisions of the existing physical planning, i.e. that RES are not installed within restricted zones and that the total number of wind turbines allowed shall not exceed a specific number per municipality calculated with respect to the wind turbines diameter and the total area of the municipality.

The evaluation for granting the Environmental Terms Approval (ETA) depends on the project's level of environmental impact and is carried out either by the Department of Environment and Physical Planning of the local Region or by the Special Unit for Environmental Licensing of MEECC and requires consent by several bodies including local authorities. After securing an ETA, an Installation License is required, which is issued either by the General Secretary of the Region or by the Minister for the Environment, Energy and Climate Change. In parallel, the operator applies for terms for connecting to the grid to PPC and for a power purchase contract to HTSO. Finally, the Operation License is issued by MEECC, the body which issued the Installation License, after the construction is finished and the plant has undergone commissioning tests.

In summary, the licenses required are electricity generation license, installation and operating permits, environmental permit, planning license, connection agreement with the utility (PPC) and power purchase contract with the grid operator (HTSO) in mainland's interconnected grid and PPC the non-interconnected grid system operator in the islands, which are not connected to the mainland's interconnected grid. The administrative acts issued in the context of the environmental and planning permitting should be in conformity with the existing limitations for the protection of nature.

The coordination between the different levels of administration, which was not foreseen with the previous legal framework, is now by L3851/2010 to be undertaken by the one-stop shop agency of MEECC.



(g) How is it ensured that comprehensive information on the processing of authorisation, certification and licensing applications and on assistance to applicants made available? What information and assistance is available to potential applicants for new renewable energy installations on their applications?

Public information with regard to the current RES legislative framework and proposed amendments or modifications (public consultation) is provided through the web sites of RAE, HTSO and the competent Ministries. Furthermore, potential applicants as well as every person interested in RES technology can submit requests/questions to RAE, CRES or the 'Invest in Greece' Agency, in order to receive information and guidance. L3851/2010 calls for the establishment of a one-stop shop agency for facilitating all issues related to RES development in MEECC, which among other responsibilities will provide full information to interested parties on all ongoing applications. Similar information will be provided by RAE.

(h) How is horizontal coordination facilitated between different administrative bodies, responsible for the different parts of the permit? How many procedural steps are needed to receive the final authorisation/licence/ permit? Is there a one-stop shop for coordinating all steps? Are timetables for processing applications communicated in advance? What is the average time for obtaining a decision for the application?

Until recently, no horizontal coordination between different administrative bodies responsible for the different parts of the permit was in place.

As already mentioned, the first step towards the facilitation of this coordination was taken on November 2009 with the establishment of the new MEECC, bringing together the bodies responsible with the greater part of RES licensing procedure. A second and more decisive step is taken with the provisions of L3851/2010 for the establishment of a 'one stop shop' under the supervision of MEECC.

The main procedural steps for large electricity units towards granting the Operation License are six (6) in the following order: Generation License issued by RAE (1), the Environmental Terms Approval (2); Terms and Conditions for Access to the Grid (3) issued by the System Operator (HTSO or PPC); Approval for intervention on public land issued by the local Forestry Service (4), the Installation License (5) and signing of the Power Purchase Agreement (6) between the investor and the System Operator. However, it should be stressed that within the procedure for granting approval of the environmental terms, several intermediate approvals from various public authorities (civil aviation authority, archaeological sites etc.) are needed.

Till now, the required lead time for the entire authorisation procedure has been lengthy and exceeded on average three and a half (3,5) years for small hydro power plants and wind farms and may have reached 6-7 years. For PV stations with capacity below 2MW,



the average time is now estimated to be one year while for larger stations the average time is estimated at 2 years.

In order to streamline this process, complying with the European directive 2009/28/EC, L3851/2010 enacted on 4 June 2010, sets the following mandatory deadlines for the intermediate stages of the RES licensing procedure:

- Production license: three (3) months
- Environmental Terms Approval: four (4) months for stations with a larger impact and two (2) months for projects characterized as 'low or zero impact' stations.
- Terms and Conditions for Access to the Grid: four (4) months
- Installation License: forty five (45) days

The HTSO and RAE inform the public via their web pages on the date and basic descriptive information for each application (name of company, technology, capacity, location) and the date of receipt of the corresponding approval (Terms and Conditions for Access to the Grid by HTSO and generation licence by RAE). With the new law, this obligation is also assigned to the one-stop shop agency established in MEECC.

In addition to the accelerated licensing process called for by L3851/2010, another special licensing process entitled "Fast Track Licensing" is put into place for large-scale renewable energy projects, which provide employment benefits locally and attract substantial capital. Currently, the criteria for fast track licensing refer to investments of more than €200 million or more than €75 million if they result in the creation of at least 200 new jobs. Fast track licensing essentially comprises the full licensing of large-scale investment projects within four (4) to six (6) months. The process is undertaken through "Invest in Greece" Agency.

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

According to the provisions of L3468/2006, Article 4, exemptions from the requirement of receiving a Generation Licence are granted in the following cases:

- i. Geothermal power plants of installed capacity $\leq 0.5\text{MWe}$.
- ii. Biomass or bio-fuel plants of installed capacity $\leq 100\text{kWe}$.
- iii. PV stations of nominal capacity $\leq 150\text{kWp}$.
- iv. Wind power parks of installed capacity: $\leq 20\text{kWe}$ for plants in isolated microgrids; $\leq 40\text{kWe}$ for plants on the remaining non-interconnected islands; $\leq 50\text{kWe}$ for plants in the interconnected system.
- v. Power plants of installed capacity $\leq 5\text{kWe}$ operated by educational or research institutions of the public or private sector exclusively for RTD purposes.



- vi. Power plants installed by CRES for as long as these plants operate in order to carry out certification work or measurements.
- vii. Other RES power plants of installed capacity $\leq 50\text{kWe}$.

For all the aforementioned cases, a decision by RAE, which confirms that the capacity of the RES unit planned, is within the above limits and that the producer has legal rights on the land where the station will be installed, is required.

The exemptions are valid provided that no grid congestion occurs.

The recently enacted L3851/2010, further simplifies the procedure. According to the new provisions for all the cases below, no generation license or exemption decision is needed:

- a) Geothermal power plants of installed capacity $\leq 0.5\text{MWe}$.
- b) Biomass or bio-fuel plants of installed capacity $\leq 1\text{MWe}$.
- c) PV stations of nominal capacity $\leq 1\text{MWp}$.
- d) Wind power parks of installed capacity: $\leq 100\text{kWe}$.
- e) Power plants of installed capacity $\leq 5\text{MWe}$ operated by educational or research institutions of the public or private sector exclusively for RTD purposes and CRES.
- f) Cogeneration plants of installed capacity $\leq 1\text{MWe}$.
- g) Autonomous power plants of installed power $\leq 5\text{MWe}$.
- e) Power plants of installed capacity $\leq 50\text{ kW}$ that are using RES other than the described in Law.

Applicants need only to have approval of the environmental terms and terms/conditions for access to the grid issued by the relevant administrator in order to sign a Power Purchase Agreement. For PV stations with capacity lower than 500kW and roof-top PVs with capacity up to 10kW, no approval of environmental terms is needed.

Furthermore, the procedure for acquiring the approval of environmental terms for PV stations with capacity within the range from 500kW to 2MW is very simple because they are now characterized by ministerial decree as "zero impact" installations.

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

For the case of solar thermal systems the only licence that is needed before the installation, is a "small works permit" given by the local building authorities. In case of



multi-dwelling buildings, consent from the other owners is needed, which should be considered as the only barrier for this type of installations presently.

For the installation of PV systems up to 10kW nominal capacity on buildings, which are entitled to a very favourable feed-in tariff (JMD OG. B1079/4.6.2009), the licensing is further simplified as residential unit owners do not have to be registered as "business" with the tax authorities and are exempted from any tax (with the exception of the 23% VAT paid on the initial equipment cost).

To be eligible for the residential feed-in tariff, the building has to cover part of its hot water needs by some other renewable source (e.g. solar thermal). A "small works permit" by the building authorities is the only license needed before installing the system. The local branch of PPC, upon request, is required to prepare the contract, the installation of the appropriate meter and the additional connection works if needed. The contract is signed between the owner and PPC and foresees the compensation of the owner via the energy bill. Information on how to proceed with such an installation is available at the websites of CRES, PPC and MEECC.

Furthermore, in the new L3851/2010, Article 9(8), the installation of low-capacity PV on buildings lodges and roofs and small wind turbines in house yards would only require a simplified small works permit that could be replaced in some cases by a simple notification of the works required to the corresponding authority.

Currently, the use of biomass for heating of buildings also in the metropolitan areas of Athens and Thessalonica is under reconsideration pending the outcome of an impact assessment study.

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

Fees related to administrative costs of granting permits are published in the corresponding Official Gazettes and/or in ministerial decisions or circulars issued on the authorisation granted by law. These fees are revised as provided in the law. No revision is planned in the next 2-year period.

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

In 2008, during the national campaign for the promotion of RES, CRES prepared and distributed guidebooks for the assessment, evaluation, environmental impact and installation procedure for all different RES technologies. In addition, CRES has issued a series of best practices handbooks regarding installation/incorporation of RES systems.



Law 3851/2010 sets specific targets for all new buildings housing services of the public and the broader public sector, which mandate the use of renewable energy sources, co-generation of electricity and heat, systems of district heating at district scale or per city block, and heat pumps to cover 10% of the energy needs by 2014.

In addition, a number of initiatives have been introduced to promote energy conservation and RES utilization at local level. These include:

- The programme "exoikonomo" that provides assistance to municipalities to put in place an integrated local plan to reduce GHGs emissions through energy conservation and RES use.
- The initiative for the "Green Islands" that aims to assist islands not connected to the mainland grid to cover their energy needs locally.
- The Public-Private initiative for the environmental and energy upgrade of the existing Industrial Zones and the development of new "green" ones.

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

The Central Administration communicates main policies and/or informs and trains local authorities through official explanatory documents and circulars. In addition, local authorities have continuous access to the central administration services who offer their support.

A number of seminars that address administrative issues have taken place in the past, either ad-hoc or in the scope of the continuing education programs of the Training Institute of the National Centre for Public Administration and Local Government.

The new one-stop shop agency of the MEECC, in cooperation with CRES is currently planning a series of seminars for local officials on the changes introduced by L3851/2010 regarding licensing procedures.

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

For the connection of a wind park with the electricity grid a Wind Turbine Type Certificate and a Power Quality Certification are required. The Power Quality Certification can be issued either by CRES or by a foreign organization that is recognized by the competent authorities in the respective country in accordance with standard IEC 61400-21, or equivalent. The same applies to Wind Turbine Type Certificates.

In addition, the wind measurements on site, necessary for the issuance of the Generation License need to be carried out by certified bodies, in accordance with standard DIN-EN ISO/IEC17025/2000.

For PV that are connected to the grid, an ISO certification of the manufacturing company of the PV modules and inverters is required for all the systems connected to the Medium or High voltage grid. For PV installation in buildings, standard IEC 60364-7-712 should be



applied. For the interconnection of the inverter to the grid, the requirements set by the Distribution or System Operator for protection and power quality that include the EN50160 standard and the EN 61000 series of standards have to be met.

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

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

L3661/2008 'Measures for the building energy consumption reduction' (OG²³ 89/B/2008). This law, implementing Directive 2002/91/EC in Greece, requires that passive solar systems as well as heating /cooling/ electricity production systems that utilise RES and CHP must be considered in the H/C specification study submitted in the licensing procedure of buildings thus promoting the installation of small-scaled RES technologies.

L3851/2010 on "*Accelerating the development of Renewable Energy Sources to deal with climate change and other regulations in topics under the authority of MEECC*".

The new law complements L3661/2008, by setting new requirements that stipulate the coverage of 60% of the need of new buildings for hot water by solar thermal systems after 1 January 2011.

Additionally, all new building construction or major renovation requires henceforth a full energy analysis study that includes energy conservation and cost/benefit analysis of the utilization of RES cogeneration, district heating, and heat pump systems.

Furthermore, L3851/2010 stipulates that by 31.12.2019, all new buildings must cover the total of their primary energy consumption with RES, CHP, district heating on a large area scale/block scale as well as heat pumps. This requirement is extended to all new public buildings by 31.12.2014 at the latest.

L3855/2010 on "*Measures to improve energy efficiency in end-use, energy services and other provisions*", and in particular Article 8 for energy efficiency measures in the public sector and Article 16 on the energy performance contracting framework.

This law, which transposes Directive 2006/32/EC, foresees specific measures for the buildings of the public sector in order to improve their energy performance and achieve energy savings. Additionally, it sets the framework for the establishment of the ESCO market in Greece through Energy Performance Contracts, promoting the use of domestic RES systems.

The "**Energy Performance of Buildings Regulation**" - KENAK (OG 407/B/2010), which has gone into effect on 1st Oct 2010. For the proper implementation of this regulation, in relation also with domestic RES systems, the Technical Chamber of Greece will issue a guidebook about the technical instructions for "RES installations in buildings".

²³ Official Gazette (OG) of the Hellenic Republic translates as ΦΕΚ



Joint Ministerial Decree "Measures to improve energy efficiency and energy saving in the public and broader public sector" (OG 1122/B/2008), where a connection with the natural gas network is made mandatory.

Ministerial Decree (OG 1249/B/2009) that defines, streamlines and facilitates the licensing procedure and framework for the exploitation of geothermal resources for own use through energy systems (ground source heat pumps) for space heating and cooling of a building.

Decision 1945/134/17-1-2003 by the General Secretary of Ministry of Environment, Public Works and Urban Planning for the "Installation of solar heaters" in buildings. **Decision 16094/08-04-2008** of deputy Minister of Ministry of Environment, Public Works and Urban Planning (OG B 917) and **Decision 16095/08-04-2008** of Deputy Minister of Ministry of Environment, Public Works and Urban Planning (OG B 925): These decisions integrate PV systems in the provisions already applicable for solar collectors.

Modifications to the Building Code (L1577/85 and L2831/00) (OG B 140) have been made as regards passive systems integration (referring to the Article 13(4.6) of the Directive).

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

Ministry for Environment, Energy and Climate Change.

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

Modifications might be required for the use of systems and RES heating/cooling equipment that achieve substantial decrease in energy consumption (i.e. SPF for heat pumps).

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

- ✚ Programme "Exoikonomo" for energy efficiency in municipal building, stock, lighting and transport.
- ✚ The national Programme "Exoikonomo kat'oikon", under which energy conservation upgrades of residential buildings are eligible for funding.
- ✚ Tax incentives are in place for the owners who install solar collectors and implement RES/EE measures in their buildings.
- ✚ Fiscal support scheme for RES systems installation in school buildings under national programme



- ↘ Fiscal support scheme for RES systems installation in central and municipal government buildings under national programme
- ↘ Fiscal support scheme for RES systems installation in the tourist sector under national programme

(e) Are there minimum levels for the use of renewable energy in building regulations and codes? In which geographical areas and what are these requirements? (Please summarise.) In particular, what measures have been built into these codes to ensure the share of renewable energy used in the building sector will increase? What are the future plans related to these requirements/measures?

The newly enacted "Energy Performance of Buildings Regulation", Article 8(3) makes it mandatory for all new or refurbished buildings in all geographical areas to meet at least 60% of their needs for hot water through solar thermal systems. This obligation is not in effect when the needs in hot water use are covered through other decentralized energy generating systems that are based on RES, CHP, district heating on a large scale area/block scale, as well as heat pumps, whose seasonal performance factor (SPF) is higher than $(1,15 \times 1/\eta)$, where η is the ratio of total gross electricity generation to primary energy consumption for the generation of electricity, according to the European Directive 2009/28/EC and at least 3.3.

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

Table 6 – Estimated share of renewable energy in the building sector

(%)	2005	2010	2015	2020
Residential	15%	17%	22%	27%
Commercial	10%	14%	27%	39%
Industrial				
TOTAL	14%	16%	24%	30%



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

Law 3851/2010 sets specific targets for the incorporation of RES in the building stock. In particular,

- Article 10(3) specifies that after 1.1.2011, new buildings must cover 60% of their need in hot water from solar thermal systems.
- Article 10(4) specifies that by 31.12.2019, all new buildings must cover the total of their primary energy consumption with energy supplied from RES, CHP, district heating on a large area scale/block scale and heat pumps.

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

Article 10(4) specifies that after 31.12.2014, all new buildings that accommodate services of the public/broader public sector must cover the total of their primary energy consumption through energy supplied from RES, CHP, district heating on a large area scale/block scale and heat pumps.

Specific measures that refer to the buildings of the public sector are also included in:

- Law 3855/10 "Measures to improve energy efficiency in end-use energy services and other provisions", article 8
- The JMD (OG 1122/B/2008) "Measures to improve energy efficiency and energy saving in the public and broader public sector"
- The National Energy Efficiency Action Plan (NEEAP), where measures highlight the use of RES & CHP systems at the premises of the public buildings

(i) How are energy efficient renewable energy technologies in buildings promoted? (Such measures may concern biomass boilers, heat pumps and solar thermal equipment fulfilling eco-label requirements or other standards developed at national or Community level (cf. text of Article 13(6))).

Currently, energy efficient renewable energy technologies in buildings are promoted under:

- The tax deduction scheme, set by L.3522/2006, which considers all small domestic RES systems to be eligible for a 20% tax deduction capped at € 900 per system.



- The requirements of the programme for development of PV on building roofs (JMD OG. B1079/4.6.2009), whereas in order to be eligible for a very favourable FIT, a residence has to cover part of its hot water needs by some other renewable source (e.g. solar thermal).
- The national Programme "Exoikonomo kat'oikon", aiming at improving the energy performance of lower income family dwellings (to commence in the 2nd semester of 2010), through subsidies of the installation of RES and energy conservation measures in residential buildings.

Additionally, consideration was given to improve the performance of conventional domestic energy systems. Specifically, Article 10 of L3851/2010 provides for a mandatory inspection regime for residential heating installations as follows:

- In order to reduce the energy consumption and mitigate the CO₂ emissions an inspection is carried out by certified energy inspectors of the boilers of those buildings heated with ordinary fossil fuels, as follows: a) at least every five (5) years, of boilers with total net nominal capacity of twenty (20) to one hundred (100) kW, b) at least every two (2) years, of boilers with total net nominal capacity higher than one hundred (100) kW and, if they are heated with gas fuel, at least every four (4) years. Heating installations older than fifteen (15) years and with boilers of total net nominal capacity higher than twenty (20) kW are inspected, in their entirety, by the energy inspectors at least once, at a time and with the procedure specified in the Regulations. The inspectors draw up a report, in which the efficiency of the boiler is assessed as well as its dimensions in relation to the energy needs of the building and instructions and recommendations are set down for possible required replacement of the boiler, modification of the heating system, maintenance and alternative solutions.
- To reduce energy consumption and limit emissions of carbon dioxide, an inspection is carried out by certified energy inspectors of the air conditioning installations of buildings, with total net nominal thermal / cooling capacity higher than twelve (12) kW, at least every five (5) years. The inspectors draw up a report, in which the efficiency and the dimensions of the air conditioning installation in relation to the energy needs of the building and suitable instructions and recommendations are set down for the improvement or replacement of the air conditioning installation.



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

- (a) Reference to existing national and or regional legislation (if any) concerning information requirements according to Article 14 of Directive 2009/28/EC:*

There is no specific national or regional legislation with respect to Article 14 of the Directive 2009/28/EC. However, such initiatives are included in L3855/2010 for "Improvement of energy efficiency at end-use and energy services" and it is in the intention of the Ministry to design, organise and implement such kind of awareness and training programmes.

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

The Ministry of the Environment, Energy and Climate Change is the entity responsible for Energy Policy in Greece; it also coordinates the major dissemination programmes and campaigns referring to the development and penetration of the RES.

CRES, in its capacity to provide advice and assistance to MEECC on matters of RES/RUE/ES national policy, strategy and planning, is entitled to dissemination and training campaigns as well as awareness raising campaigns on RES. The main instruments used are, training activities, specialised events and production of material (technical guides, promotional publications, training software etc).

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

The Regulatory Energy Authority and Public Power Corporation have also implemented respective dissemination programmes for the promotion of RES to the general public.

Furthermore, the General Secretariat for Research and Technology has designed and implemented numerous awareness campaigns on energy issues (in the form of open energy days and fairs for presentation of scientific achievements), targeting mainly students, new scientists and market stakeholders.

- (d) Please indicate how information is made available on supporting measures for using renewable energy sources in electricity, heating and cooling and in transport to all relevant actors (consumers, builders, installers, architects, suppliers of relevant equipment and vehicles). Who is responsible for the adequacy and the publishing of this information? Are there specific information resources for the different target groups,*



such as end consumers, builders, property managers, property agents, installers, architects, farmers, suppliers of equipment using renewable energy sources, public administration? Are there information campaigns or permanent information centres in the present, or planned in the future?

Every supporting measure instituted by MEECC is accompanied by a large-scale dissemination campaign aimed at the respective target group. The programme may be implemented directly by the Ministry and/or entities under its supervision. Each year the Ministry defines an "energy objective" (which is usually the main objective of a new law), financial incentive or a supporting measure in general, and creates a multi-targeted awareness campaign.

Each information campaign is supported by an info-desk, which is usually set-up at the Ministry's headquarters and assists every dissemination activity. Moreover, when appropriate, this provision of information is supported by standardised or frequently asked Questions & Answers sheets, online catalogues of installers, companies and suppliers as well as dedicated websites where all relevant information on fiscal and legislative issues is uploaded.

A successful example of such a campaign is the "Smart Energy" awareness campaign conducted in 2008. This programme targeted all relevant actors (end-users, installers, builders, local authorities etc.) and was elaborated with the technical and organisational assistance of CRES. The primary target group was the general public of the regions with high RES potential and therefore high investment interest. The campaign also targeted groups such as the local authorities, engineers and builders, local chambers (technical, commercial, industry etc). Multi-level dissemination activities were selected according to the target group needs and implemented through various communication channels. An integrated set of promotional, educational and communicative materials was developed, consisting of:

- A radio spot broadcast over selected local radio stations all over Greece
- The creation and broadcasting of a TV spot for RES & CHP at national level
- A website development (<http://www.ypan.gr/ape/index.php?cat=home>)
- Numerous articles in local and national newspapers, and
- 3 promotional brochures and 6 environmental guides (1 for each subject).

Furthermore, during the campaign, the "Promo-bus", a travelling group of experts, visited 26 cities, to distribute the dissemination material, inform citizens and promote the benefits of the RES & CHP use. Additionally, information events were held in 2 major cities dedicated to the specific target groups (Kalamata -Southern Greece and Thessaloniki - Central & Northern Greece) and a 3-day event, in the framework of "Entrepreneurship Panorama" in Athens.

- (e) ***Who is responsible for publishing information on the net benefits, costs and energy efficiency of equipment and systems using renewable energy sources for heating, cooling and***



electricity? (Supplier of the equipment or system, public body or someone else?)

MEECC and entities under its supervision. In particular, CRES, the Technical Chamber of Greece and the Special Secretariat for Competitiveness and Innovation, constitute the permanent information centres –resources for energy, in the field of their activities.

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

The guidance is provided through technical seminars and workshops organised regularly mainly from CRES and the Technical Chamber of Greece.

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

An information campaign will be implemented in early 2011, targeting especially citizens in areas with high RES potential, in order to overcome existing barriers, to provide adequate information and to promote RES installations. In these activities, the local stakeholders will have as significant role, as they are requested to gather and disseminate the information given to all the interested parties at local level. CRES has developed an Energy Awareness Park (PENA) near Athens which attracts over 6000 visitors (students, teachers, professionals) annually and where all the relevant RES technologies are exhibited. Furthermore, awareness campaigns targeting students and pupils organized regularly by CRES in collaboration with networks of Municipalities.

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

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

There is not as yet any national regulation.



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

No organization has been assigned the task as yet to certify installers. The current plans are that MEECC in conjunction with the General Secretariat for Industry of the Ministry or Regional Development will take on this responsibility with the possible assistance of the Technical Chamber of Greece providing technical support to take on this task.

Moreover, CRES is currently participating at the IEE project Qualicert that aims to contribute to the development of a European set of common criteria for the certification or equivalent qualification schemes for installers of small scale renewable energy systems. The information and evaluation of procedures of other MSs to be acquired in this project will be taken into consideration as appropriate for the development of the national scheme for the certification of the installers.

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

There is not a certification scheme as yet. CRES maintains a database of PV systems installers who have agreed to implement the technical good practice guidelines specified in the "Guidebook for Installing PV Systems in Buildings' Roofs" developed by CRES, PPC and NTUA.

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

When this scheme is going to be developed, will be publicly available the relevant database with the certified installers.

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

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

The Electricity infrastructure development is regulated through various Laws and Decisions. Requirements related to the energy grid are covered as follows:

- 1. L2773/1999** and especially article 28 par.5 for direct lines.



2. **L3468/2006**, and especially
 - Article 3 for congested areas of the networks
 - Article 9, for priority dispatch of RES energy within the interconnected system
 - Article 10, for priority dispatch of RES energy within the free-standing island systems
 - Article 11, for connection of RES plants to the transmission and distribution networks.
3. **L3734/2009**, and especially
 - Article 27 for congested areas of the grid
 - Article 28 for connection to grid
4. **L3851/2010**, and especially
 - Article 4 for the development of the national grid system
5. **Ministerial Decree 13310** (June 2007), concerning the process for RES plants to obtain connection to grid
6. **Ministerial Decree D6/F1/ 5707** (OG B 448/3-4-2007), and especially Article 4 and 23, for congested areas of the grid
7. **Transmission System and Market Operation Code** (Ministerial Decree OG B 655/17-05-2005), and especially
 - Ch. 6, for bidding in the DA market
 - Ch. 51, for System Transmission
 - Ch. 59, concerning connection to the Transmission System

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

Wind is expected to contribute the largest portion of renewable energy in the electricity sector; the contribution of the rest RES (small hydro, geothermal, etc), with the exception of PV that will contribute gradually at high shares, seems to be significantly lower. According to the current procedures, only PV and some small hydro will be connected to the distribution network while the majority of wind farms will be connected to the HV network (mainly 150KV).



The licensing procedures call for firm Connection Offers by the respective System Operator (the Hellenic Transmission System Operator – HTSO) for projects in the mainland and interconnected islands and by the Operator of Islands (currently PPC) for plants at the free-standing island grids, after the projects obtain environmental licensing. The plans of both HTSO and PPC for grid improvement and expansion are described below.

Transmission System

Every year HTSO produces an updated version of the National Transmission Development Plan (NTDP); this plan describes all the planned transmission projects for a 5-year period. The major projects inscribed in the 2010-2014 NTDP include:

- expansion of the 400 kV transmission network in the area of East Macedonia and Thrace (to accommodate about 1000 MW of new wind capacity).
- expansion of the 150 kV transmission network to the area of South Evia (to accommodate about 400 MW of new wind capacity)
- expansion of the 400 kV transmission network in the area of Peloponnese (to accommodate approx. 1300 MW of new wind capacity)

A strategic (provisional) view with a 10-year horizon is also included. This information has been included in the ENTSO-E 10-year development plan as described in the 3rd Electricity Package. Similar development plans are issued by the Islands Operator (currently PPC).

The NTDP is first approved by the Regulator and finally by MEECC by a Ministerial Decree. All planned system enhancements are undertaken by the system owner (PPC), following an opinion by the Regulator. All planned upgrades of the existing system are undertaken by the Transmission System Owner (PPC).

In this planning process, HTSO takes into consideration the generation licenses issued and requests for new licenses in close coordination with the Regulator, in order to plan (propose) the most suitable transmission projects to accommodate future RES generation. This procedure started in 2001- when HTSO was established – and specific projects have been already completed or are near completion to accommodate more than 1500MW of RES plants. HTSO estimates that the realization of the NTDP, as currently planned, will allow the connection of about 8500 MW of RES plants within the mainland system.

Also, interconnection of non-interconnected islands with very high wind potential (Crete, Rhodes, Chios, Lesbos, Skyros) are currently under consideration by the TSO (DESMIE SA) to be included in the National Transmission Development Plan for the period 2012-2016 as called for by L3851/2010. The enhanced wind energy capacity on islands, the production of which is to be injected into the system via these planned interconnections is included in the 8,500 MW figure stated above.

However, the construction of new transmission projects faces considerable difficulties and consequent delays, mainly due to strong public opposition.

Transmission System planning and operation is, in accordance with the operational standards, provided for in the Grid Code and that are in turn harmonized with the "UCTE Operation Handbook" which has been accepted by all the TSOs of the synchronous system of Continental Europe; by a Multilateral Agreement that was signed on 2005.

The UCTE Operation Handbook²⁴ to that effect is an up-to-date collection of operation principles and rules for the transmission system operators in continental Europe. A revision

²⁴ <http://www.entsoe.eu/index.php?id=57>



was issued in March 2009, but no assessment on its impact on the operational practices of the HTSO has been issued yet.

Distribution System

There is a provision for the so-called Distribution Development Plan in the draft version of the Distribution System Code²⁵. A public consultation regarding this Code was launched in September 2009. The issuance is still pending.

Non-interconnected islands

Due to their small size, most of the free standing island grids are supplied by small fuel-oil fired power plants and a MV radial distribution network. A limited amount of RES plants can be installed in these islands. A Code regulating the operation of the non-interconnected islands is under preparation.

In order to exploit the high wind potential of the Aegean Sea islands, a number of interconnection projects has either been launched (Cycladic Complex) or are under study (Crete, North East Aegean islands, etc). All the interconnection projects are included in the NTDP for the periods 2008-2012 and 2010-2014.

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

Transmission System

Information technology tools

A wind power prediction tool is currently in operation in the Transmission System Operation Centre to provide input for better utilization of wind energy production in conjunction with dispatching of conventional plants. Special Protection Schemes (SPSs) have also been designed by the HTSO to allow for increased wind penetration in specific regions. It is expected that in the near future and as wind power penetration increases, wind power prediction tools with enhanced capabilities will be used extensively by transmission system operators.

HTSO is currently establishing new standards for connection of wind parks to the transmission system. Among other requirements, wind parks are now required to maintain communication with the National Dispatch Centre on a continuous basis for sending /

²⁵ http://www.rae.gr/downloads/DSOCode_Draft.pdf



receiving on a real time basis, information concerning production forecasts, availability, dispatch commands, orders for provision of ancillary services, etc.

Furthermore, a new control Centre is under design by HTSO, to facilitate the future development of the electricity market and the expected RES development. The public tender for the construction of this Control Centre is expected to be issued in 2011.

Storage facilities

A study is underway by RAE regarding the possibilities for development of new pumped-storage hydro plants in the interconnected system. As already mentioned, private investors have applied to RAE for approx. 1400 MW of pumped storage hydro units. Additionally, PPC is considering the development of such plants. A study recently completed by NTUA on behalf of RAE has indicated that the development of pumped storage hydro units exceeding 1000 MW in capacity is technically possible.

HTSO has also commissioned a number of studies for the determination of the optimal RES generation mix. One major objective of these studies is to determine the optimal size of the pumped storage facilities necessary to minimize the wind energy curtailments in view of the 20-20-20 target.

Distribution System

Intelligent networks

The most important recent development in the Distribution System is the installation and operation of hourly remotely-read meters for medium voltage customers. However, this development will probably have only a small impact on renewable energy.

Another large investment in the distribution network is the installation of a SCADA system by HTSO.

PPC has implemented 2 pilot Smart Grid applications (via broadband services) on the MV network (BPL) at Larissa (Thessalia) and Lavrio (Attica) regions. Moreover, PPC is currently implementing or planning larger scale deployment programmes of smart meters as highlighted in 4.2.7. Additionally, in the scope of 2 EC funded R&D programs, 2 small scale projects at Kythnos island (12 remote houses using 100% renewable energy – MORE MICROGRIDS project) and at the Rafina region in Attica Prefecture (smart load controllers in houses – SmartHouse/SmartGrids Meltemi project) are operational providing valuable experience to be utilized for future scale-up action.

Storage facilities

A small 8MW pumped-storage plant project was recently launched in the non-interconnected island grid of Ikaria.



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

The Greek transmission system is interconnected to the neighbouring country systems as follows:

- to Bulgaria through one 400 KV line Thessaloniki (GR) – Blagoevgrad (BU)
- to FYROM through two 400 KV lines: Thessaloniki (GR) – Dubrovo (FYROM) and Meliti (GR) – Bitola (FYROM); the latter was put in operation on 2007.
- to Albania through one 400 KV line Kardia (GR) – Elbasan (AL)
- to Italy through one 400 KV HVDC link Arachthos (GR) – Galatina (IT)

Another 400 KV interconnector to Turkey (N. Santa (GR) – Babaeski (TR)) has been completed and is expected to be fully operational by summer 2010. A new 400KV interconnector to Bulgaria (N. Santa (GR) – Maritsa (BG)) is in the planning phase and a MoU has been signed between the respective TSOs; it is expected to be completed by 2014-15. In addition, a new 400KV HVDC link to Italy is under consideration.

(e) *How is the acceleration of grid infrastructure authorisation procedures addressed? What is the current state and average time for getting approval? How will it be improved?*

The construction of new transmission projects faces significant barriers. In order to accelerate authorization procedures, a law was put in place in 2003 (L3175/2003, Art.15(3)) classifying these projects as “of significant National interest” to reduce the authorization procedures foreseen for such projects. Several transmission projects of importance to RES integration have been included in the scope of L3175/2003 although the average time for getting approval still exceeds 5 years if land expropriation time is included. A further significant improvement is expected, in view of the favourable provisions of L3851/2010 regarding the licensing of infrastructure and ancillary works for RES plants.

(f) *How is coordination between grid infrastructure approval and other administrative planning procedures ensured?*

L.3851/2010 facilitates and accelerates environmental licensing of transmission projects including accompanying civil works.

During the licensing procedure for a RES plant, the conditions and availability for grid connection are investigated as follows:

1. Before the issuance of the Generation license RAE may request the opinion of the Grid System Operator for the existence of adequate grid capacity for the future interconnection of the plant. This normally is the case for large or complicated RES plants. The opinion of the Operator is not legally binding at this phase.



2. After the issuance of the Generation License, the developer applies formally to the Grid System Operator for the Connection Offer. The Operator issues the Connection Offer, which is not binding at this time. It becomes binding after the Environmental Terms Approval is secured by the relevant Department of MEECC and if grid capacity is still available.
3. After the Connection Offer becomes binding, the Connection Contract is signed between the RES developer, the Grid System Operator and the Transmission System Owner (PPC). The HTSO is responsible for drafting the Connection Contract. The connection works are usually constructed by the RES developer and their ownership is usually transferred to PPC unless the developer chooses otherwise in which case, he is responsible for their maintenance.

It should be clarified that the interconnections works are also subject to environmental approval.

- The general grid infrastructure development is the responsibility of TSO. In this respect: The TSO elaborates a National Transmission Development Plan (NTDP), which takes into consideration all the Interconnection Offers issued and the expressed investment interest. The NTDP is updated each year.
- With the aim to optimise the electrical interconnection of the islands and to effectively exploit their rich RES potential, the System Operation is required by L3851/2010 to submit by the end of 2010 a separate Strategic Study in the scope of the System Development Study for the period to 2020.
- This planning procedure ensures that the expressed investment interest for RES is taken into consideration in the planning of the grids, and conversely, the grid infrastructure development provides guidance for future investors targeting remaining suitable areas.

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

Under current legislation, connection rights for RES plants are provided by the HTSO (within the "connection offer") upon request submitted by the RES plant developer, after successful completion of the 1st licensing step, i.e. after obtaining the generation license. The HTSO reserves firm network/system capacity for the RES plant after successful completion of the ETA procedure. In case there is no more local network capacity available, or there is an overall system constraint, the HTSO does not provide further connection rights in the specific area. This constraint is taken into account in the revision of the NTDP.



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

As already mentioned, this is not foreseen/allowed by the current licensing regime, i.e. for a RES plant to secure an installation license first it has to obtain a connection offer from the responsible Grid Operator. Today, there are a number of locations (Southern Euboia, Eastern Peloponnesus) where wind park installation is temporarily stopped because of grid limitations. Roadblocks to grid capacity increases have recently (2010) been addressed and new HV lines, some under water, have already been put up for public tender.

- (i) Are the rules on cost sharing and bearing of network technical adaptations set up and published by transmission and distribution system operators? If so, where? How is it ensured that these rules are based on objective, transparent and non-discriminatory criteria? Are there special rules for producers located in peripheral regions and regions with low population density?**

HTSO is currently developing the methodology for sharing the grid connection costs in case that more than one RES energy producers use the same connection infrastructure; in such cases, the initially connected user(s) are remunerated by users connected at a later stage. The methodology is expected to be in place in 2011, after approval by RAE

Transmission System – Connection costs

Cost bearing rules are defined in the Grid Operation Code. With regard to cost sharing rules, the HTSO has to provide to the Regulator a recommendation concerning rules for remuneration of the initially connected user(s) by subsequent connected user(s) in case of common connection infrastructure.

Distribution System

There are no published connection tariffs by PPC, the transmission system owner.

Transmission and distribution system connection costs are examined by the Regulator who serves as an advisor to the Minister by recommending appropriate tariffs. The Minister has the competence to approve the secondary legislation (Grid Operation Codes, etc) as well as the connection costs.

There are no special rules for producers located in peripheral regions and regions with low population density.



- (j) Please describe how the costs of connection and technical adaptation are attributed to producers and/or transmission and/or distribution system operators? How are transmission and distribution system operators able to recover these investment costs? Is any modification of these cost bearing rules planned in the future? What changes do you envisage and what results are expected**

The costs of connection and related technical adaptations of a RES plant are attributed to the producer on a percentage basis – “shallow” connection cost charging. These costs are considered part of the total investment costs (i.e. have to be covered by selling the energy of the RES plant).

In case further reinforcement of the network is necessary, related costs are born by the TSO/DSO and collected through the regular network charges. No modification of the above cost bearing rules is planned in the near-term.

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

As already mentioned in (i), with regard to cost sharing rules, the HTSO has to provide to the Regulator an initial recommendation for the remuneration rules of the initially connected user(s) by subsequent connected user(s) in case of common connection infrastructure.

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

The “connection offer”, as already mentioned in (g), provides all necessary information on costs, timetable for connection, etc. The HTSO must provide the connection offer within sixty (60) days of the respective request.

The connection assets (interface) are constructed by the producer who also bears the respective costs. Due to the uncertainties mentioned above, no guarantee can be given for the completion time of the transmission projects and therefore, the timetable for the grid connection (“shallow connection”) of RES plants is only indicative. For major transmission projects, the precise timetable is announced by the HTSO through the 5-year NTDP, which is updated every 12 months. All relevant information is published at the HTSO site (www.desmie.gr).



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

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

- a1) The transmission and distribution of RES produced electricity is guaranteed by National Law and the PPAs. In case RES plants are connected to congested areas, a pre-determined upper limit of possible curtailments is contracted; some remuneration of RES plants is predicted for such cases under L3851/2010.
- a2) Priority access (as defined by Directive 2009/28/EC) is ensured as long as system security and security of supply are not jeopardized. Security criteria take into account various factors and parameters such as:
 - Technical minima of conventional thermal power plants.
 - Flexibility of conventional generation for load following.
 - Required reserves.
 - Dynamic security aspects.

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

Any deviations from the "merit order" in dispatching have to be documented by the respective System Operator and justified. No violation of the rule has been reported so far.

(c) How are grid- and market-related operational measures taken in order to minimise the curtailment of electricity from renewable energy sources? What kinds of measures are planned and when is implementation expected?

Extended curtailments of electricity produced by intermittent RES plants (mostly wind plants) have not taken place so far in the interconnected system, as the current penetration level is rather low. However, in the near future, rules must be set by HTSO and all the necessary infrastructure must be designed, in order to facilitate this type of action in view of increased penetration of wind power ensuring at the same time the security of the electricity system.

There is no balancing market or intra-day market. The demand side does not participate in the daily energy wholesale market.

There is no demand side management mechanism apart from a load-shedding program for summer peak hours.



- i. grid-related measures:
 - ia. During the planning phase of regional RES installation licensing, a more relaxed approach is followed concerning the availability and robustness of grid capacity offered to wind producers. As a result, planning of new RES connections is based on the premise that a limited amount of curtailment of the order of 3% is factored in, so as to increase the overall wind energy penetration. This relaxation has been possible because of the Ride-Through Capability (FRT) that is now required, and the more efficient network management techniques already implemented by the HTSO utilizing the hourly wind energy forecasting capabilities now available.
 - ib. HTSO has already submitted to the RAE a request to amend the Transmission Grid Code in order to incorporate procedures and standards aiming to provide to HTSO the capability to perform appropriate unit commitment, including dispatch as well as real-time control of wind parks so that, among other reasons, to minimize curtailments of wind generation.

- ii. market related measures:

Such measures are mainly related to installation of 'smart meters' by PPC, which provides the overwhelming majority of customers in all voltage ranges in Greece. Currently all high and medium voltage consumers are equipped with meters capable of telemetering.

PPC is planning a gradual replacement of all meters by 'smart' ones. A cost-benefit analysis and a plan of action have already been elaborated. Some small pilot projects involving selected areas in Attica and some islands have already been completed and the installation of 60,000 smart meters to low-voltage consumers (with an approximate budget of 27 MEuro) is planned. A next step under evaluation is the installation of an additional 160,000 smart meters to residential customers in 2 islands in the Aegean.

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

In general, RAE is responsible for monitoring the energy markets in Greece. RAE cannot enforce implementation of measures described in (c) above, as in most cases such measures must be introduced by law.

RAE has already established a requirement for HTSO to report on an annual basis on various operational aspects concerning electricity generation from wind parks in the country. Such aspects include the loading of critical transmission lines, cases where generation from wind parks had to be curtailed, the accuracy of the wind generation forecasts performed by HTSO, etc. This report has already been submitted by HTSO for year 2009; the report for year 2010 is to be submitted in the first semester of 2011.

Additionally, HTSO has to report on the methodology to be applied in case curtailments of generation from wind parks is necessary to safeguard the operational security of the power system.

Finally, a requirement that HTSO drafts and submits on a yearly basis to RAE a 3-year Business Plan, is under consideration by RAE.



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

Plants generating electricity from renewable energy sources with the exception of large hydro plants are not integrated in the wholesale electricity market.

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

No charges are applied in view of the fact that generators bear the cost of connection works.

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

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

There is no discrimination in the transmission and distribution of biogas. According to article 39 of L3428/2006 regarding the liberalization of the market of natural gas, "the use of natural gas systems according to the provisions of the Law is allowed for the distribution of biogas, a gas produced from biomass and other types of gasses, if this distribution is technically possible and the safety measures are met, taking into account the quality requirements and the chemical characteristics of these gases".

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

The development of the natural gas network was implemented to satisfy the expected needs of the population and the industry. A detailed map elaborated by DESFA (the Hellenic Gas Transmission System Operator S.A) showing the central pipeline, the cities connected to grids of low and medium pressure and the envisaged extensions is available at its web site. The map also includes the areas where gas production coming from RES is estimated to be sufficient to establish plants for its exploitation. From this map, it is clear



that in the majority of the cases the possible integration of biogas into the natural gas grid is feasible.

In the few cases that biogas integration into the natural gas grid is not possible it is either due to difficulty in the construction of high pressure networks that would access the biogas resources or doubts about the economic viability of such a construction without any additional financial support.

It should be noted that the biogas plants currently in operation are co-generation plants and the biogas produced is used to cover their own needs in electricity and heat. As these needs may not be fully covered by the biogas produced, the biogas plants are also connected to the natural gas grid.

In Greece, biogas plants of 41 MWe installed capacity are operating, at solid waste landfills (SWL) and municipal wastewater treatment plants (MWTP). The most important are the following:

- In the SWL of Ano Liossia a co-generation plant of 23.5 MWe capacity is in operation.
- In MWTP of Psytalia a co-generation plant of 11.4 MWe capacity is in operation. The biogas produced is also used to dry the sewage sludge.
- In SWL of Tagarades in Salonica a co-generation plant of 5 MWe capacity is in operation.

It is estimated that in the near future, additional SWLs will be constructed near Athens, where the possibility to connect to the natural gas grid is assured.

In all biogas plants, the biogas produced is not upgraded to biomethane. In the case that natural gas grid is connected to the biogas production plants, it is more likely that biogas will be used to substitute natural gas rather than to be injected (as upgraded) in the system.

In addition, biogas or other gasses produced by RES have specific characteristics as to their consistency and flow rates. Thus the cost of upgrading plus the cost of the extension to the nearest existing natural gas grid will most likely make such investments non-viable.

For all these reason, no plan exists at this time to extent the grid to facilitate biogas insertion in the natural gas system.

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

There are a number of technical rules for the connection and connection tariffs for the natural gas; the most important of with are:

1. The standard transfer service contract
2. Regulation of steel natural gas distribution networks with design pressure 19 bar (OG B 1552/24-10-2006)
3. Regulation of polyethylene natural gas distribution networks with maximum operating pressure 4 bar (OG B 1530/19-10-2006)
4. Manual of operation and maintenance of distribution networks of medium pressure gas (design pressure 19 bar) and of distribution networks of low-pressure gas (maximum operating pressure 4 bar) (OG B 1712/23-11-2006)



5. Regulation of installation of pipelines and meters gas with operating pressure until 4 bar (OG B 1810/12-12-2006)

The technical regulations have been published in the Official Government Gazette and uploaded on the web pages of the relevant organisations (www.rae.gr, www.desfa.gr, www.depa.gr, www.aerioattikis.gr).

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

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

At present, there are no RES district heating networks, with the exception of some pilot geothermal applications for district heating and cooling on the island of Lesvos. Similar projects for the exploitation of geothermal energy are under consideration albeit at an early stage in some regions of North-eastern Greece.

A number of district heating installations that use natural gas are able to also utilize biomass. The contribution of district heating/cooling installations from RES is foreseen in order to reach the National targets for 2020 and toward that purpose, an attractive feed-in tariff is provided by L3851/2010. However, this contribution is estimated to be low and it will be almost exclusively in conjunction with CHP installations of biomass. In the medium term, such upgrade of an existing conventional district heating network (mainly for the ones using heat from lignite plants rather than natural gas) to a RES one, could be considered but no specific planning or pilot project has been announced. Nevertheless, the existing legislative framework and all fiscal initiatives favour the development of RES district heating and cooling applications. This includes solar and shallow geothermal applications to be utilized mostly for unit building applications while biomass and medium enthalpy geothermal plants will likely cover some district heating applications.



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

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

There is no specific legislation for the implementation of sustainability criteria for biofuels and bioliquids presently under consideration.

The introduction of sustainability criteria at national level is planned to be carried out through legislative alternatives that include:

- ▾ additions amending Law L3769/2009, so that all quantities of biofuels placed on the domestic market meet the sustainability criteria of Directive 2009/28/EC,
- ▾ use of the invitations to participate in the quota allocation of pure biodiesel - terms and conditions for the verification of compliance with sustainability criteria. Note that under Article 15A (10) to (11) of L3769/2009, the supply of bioethanol and other biofuels in the Greek market is determined by JMDs which may cover sustainability criteria,
- ▾ issuance of a JMD as specified in Article 15A par. 12 of L3054/2002.

A final decision on the instrument that will implement such sustainability criteria for the biofuels and the bioliquids is not taken yet.

(b) How will it be ensured that biofuels and bioliquids that are counted towards the national renewable target, towards national renewable energy obligations and/or are eligible for financial support comply with the sustainability criteria set down in Article 17(2) to (5) of Directive 2009/28/EC? (Will there be a national institution/body responsible for monitoring/verifying compliance with the criteria?)

Currently, plans to ensure compliance with the sustainability criteria as set by Directive 2009/28/EC include the design of a Certification Sustainability System for biofuels and bioliquids by a standing committee under the auspices of ELOT, the Greek national body for standards, composed of well qualified and widely respected experts.

The standards are to be based on the methodology and values of the tables in Annex V to Directive 2009/28/EC and include all aspects of the Directive on raw materials and production process.



Each biofuel producer will then be certified according to this standard from any certification body that has the qualification or authorisation to do so from ESYD, the national accreditation organization. The standard can be used also for biofuels or for raw materials producing biofuels in other countries (within or outside the EU).

The standing committee will have responsibility for updating the standard in accordance with the technological and environmental developments, as they will be reflected in EU Directives and national legislation. It should also be responsible to provide clarification on issues arising occasionally and to settle disputes relating to sustainability criteria and applicability of the standard.

The operation of a well functioning Certification Sustainability System for biofuels and bioliquids is critical to promote biofuels and bioliquids, because:

- ▾ The contribution in the reduction of greenhouse gas emissions (GHG) of biofuels coming from specific production procedures will be estimated and confirmed.
- ▾ The control of compliance with the sustainability criteria will facilitate the allocation of subsidies to farmers.

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

So far, there is no national authority or other entity entrusted with the monitoring of compliance with the sustainability criteria, as mentioned in question (b) above. MEECC, which is responsible for assuring quality control of conventional fuels including transportation fuels specifications, is currently searching for ways to extend the capability of its policy mechanisms to cover market adherence to sustainability criteria.

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

The basic legal framework for land zoning is **L2742/1999**, which addresses issues of economic, social and territorial coherence and removal of inequality among the prefectures are promoted.

More specifically, L2742/1999 comprises a complete framework of targets, authorities, mechanisms, procedures and means of practice of land zoning, to promote the sustainable and balanced development, ensure the production and social coherence, and secure



environmental protection in the entire national territory. The general policy goals for land zoning at national level are set in the General Framework of Physical Planning and Sustainable Development. The General Framework is proposed by the National Council of Physical Planning and Sustainable Development, approved by the Inter-Ministerial Coordination Committee for Physical Planning and Sustainable Development chaired by the Minister of Environment, Energy and Climate Change and is subject to approval by the Plenary Session of the Greek Parliament. The General Framework is further specialized and completed by the Special Frameworks for Tourism, Renewable Energy Sources and Industry. Moreover, L2742/1999 foresees the possibility of enactment of more Special Frameworks in sectors of particular importance or with special characteristics. The Special Frameworks are approved by the Inter-Ministerial Coordination Committee.

The general principles of the above mentioned Planning Frameworks (General and Special) are binding for the regional and local levels of planning. Regional Frameworks are approved by decision of the Minister of Environment, Energy and Climate Change.

The land use planning at the lower level is implemented by decisions under L2742/1999 that include:

- The General City Plans (GPS) and General Urban Plans (GPS).
- The Plans for Physical Planning and Urban Organization for the Open City (SCHOAP).
- The Zones for Urban Control (ZOE).
- The Zones for Organized Development of Productive Activities (POAPD).
- The Zones for Special Physical Interventions (PECHP).
- The Plans for Integrated Urban Interventions (SOAP).

The responsibility for the approval of the above mentioned local plans belongs for the first two (GPS, SCHOAP) to the Regions, and for the rest (ZOE, POAPD, PECHP, SOAP) to MEECC.

The approval of these local plans requires the elaboration of a detailed planning study. The terms of reference of the study are set by the Minister of Environment, Energy and Climate Change. The land use categories usually found in a local plan include:

- Industrial or general commercial activities zones classified according to their impact level.
- Agricultural and animal farming activities zones.
- Lands for high agricultural productivity.
- Zones for urban development and housing.
- Zones for cultural, sport or relevant activities.
- Protected nature areas, as they are defined by the environmental laws (see paragraph e below).

During the study elaboration and plan approval process, an extensive public consultation procedure is required. After the approval of the plan, the relevant information is available through the Planning Services of the local and regional authorities.



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

Nature areas are recognized as protected areas either through their characterization based on the current national legal framework or through their inclusion in the framework of the global initiatives which have been adopted by the country.

At national level, L1650/1986 defines five categories of protected areas: area of absolute nature protection, area of nature protection, national park, protected natural formation and protected landscape, and area of eco-development. Landscapes can be characterized for conservation purposes as being of outstanding natural beauty in accordance with the provisions of L1465/1950, which complements L5351/1932 "On antiquities".

Greece has included in the European Ecological Network NATURA 2000, 163 Special Protection Areas (SPA – Directive 79/409/EC) and 239 Areas of Community Interest (SCI – Directive 92/43/EC) which cover over 25% of the total national territory. Greece is also signatory to a number of international environmental protection conventions including Wetlands of Global International Importance in the Ramsar Convention. In the scope of a number of international conventions that include Monuments of World Heritage (UNESCO), Biosphere Reserves (UNESCO, Man and Biosphere), Special Protected Areas (Barcelona Convention) and Biogenetic Reserves (Council of Europe) a number of areas have been declared as protected areas.

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

Characterization and alteration of the characterization of land use are carried out at different levels:

- at the national and strategic level with the National General Framework and the Special Frameworks,
- at regional level with the 12 Regional Frameworks,
- at lower level through GPS, SCHOAP, ZOE, regulatory plans,
- by the governing bodies entrusted with the administration of areas of special interest including NATURA areas, National Parks etc.

Land Zoning at National Level (General and Specific Frameworks) and at Regional Level as called for in L2742/1999 is to be re-evaluated and possibly revised at least every 5 years or earlier if the need of substantial revision arises.

Especially for forests and forest areas, the characterization is done through the elaboration of forest maps and until its completion, through the physical examination of each area from the responsible forestry authorities.



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

The implementation of the cross-compliance requirements to "avoid abandonment of agricultural land and ensure conservation of land in good agricultural and environmental condition" (Regulation (EC) 73/2009) at national level is carried out on the basis of the JMD 324032/2004 (OG B' 1921) entitled "Implementation of the system of cross compliance and other additional measures in implementation of Regulation (EC)1782/2003 of the Council". A later Ministerial Decree 26202/2005 (OG B' 538) provides further guidance. Every year, following a specified sampling procedure (year 2008: sampling of 1.08% of approximately 780.000 beneficiaries) the authorised entities (OPEKEPE, & regional prefecture services) carry out administrative and in situ checks for the certification of the requirements of cross compliance. Farmers who submitted requests for direct aid (article 76 of Regulation (EC) 796/2004) and farmers who are eligible to submit a request for direct aid (Regulation (EC) 1698/2005) from rural development programmes (article 34 of Regulation (EC) 1975/2006) comprise the sample population.

Shortcomings in the application of the cross-compliance mechanism in Greece have been notified and in response, the authorized entities have introduced a number of improvements that have increased reliability of the verification process.

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

Voluntary "certification" schemes for biofuel and bioliquid sustainability are not envisaged.



4.3 Support schemes for the promotion of the use of energy from renewable resources in electricity applied by the Member State or a group of Member States

Regulation

No renewable energy obligation with or without green certificates is imposed by the Greek legislation. Only national targets are set, transferring the corresponding targets set by the European Directives into the national legislation. The indicative target of 20.1% share of renewables in gross electricity consumption by 2010, set with the Directive 2001/77/EC for the *"Promotion of Electricity Produced from RES in the Internal Electricity Market"* (RES-E), was included in Article 27(9) of L3468/2006 and the percentage was also further extended to 29% by the year 2020. No specific targets per technology and no consequences of non-compliance were set. The new binding national target of 18% share of renewables in gross final energy consumption by 2020 set with the European Directive 28/2009 *"On the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC"* along with all the other provisions of the Directive are transposed with the recently enacted L3851/2010. More specifically with respect to the national target, in the first article of L3851/2010, the share of RES is amended upwards to 20% of gross final energy consumption by 2020 and the corresponding share of electricity is set at 40% in gross electrical energy consumption. The targets for RES shares in energy consumed for heating/cooling and in the transportation sector are set to at least 20% and 10% respectively by 2020. Furthermore, a ministerial decree to be issued in September 2010, will specify the targeted RES energy mix (installed capacity per technology) and the implementation schedule to ensure that progress towards the target adheres to the trajectory in the Directive and the Ministerial Decree. It is also foreseen that this decision is revised every two years or sooner in case significant reasons arise. Finally, the climate protection through the promotion of RES is given high priority in the environment and energy sector policy decisions.

General Framework

The development of RES in Greece first started to a significant degree in the 1990s with the development of solar thermal systems stimulated by a sizable tax deduction for final users. Law 2364/95 introduced a tax deduction of 75% of the total expenditure for the purchase and installation of domestic RES appliances and installations. This deduction was terminated in 2002 with L3091/2002. Law 2244/1994 on Electricity from Renewables has played a decisive role in starting the large-scale development of RES through private investments. The combination of feed-in tariffs and subsidies in the order of 40% of the investment cost (provided through either the development law or the Community Support Framework-CSF) created a large investor interest. Until 2006 most of the RES



development activity has been concentrated in wind energy and active solar thermal systems. In 2006, L3468/2006, regulating all RES and high efficiency CHP issues, introduced new feed in tariffs. The former uniform tariff scheme set by L2244/1994 was modified into technology specific tariffs, offering significantly increase for solar energy and introducing new moderately higher tariffs for offshore wind. Law 3734/2009 that entered into force in January 2009 modified again the feed in tariffs for PVs, taking into account the significant reduction of the relevant investment cost during the period 2006-2009 by introducing a gradual reduction of feed in tariffs for new PV stations beginning after mid 2010. Law 3851/2010 rationalizes further the existing feed-in tariff system and the relevant Power Purchase Agreement (PPA) contract duration and attempts to promote other RES investments such as geothermal plants, biomass and biogas plants for which no significant investment interest has been exhibited so far. It eliminates any pricing differentiation for energy produced in the mainland or in the non-interconnected islands and provides for further increase of the tariffs set, in case the producer does not receive any investment subsidy or tax exemption/reduction/refund.

Investment

The most important financial support instrument which provided substantial public subsidies to RES projects was the "National Development Law" (L3299/2004 as amended by L3522/2006). Law 3299/2004 is the framework investment law, covering all sectors of economic activity in the regions of the country. Regions with high unemployment rates and low income per capita received the highest investment subsidies from the State.

Investments in RES installations (both for electricity- and heat-production) were classified and were accorded favoured status under that Law such as investments in high technology, environmental protection, tourism, etc. The funding was in the form of a subsidy for the total investment cost and could range from 20% to 60% depending on the region and the size of the company.

The following categories in the energy sector were eligible for incentives under the Development Law:

- ↓ Power generation, in the form of hot water, steam.
- ↓ Production of solid fuels from biomass.
- ↓ Cogeneration of electricity and heat.
- ↓ Energy production from renewables, and especially wind and solar, hydroelectric, geothermal energy and biomass.
- ↓ Environmental protection and waste disposal projects.

In Law 3522/2006 there was also an article that referred to a 20% tax deduction for a series of equipment including off-grid RES systems, thermal solar heating & natural gas systems and thermal insulation retrofits, with a maximum absolute deduction of 700€, mainly targeting private individuals for the installation of such systems in the residential sector.

The Greek government had also included RES technologies in the relevant actions of the Greek Operational Programme for Competitiveness (OPC) of the Third Community



Support Framework (CSF III; 2000-2006) for Greece. The latest OPC for the 2007-2013 period also includes, direct and indirect, funds for assistance of RES installation.

Tradable certificates:

Not applicable.

Feed-in tariffs

Feed-in-tariffs for RES-E were introduced by L2244/1994 and were amended by laws L2773/1999, L3468/2006, L3734/2009 and most recently by Law L3851/2010.

Law L2244/1994 *"Regulation of power generation issues from renewable energy sources and conventional fuels and other provisions"*, modelled on the German *Stromeinspeisungsgesetz*, established for the interconnected system fixed sale rates for renewable energy at a level -in real terms- equal to 90% of the medium voltage general use tariff and made it obligatory for the Public Power Corporation to buy the energy produced from the RES unit. For the reimbursement of the capacity part, a scale pricing system was introduced according to the type of RES plant in terms of time availability in nominal capacity. Roughly speaking, the capacity part merely augments the energy earnings by a small percentage in the range of 6.5% so that the final rate corresponds to 0.07287 Euro/kWh. In the non-interconnected islands (autonomous grids) the pricing was based on 90% of the low-voltage household rate, corresponding to 0.08458 Euro/kWh with no capacity reimbursement.

Law L2773/1999, for the liberalization of the electricity market, maintained the favourable pricing regime for RES-E by also placing emphasis on priority access to the grids. At the same time, it introduced a fee of 2% on the renewable energy proceeds for the benefit of the relevant local government organizations. Furthermore, the renewable energy sale rates were deemed as "cap prices" and the Minister of Development was given the authority to ask for a discount. Tariffs were guaranteed for 12 years with the possibility of extension up to 20 years.

Law L3468/2006 *"Generation of electricity from renewable energy sources and through high-efficiency co-generation of electricity and heat and miscellaneous provisions"*, set in detail the pricing of electricity produced from RES, introducing technology specific tariffs, higher tariffs for small size PV units and off shore wind and higher tariffs for the energy produced by RES units operating in the non-interconnected islands. Remuneration of the electricity production was set in article 13 of L3468/2006 as follows:



Electricity production from:	(€/MWh)	
	Mainland	Non-interconnected islands
Wind energy	73	84.6
Off-shore wind energy	90	
Small Hydro electric plants < (15) MWe	73	84.6
Photovoltaics < (100) kWpeak, Photovoltaics > (100) kWpeak	450 400	500 450
Solar energy from units other than photovoltaic < (5) MWe	250	270
Solar energy from units other than photovoltaic > (5) MWe	230	250
Geothermal energy, biomass, landfill gases sewage treatment plants and biogases	73	84.6
Other RES	73	84.6
High efficiency cogeneration of heat and electricity	73	84.6

Billing of the electricity produced takes place every month with the exception of the energy produced by RES power stations connected to the Low Voltage grid where billing takes place every 4 months. For "auto-producers", tariffs presented in the table are valid for a maximum power capacity of 35MW regarding the surplus electricity fed into the grid with an upper limit of 20% of the total energy produced by the plant on an annual basis. The above prices are re-adjusted every year by decision of the Minister of Development (now MEECC), issued following an opinion of RAE. The basis for this readjustment is the weighted average change of the approved tariff for the electrical energy produced by PPC. By weighted average change, the average of the individual approved changes for each tariff category according to the respective electrical energy consumed during the previous year is meant. When the market is fully liberalized, all the tariffs are to be re-adjusted, by decision of the Minister of Development (now MEECC), at 80% of the index of consumer prices as determined by the Bank of Greece.

Finally, the System or Grid Operator (mainland and non-interconnected islands) is obliged to absorb the energy produced as per Power Purchase Agreement (PPA) signed with the producer. This contract is valid for 10 years and may be extended for another 10 years after a written declaration of the electricity producer.

With Ministerial Decrees issued after an opinion by RAE the feed-in tariffs set by L3468/2006 were re-adjusted for the years 2007 and 2008, reaching in 2009 the following values:



Feed in tariffs valid for 2009		
Electricity production from:	(€/MWh)	
	Mainland	Non-interconnected islands
Wind energy	87.84	99.44
Off-shore wind energy	104.84	
Small Hydro electric plants < (15) MWe	87.84	99.44
Photovoltaics < (100) kWpeak,	454.73	505.25
Photovoltaics > (100) kWpeak	404.20	454.73
Solar energy from units other than photovoltaic < (5) MWe	264.84	284.84
Solar energy from units other than photovoltaic > (5) MWe	244.84	264.84
Geothermal energy, biomass, landfill gases sewage treatment plants and biogases	87.84	99.44
Other RES	87.84	99.44
High efficiency cogeneration of heat and electricity	87.84	99.44

With L3734/2009, "Promotion of co-generation of two or more energy sources, regulation of issues related to Mesochora hydroelectric plant and other provisions", Article 27A, the tariff of the electricity produced from photovoltaic plants is modified, taking into account the significant reduction of the relevant investment cost during the period 2006-2009, according to the time schedule of the following table.



Year	Month	Mainland		Non-interconnected islands	
		A	B	C	D
		> 100kW	<= 100kW	> 100kW	<= 100kW
2009	February	400,00	450,00	450,00	500,00
2009	August	400,00	450,00	450,00	500,00
2010	February	400,00	450,00	450,00	500,00
2010	August	392,04	441,05	441,05	490,05
2011	February	372,83	419,43	419,43	466,03
2011	August	351,01	394,88	394,88	438,76
2012	February	333,81	375,53	375,53	417,26
2012	August	314,27	353,56	353,56	392,84
2013	February	298,87	336,23	336,23	373,59
2013	August	281,38	316,55	316,55	351,72
2014	February	268,94	302,56	302,56	336,18
2014	August	260,97	293,59	293,59	326,22
For each n year as of year 2015		1.3 $ASMC_{n-1}$	1.4 $ASMC_{n-1}$	1.4 $ASMC_{n-1}$	1.5 $ASMC_{n-1}$
<i>ASMV_{n-1}: Average System Marginal Cost during the previous year (n-1)</i>					

The tariffs of the table above may be amended by decision of the Minister of Development issued following an opinion by RAE. Such amendment should mainly take into consideration the entry of PV stations in the country's energy balance, the rate of achievement of the national goals for introduction of RES and the effects on the consumers.

By L3734/2009, the Power Purchase Agreement (PPA) especially for PVs has a twenty-year term of effect and is executed based on the reference value set out in the table above. This value applies to the month and the year that PPA is signed with the competent Operator, provided that the PV station is pre-commissioned or activated - where no pre-commissioning is required - within eighteen (18) months (for stations with a maximum



capacity up to 10 MW) or thirty-six (36) months (for stations with a capacity of 10MW or higher). Otherwise, the reference value shall be the one applicable to the month and the year in which such pre-commissioning or activation takes place, according to the station's capacity at that time.

It is also foreseen that the values set out in the table are readjusted annually by an amount equal to 25% of the consumer price index of the previous year, as determined by the Bank of Greece. If the value set out in this table, readjusted as above, is lower than the Marginal System Cost, as formed in the previous year, increased by 30%, 40%, 40% and 50% respectively for cases A, B, C and D of the table above, then the tariff is set at the Marginal System Cost of the previous year, increased by the respective rates.

With another Ministerial Decree issued in 2009 (OG 1079 B/4.6.2009) after an opinion by RAE, a new feed-in tariff designated especially for roof-top PVs was introduced. The new FIT scheme for small-scale solar PV (less than 10 kW installed capacity) offers a payment of €550/MWh (re-adjusted every year by 25% of the consumer prices index) for all the contracts signed in the years 2009, 2010 and 2011 and a 5% reduction each year starting from 2012. The payment is made after settlement of the amount corresponding to the energy produced from the PV and the corresponding amount due for the electrical energy consumed by the owner of the building. The tariff is granted for 25 years. Only residential households and small businesses are eligible under this specific PV feed-in tariff scheme.

Feed in premiums

Not applicable.

Tendering

For the first time in Greece, a tendering procedure is foreseen for the construction and operation of offshore wind farms (Article 6 of the new L3851/2010). The state will assess the environmental impacts from the construction and operation of offshore wind farms and will determine areas where the construction of offshore wind farms of specific installed capacity is environmentally acceptable. It will then issue approvals of environmental terms for wind farms in selected areas. An open public tender will follow for the exploitation rights of these wind parks sites.

Reform or future schemes

Despite the schemes already in operation at the beginning of 2010 and in view of the 20-20-20 targets, development of RES-E in Greece will need further assistance and this because currently the installed capacity of RES except large hydro is only 1180MW of wind and about 70MW PV generating about 4% of electricity (on top of 9% by large hydro). This brings the total share of RES-E in gross electrical production to 13%. Taking into account:



- (a) the national target set for 2020 with respect to the currently accomplished share of RES in the electrical energy consumption
- (b) the economics (feed-in tariffs, investment and operation/maintenance costs, energy produced/revenues and pay back periods and last but not least consumer impact) for the different RES technology investments
- (c) the fact that the most significant barrier to a large development of wind and small hydro power plants is the long lead time needed for the completion of the licensing procedure for both the RES stations and the necessary grid infrastructure and not the inadequate financial support
- (d) no investments have so far been made for geothermal plants and the installed capacity of biogas units is limited to 41MW
- (e) the existing calculations regarding the solar/wind/biomass/geothermal potential of Greece and
- (f) the fact that subsidies are limited and very uncertain in the near future,

A reform of the existing support scheme for RES should aim at promoting the technologies for which abundant resource is available and yet limited or no investments have been made, or the technologies such as small PV or WTs, which could result in the development of local construction units, offering valuable employment opportunities. It should also provide a stable, fair and financially appropriate tariff that does not overburden consumers but still provides for bank ability of projects. Finally, a reform of the existing support scheme should provide strong incentives to investors who undertake the connection of non-interconnected islands to the System via submarine cables, thus exploiting the large wind potential of the islands, while offering better power quality to the consumers in the islands, protecting the environment by shutting down the polluting conventional power stations, mostly HFO operating in the autonomous island grids, and benefiting the national economy with the savings from these shutdowns.

These reforms are attempted by L3851/2010 "*Accelerating the development of Renewable Energy Sources to deal with climate change and other regulations in topics under the authority of MEECC*" which went into effect on 4 June 2010. The feed-in tariffs set by L3851/2010 currently applicable as of 4 June 2010 are given in the table below:



Feed in tariffs set by L3851/2010, valid as from June 2010		
Electricity production from:	(€/MWh)	
	Mainland	Non-interconnected islands
(a) Wind energy >50kW	87.85	99.45
(b) Wind energy <50kW	250	
(c) Small Hydro electric plants < (15) MWe	87.85	
(d) PVs in households or small enterprises < (10) kWp	550	
(e) Solar thermal energy	264.85	
(f) Solar thermal with storage system (at least 2h at nominal load)	284.85	
(g) Geothermal energy of low temperature	150	
(h) Geothermal energy of high temperature	99.45	
(i) Biomass ≤1MW (excluding biodegradable sewages)	200	
(ia) Biomass >1 and ≤5MW (excluding biodegradable sewages)	175	
(ib) Biomass >5MW (excluding biodegradable sewages)	150	
(ic) Landfill gases sewage treatment plants and biogases (including biodegradable sewages) ≤2 MW	120	
(id) Landfill gases sewage treatment plants and biogases (including biodegradable sewages) >2 MW	99.45	
(ie) Gas from biomass ≤3MW	220	
(if) Gas from biomass >3MW	200	
(j) Other RES	87.85	99.45

PPAs are valid for 20 years (instead of 10+10 years till now) for all RES units with the exception of solar thermal units for which a 25-year duration is foreseen. The PPA duration may be extended after a bilateral agreement (Operator-Producer) provided that the relevant generation license is still valid. The tariffs from case (a) to case (h) and case (j) of the table are increased by 20% if no state subsidy is made available to the producer. For biomass/biogas feed in tariffs, the corresponding increase is set at 15%.



Further provisions of Law L3851/2010 are:

(a) An increase set by Ministerial Decree of the feed in tariff with which wind energy producers will be remunerated in case the operating units are installed in areas of lower wind potential.

(b) In case the system operator decides to curtail RES production, the producers are compensated for up to 30% of the curtailment. The percentage increases each year and may reach up to the maximum of 2200 equivalent hours of operation without curtailment.

(c) For electricity produced from wind parks operating in the islands and connected to the mainland System by the developer, the tariff set for wind parks in non-interconnected islands applies throughout the entire duration of the PPA, increased by a percentage ranging from 10 to 25% depending proportionally on the distance of the connection line and reversely on the total installed capacity of the unit.

Especially for PVs not integrated in buildings the feed in tariffs are now set as follows:

Year	Month	Mainland		Non-interconnected islands
		A	B	C
		> 100kW	<= 100kW	
2009	February	400,00	450,00	450,00
2009	August	400,00	450,00	450,00
2010	February	400,00	450,00	450,00
2010	August	392,04	441,05	441,05
2011	February	372,83	419,43	419,43
2011	August	351,01	394,88	394,89
2012	February	333,81	375,53	375,54
2012	August	314,27	353,56	353,55
2013	February	298,87	336,23	336,23
2013	August	281,38	316,55	316,55
2014	February	268,94	302,56	302,56
2014	August	260,97	293,59	293,59
For each n year as of year 2015		1.3 ASMC _{n-1}	1.4 ASMC _{n-1}	1.4 ASMC _{n-1}
<i>ASMV_{n-1}: Average System Marginal Cost during the previous year (n-1)</i>				

These values are readjusted annually by 25% of the consumer price index of the previous year, as determined by the Bank of Greece. If the value set out in the previous table, readjusted as above, is lower than the Marginal System Cost, as formed in the previous year, increased by 30%, 40% and 40% respectively for cases A, B and C of the table, then the tariff is set at the Marginal System Cost of the previous year, increased by the respective rates.



4.4 Support schemes for the promotion of the use of energy from renewable resources in heating and cooling applied by the Member State or a group of Member States

The use of RES systems in heating and cooling is only supported by tax rebates or capital investment subsidies. Until recently, there was no regulatory support scheme (referring to targets or obligations) for the use of such systems.

However, the legislative framework has been modified in the past years and now after the implementation of L3175/2003 for electricity production from high enthalpy geothermal energy, L3734/2009 for the co-generation of heat and electricity and L3851/2010, Article 10, for the use of RES in buildings, a specific legal framework is in place for the installation and use of RES/CHP systems for heating and cooling applications.

Investment subsidies

The use of RES in the heating and cooling sectors has been supported by investment subsidies granted in the framework of the following programmes and National Investment laws:

- Support for private investments through the Development and Investment Law L2601/1998.
- Operational Programme for Energy – OPE (2nd Framework Programme (1994- - 2000)
- Operational Programme for Competitiveness – OPC (3rd Framework Programme (2000 – 2006), “Promotion of RES systems, co-generation – energy conservation” which was included in the theme “Security of energy supply and promotion of the liberalization of the energy market”.
- Development and Investment Law L3299/2004 “Incentives for private investments for economic development and regional convergence” which replaced law L2601/1998 as supplemented by law L3522/06.

The OPE and OPC programmes provided economic incentives for individual private energy investments in co-generation systems, RES and energy saving installations.

These programs provided economic incentives either in the form of grants covering part of the initial cost of the investment plan, or in the form of a subsidy in support of financial leasing, tax rebate, or cost of the employment created by the investment plan. Although these laws covered mainly RES electricity generation projects, they also provided for RES heat generation projects as for example:

- Co-generation systems for electricity and heating/cooling production including district heating/cooling.
- Exploitation of geothermal energy for: a) co-generation of electricity and heating/cooling, b) district heating and/or district cooling and c) generation of heating/cooling at an individual plant and distribution to the surrounding area.
- Heating & cooling systems utilizing heat from geological formations and water, surface or ground, which are not considered geothermal fields.



- Central solar thermal systems for heat production.
- Use of biomass for generation of heating/cooling at an individual central plant and distribution to the surrounding area or for district heating and/or district cooling.
- Use of biomass for the co-generation of electricity and heat (exclusively with the use of biomass)

The entity responsible for the implementation and supervision of the investment law was the Ministry of the Economy and Finance and specifically the General Secretariat for Investments and Development, which also supervised the OPE and the OPC. The body responsible for implementation was the Ministry of Development (Special OPC Management Office). The supervision of the private investments and the management of the funds, which were allocated by the OPE and the OPC, were delegated to intermediate management bodies (IMBOPE) and (IMBOPC) correspondingly.

In order to ensure the long-term security and reliability of the subsidized investments, the minimum term of operation of subsidized facilities was set at five years.

The funds allocated by the programmes and the development law were distributed based on criteria that included:

- National energy planning,
- The total available capital for investments and the needs of the energy market

During the adjustment of the support programmes, improvements were made through:

- Additional criteria for approving an investment (i.e. viability of the investment, energy production license, etc.)
- Optimization of the system for monitoring and control
- Broadening the types of eligible energy investments

The percentage/amount of the financial support depended on the type of technology, the geographical location of the investment and the size of the enterprise that applied (in the case of the development-investment law).

Moreover, the financial support, which was provided to each investment plan, depended on the fulfilment of certain specific criteria related to the energy output of the systems so that only the most efficient systems would be subsidized. These criteria included:

- A minimum total yearly power output to be met by the CHP installation, calculated in relation to the useful heat.
- For investments in thermal solar systems, a minimum coefficient of performance for the collector to be met, measured by certified laboratories, according to the harmonized standards (ISO 9806-1, EN 12975-2) currently in effect.
- For heat production by thermal solar collectors which is used for heating of domestic hot water, space heating/cooling, or other thermal processes, high efficiency collectors must be used (i.e. parabolic, flat, vacuum, etc.).
- Absence of fiscal support from other national support measures

These schemes expired in January 2010. A new Development and Investment Law is currently being drafted and is expected to be put up for consultation by September 2010.



Although the specific aspects of this draft law are still debated internally, the subsidization of heating/cooling projects utilizing RES will be most likely included.

Feed-In Tariff Scheme

In the financial support system for electricity generation from RES, there is a special category for a feed-in tariff scheme for electricity derived from CHP plants. There is neither a special price for kWh_{th} derived from RES-CHP installations, nor any other subsidy for thermal energy produced by RES.

Tax Deductions

For the production of heating/cooling from RES, **L2364/1995** passed in 1995 provided for a 75% deduction from taxable income of the acquisition cost of RES systems and was in force until 2002. This tax deduction was used mainly for the purchase of solar thermal systems (for the production of domestic hot water).

In December of 2006, **L3522/2006** was passed and is still in effect. By this law the tax deduction scheme that existed with L2364/1995 is reactivated but with lower financial benefits namely, small domestic RES systems are eligible for a 20% tax deduction capped at € 700 per system.

In particular, this tax deduction applies to the following systems:

- a) the purchase of solar thermal collectors and the cost for the purchase and installation of central heating & cooling systems utilizing solar energy.
- b) the purchase of both RES systems (photovoltaics, small wind turbines) for covering residential electricity loads and co-generation systems (using natural gas or RES) for the electrical and cooling-heating needs.
- c) the cost for the replacement of an oil burning boiler with a district heating installation or for a new district heating installation.

The law provides the same tax deduction for other types of applications such as:

- ↳ changing from an oil-fired central heating & cooling system to a natural gas one or for the purchase of a new natural gas installation and
- ↳ for thermal insulation works in existing buildings.

As with L2364/1995, these tax deduction benefits have been primarily used by the end consumers for the purchase of solar thermal systems for domestic hot water.



4.5 Support schemes for the promotion of the use of energy from renewable resources in transport applied by the Member State or a group of Member States

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

The concrete targets per year and fuel/technology are presented in detail in Table 12.

Obligations per fuel: Existing legal framework

In 2005, Law L3054/2002 "Organisation of the oil market and other provisions" was amended to include biofuels in the existing legal framework for oil products by law L3423/2005 "Introduction of biofuels and other renewable fuels in the Greek market" (O.G. A' 304/13.12.2005), which transposed Directive 2003/30/EC in the Greek legal system and provided for the introduction of biofuels into the oil market. One of the provisions of L3423/2005 is the full introduction of biofuels and other renewable fuels in the Greek market at the prescribed level by the end of 2010 (Article 8(1)).

Since December 2005 pure biodiesel is blended (according to EN 590:2004) by the 4 Greek oil refineries in diesel used in transport up to 5% by volume. In early 2010, by decision 460/2009 (O.G. B' 67/28.01.2010) of the State Chemical Council (SCC) the EN 590:2009 standard was adopted formally and the maximum biodiesel percentage was increased to 7%. Currently, new legislation is being prepared for the increase of the maximum biodiesel percentage to 10%, according to Directive 2009/30/EC.

According to the provisions of Law L3054/2002, as amended by Law L3769/2009 (O.G. 105A/01.07.2009) biofuel quantities are allocated every year, after a relevant call for tenders and an evaluation and allocation procedure, to stakeholders, producers or importers, who are interested in participating in this quota system. Through the evaluation procedure which is based on specific criteria and a specified formula for quota allocation, raw materials of Greek origin like energy crops, agro-industrial residues (cottonseed) and wastes (animal fats and used vegetable oils) are approved for biofuel production. According to the Joint Ministerial Decree D1/A/15555/04.08.2010 (O.G. B' 1174/2010) of the Ministry of Finance, the Ministry of Environment, Energy and Climate Change and the Ministry of Rural Development of Food, a quantity of 164,000 kiloliters of pure biodiesel was set for blending for the period of July 2010 to June 2011. The data submitted for evaluation for the 2010 call for tenders showed that more than half of the pure biodiesel produced in domestic biodiesel plants (53.8%) came from domestic energy crops, mainly sunflower and rapeseed, as well as cottonseed and used vegetable oils and animal fats of Greek origin.

In addition, Article 15A(12) of L3054/2002, as modified by L3769/2009 calls for the issuance of a JMD of the Ministry of Finance, the Ministry of Economy, Competitiveness and Shipping, the Ministry of Environment, Energy and Climate Change, the Ministry for Infrastructure, Transport and Networks and the Ministry of Rural Development and Food to further improve the framework for the use of biofuels. By this JMD, after it is issued, the



minimum quota of biodiesel may for specific occasions be extended on condition that the blend meets the standards set by SCC.

In order to further promote the distribution of higher blends (biodiesel in diesel as well as bioethanol in gasoline), according to Article 15A (1) of L3054/2002, as modified by L3769/2009, the distribution of blends higher than the blends set by the SCC is allowed, under the condition that the rest of the blends' characteristics fulfil the standards for the biofuels or other renewable fuels and the fossil fuel are set by the SCC. The distribution of the higher blends of biofuels is allowed on condition that a special labelling is put in place at the fuel stations to inform customers of the fact. The necessary permit to do so is issued by a JMD of the Ministry of Economy, Competitiveness and Shipping and MEECC.

In this respect it should be noted that the EN15376 standard for "Transport fuels – ethanol of biological origin (bioethanol) as blending component in gasoline – Requirements and Testing methodology" has been recently transposed into the Greek legislation.

Regarding bioethanol introduction in the Greek fuel market, the relevant legal framework (for Standards and Law see above) is already in place since mid-2009. Nevertheless, bioethanol introduction will be slow and progressive over time. It is anticipated that the utilization of bioethanol will be initial through transformation to oxygenated additives (ETBE, TAE) to be mixed with gasoline.

As the prospect of adequate local production of raw material for bioethanol is low, bioethanol will most likely be imported until such time, probably after 2015 when 2nd generation production technology becomes attractive to local investors.

A current estimated timetable for bioethanol introduction is as follows:

2011 – 2012: Test runs in refineries and resolution of some of technological limitations of the fuel distribution system.

2013 – 2015: Slow and progressive introduction of bioethanol mainly as additives.

2016 – 2020: Direct use of bioethanol share in the fuel mix coupled with possible local production

It should be noted that the existing biodiesel production capacity is capable of meeting fully the 10% biofuel obligation, albeit with increased amounts of imported raw material. This fallback option has not been ruled out as yet.

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

Differentiation of the support according to fuel types

As mentioned in Section 4.5a, there is no differentiation in the support of different fuel types, as biodiesel is the only biofuel for transport currently distributed in the Greek market.

For the annual quota granted to every eligible product, the following formula (also utilized for the 2009 quota specification) is used, which includes criteria with specific weighting factors for each type of raw material (vegetable oils, used/fired oils and animal fats):



$$K_i = \{ [0,35 * EL1_i / (Total EL1_i)] + [0,05 * L2_i / (Total EL2_i)] + [0,075 * EL3_i / (Total EL3_i)] + [0,20 * A_i / (Total A_i)] + [0,05 * I_i / (Total I_i)] + [0,05 * E_i / (Total E_i)] + [0,15 * P_i / (Total P_i)] + [0,075 * PK_i / (Total PK_i)] \} * \text{annual compulsory biodiesel quantities}$$

where

i = the company under consideration

K_i = compulsory pure biodiesel quantities, in Kiloliters for company i

$EL1_i$ = Kiloliters of pure biodiesel produced from domestically grown energy crops through contractual agreements with farmers, assuming a production of 1.0 kiloliters of biodiesel per hectare of energy crop

$EL2_i$ = Kiloliters of pure biodiesel produced from domestic cottonseed through submitted invoices or/and accounts assuming a production of 0,14 kiloliters of biodiesel per ton, or/and from domestically produced cottonseed oil through submitted invoices assuming a production of 0,95 kiloliters of biodiesel per metric ton.

$EL3_i$ = Kiloliters of pure biodiesel produced from used vegetable oils, fried oils and animal fats of domestic origin that are considered appropriate for biodiesel production, through the submission invoices or/and accounts, assuming a production of 0,95 kiloliters of biodiesel per metric ton of raw material.

A_i = total requested quantity of pure biodiesel, in kiloliters, which cannot exceed the annual capacity of the plant.

I_i = index, based on the submitted justifications, equal to 1 if there is an ISO 9000 certificate or a contract for getting it, or 0 if there is not.

E_i = index, based on the submitted justifications, equal to 1 if research activities are included, 0 if there are not.

P_i = total delivery of pure biodiesel, in kiloliters, for the quota system of 2007 and 2008.

PK_i = index, based on the consistency of deliveries in the oil refineries in 2008, equal to 1 for declination of up to 2% on the total biodiesel quantities of the year, or 0.5 for declination of the total deliveries ranging from 2% to 5% of the total biodiesel quantities of the year, or 0 for declination higher than 5%.

Specific support to biofuels, which meet the criteria of Article 21(2) of Directive 2009/28/EC, will be introduced in the new legislative framework implementing the above-mentioned Directive.

Differentiation according to automotive technology

The differentiation of the support according to automotive technologies refers to three main items: annual circulation taxes, registration taxes and circulation license in Athens inner ring.



Annual circulation taxes: According to Law 3888/2010 (O.G. A' 175/2010), the allocation of annual circulation taxes on passenger cars is calculated as follows:

- a. passenger cars registered until 31.10.2010, as well as two- and three-wheel motorcycles irrespective of their registration date, according to their cylinder capacity:

Category	Cylinder capacity (cc)	Annual circulation taxes (Euro)
A	up to 300	20
B	301 - 785	50
C	786 - 1,071	110
D	1,072 - 1,357	120
E	1,358 - 1,548	220
F	1,549 - 1,738	240
G	1,739 - 1,928	270
H	1,929 - 2,357	600
I	2,358 - 3,000	800
J	3,001 - 4,000	1,000
K	4,001 and over	1,200

Additionally, for privately owned, hybrid, electric and hydrogen passenger cars with a cylinder capacity lower than 1,929 cc, which are registered until 31.10.2010, exemption from annual circulation taxes is granted. For vehicles of the same category (hybrid, electric and hydrogen), but with cylinder capacity higher than 1,929 cc, that are registered until 31.10.2010, the annual circulation taxes are half the taxes applied to the relevant class, as shown in the table above.

- b. passenger cars registered from 01.11.2010 and after, irrespective of their technology, according to their CO₂ emissions:

Category of CO ₂ emissions (gr CO ₂ per Km)	Annual circulation taxes per gr of CO ₂ emissions (Euro)
0 - 100	0
101 - 120	0.80
121 - 140	1.00
141 - 160	1.50
161 - 180	2.00
181 - 200	2.25
201 - 250	2.50
251 and over	3.00



- c. taxis registered from 01.11.2010 and after, irrespective of their technology, according to their CO₂ emissions:

Category of CO₂ emissions (gr CO₂ per Km)	Annual circulation taxes per gr of CO₂ emissions (Euro)
0 - 100	0
101 - 150	2.00
151 and over	2.50

Moreover, for hybrid taxis, that are registered until 31.10.2010, exemption from annual circulation taxes is granted, while for taxis, that are registered until 31.10.2010, the annual circulation tax is 260 Euro.

Circulation license in the city of Athens inner ring

According to Article 52 of L2649/1999 the circulation of vehicles in the centre of Athens can be limited only through a relevant JMD. According to the JMD O.G. B' 1720/19.08.2009 all hybrid vehicles are excluded from the traffic restrictions in the city of Athens.



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

4.6.1 Biomass supply: both domestic and trade

Table 7: Biomass supply in 2006

Sector of origin		Amount of domestic resource ²⁶	Imported		Exported	Net amount	Primary energy production (ktoe)
			EU	Non-EU	EU/non-EU		
A) Biomass from forestry²⁷:	<i>Of which:</i>	3,225,559	0	0	0	3,225,559	729
	(1) direct supply of wood biomass from forests and other wooded land for energy generation	2,908,571				2,908,571	702
	<i>Optional — if information is available you can further detail the amount of feedstock belonging to this category:</i>						
	(a) fellings	a)+d) 2,908,571				a) + d) 2,908,571	a)+d) 702
	(b) residues from fellings (tops, branches, bark, stumps)						
(c) landscape management residues (woody biomass from parks, gardens, tree rows, bushes)							
(d) other (please define)							
(2) indirect supply of wood biomass for energy generation	316,988				316,988	27	
<i>Optional — if information is available you can further detail:</i>							
(a) residues from sawmilling, woodworking, furniture industry (bark, sawdust)	a) 316,988				a) 316,988	a) 27	
(b) by products of the pulp and paper industry (black liquor, tall oil)							
(c) processed wood-fuel							
(d) post consumer recycled wood (recycled wood for energy generation, household waste wood)							
(e) other (please define)							
B) Biomass from agriculture and fisheries:	<i>Of which:</i>	508,886				508,886	202
	(1) agricultural crops and fishery products directly provided for energy generation						

²⁶Amount of the resource in m³ for category A and its subcategories: and in tonnes for categories B and C and their subcategories.

²⁷Biomass from forestry should also include biomass from the forest-based industries. Under the category of biomass from forestry processed solid fuels, like chips, pellets and briquettes should be included in the corresponding subcategories of origin.



Sector of origin	Amount of domestic resource ²⁶	Imported		Exported	Net amount	Primary energy production (ktoe)
		EU	Non-EU	EU/non-EU		
<i>Optional — if information is available you can further detail:</i> (a) arable crops (cereals, oilseeds, sugar beet, silage maize) (b) plantations (c) short rotation trees (d) other energy crops (grasses) (e) algae (f) other (please define)						
(2) agricultural by-products/residues and fishery by-products for energy generation	508,886				508,886	202
<i>Optional — if information is available you can further detail:</i> (a) straw (b) manure (c) animal fat (d) meat and bone meal (e) cake by-products (incl. oil seed and olive oil cake for energy) (f) fruit biomass (including shell, kernel) (g) fishery by product (h) clippings from vines, olives, fruit trees (i) other (please define): residues from rice mills and cotton ginning factories	f) 472,190 i) 36,696				f) 472,190 i) 36,696	f) 189 i) 13
C) Biomass from waste:	<i>Of which:</i>	79,038,904			79,038,904	33
(1) Biodegradable fraction of municipal solid waste including biowaste (biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises, and comparable waste from food processing plants) and landfill gas	5,800,000 tonnes of municipal waste resulting in 55,476,426 m ³ of biogas utilized				5,800,000 tonnes of municipal waste resulting in 55,476,426 m ³ of biogas utilized	23.3
(2) Biodegradable fraction of industrial waste (including paper, cardboard, pallets)						
(3) Sewage sludge	23,562,478				23,562,478	9.6

In order to form a representative picture of the biomass market in Greece and with regards to the new EU directives, the development of a suitable system for the collection, recording and processing of the data is currently in process to assist the Ministry in meeting the following needs:

- policymaking at different levels (national, local, etc.),
- siting of new installations (granting licenses, location of new plants, etc.).
- informing and providing access to the public to the available statistics.



Table 7a
Estimated domestic supply in 2015 and 2020

Sector of origin		2015		2020	
		Expected amount of domestic resource	Primary energy production ²⁸ (ktoe)	Expected amount of domestic resource	Primary energy production ²⁸ (ktoe)
	(1) direct supply of wood biomass from forests and other wooded land for energy generation	800,000	136	800,000	136
	(2) indirect supply of wood biomass for energy generation	133,333	28	133,333	28
B) Biomass from agriculture and fisheries:	(1) agricultural crops and fishery products directly provided for energy generation	75,000	68	176,000	159
	(2) agricultural by-products/processed residues and fishery by-products for energy generation	10,000,000	1,200	23,000,000	1,500
C) Biomass from waste:	<i>Of which:</i> (1) Biodegradable fraction of municipal solid waste including biowaste (biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises, and comparable waste from food processing plants) and landfill gas	60,000,000	25	60,000,000	25
	(2) Biodegradable fraction of industrial waste (including paper, cardboard, pallets)	0	0	0	0
	(3) Sewage sludge	26,000,000	10.5	26,000,000	10.5

The estimated domestic supply of biomass from agriculture (Table 7a, row B1) for 2015 and 2020 mainly refers to oil crops – sunflower and rapeseed. To cover the biofuels target, which is set at 5.75% of the total consumption of fossil fuels for transport, around 148,000 tons of biodiesel have to be produced by 2010 according to the MEECC. These quantities require around 16,000 hectares, assuming that 9,2 tons of biodiesel are produced per hectare on average. It is obvious that in order to cover the energy targets for biofuels for transport - for 2015 and 2020 – a substantial reform of agricultural practices and possibly some imports will be needed.

In contrast to the above figures, there is no land dedicated to short rotation forestry or to perennial grasses so far, as depicted in Table 8. However, it is expected that such scenarios will be included in the Programme of Rural Development of Greece 2007-2013 (PRDG) that is issued by the Ministry of Rural Development and Food and is revised annually.

²⁸ The data in column 'Primary energy production' refer to the final energy contained in the biofuels produced.



Estimated role of imported biomass up to 2020

The imported biomass up to 2020 refers mainly to that for the production of biofuels for transport.

In the case of biodiesel, it is expected that imports will comprise either seeds of oil crops (rape-seed, sunflower-seed, soybean) or seed oils (rape-seed oil, sunflower-seed oil, soybean oil, palm oil), in quantities sufficient to cover the biodiesel share in our national target. The existing biodiesel production units produce over 750,000 tons of biodiesel, which is more than five times the quantities required to meet our national target of 5,7% for 2010. Imported materials comprise about 50% of the raw materials used so far by these units and domestically produced oils (sunflower-seed oil, rape-seed oil, cotton-seed oil, used cooking and frying oils) the remaining 50%. There is an ongoing attempt to increase the production of domestically grown energy crops, as well as the quantities of used cooking and frying oils utilized. Both efforts are progressing well.

Furthermore, small amounts (less than 5% of the national total) of biodiesel have been imported occasionally from units located in other EU Member States by participants in the annual quota allocation. This is not expected to increase as the additional cost of transport ups their price and make them uncompetitive.

With regard to bioethanol, it is more likely that some amounts will be imported, the exact figures though are difficult to ascertain at this time (See also 4.5 (a))

Imports of small quantities of solid biomass are mainly processed wood in the form of chips or pellets for domestic heating purposes.

Table 8: Current agricultural land use for dedicated energy production in year 2006

Agricultural land use for dedicated energy production	Surface in ha
1. Land used for short rotation trees (willows, poplars)	0
2. Land used for energy other energy crops such as grasses (red canary grass, switch grass, Miscanthus), sorghum	0



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

Mobilisation of new biomass sources:

Mobilisation of new biomass sources will be accomplished through a progressive shift from agricultural crops to energy crops rather than utilising degraded lands.

In the frame of the reformed Common Agricultural Policy (CAP), sizeable areas where tobacco, cotton and sugar beets are now cultivated will be released from agriculture. If these lands stay uncultivated for a long time they risk degrading. The introduction of new crops (such as energy crops) with an easy access to the markets is thus highly required and necessary to prevent these areas from degradation, offering at the same time an alternative solution to enhancing agricultural activities and promoting regional development. At present, tobacco is grown on 12,000 ha, cotton on 370,000 ha and sugar beets on 36,000 ha.

In addition, energy crops could be grown partly substituting wheat (that is grown on 900,000 ha) and there are approximately 60,000 ha of set aside land that could be also used for growing energy crops.

(a) *Please specify how much land is degraded.*

The agricultural land of Greece actually used amounts to 3,967,770 ha (2003), which constitutes 30.1% of the total land area, whereas the respective figure for EU-27 is 42%. However, 82.7% of the agricultural land is Low Fertility Areas (LFAs). The mountainous areas of Greece cover a significant part of the mainland as well as of the islands and agriculture there is one of key contributors to the regional economic development. The agricultural land in the mountainous areas that is areas with shallow and rocky soils and high inclinations amounts to 56.4% of the total agricultural land. In a large proportion of this land, precipitation is also low, i.e. below 400mm annually.

Trends in agriculture will be monitored through the data on agricultural land use and crop production that are collected by the Services of the Ministry of Rural Development and Food and compiled in the annual national statistics.

The annual contracts between farmers and biodiesel producers already collected will provide the necessary information on the lands devoted to energy crops and their biomass (seeds or oils) production.

Statistics on imports and exports of commodities for the food market (i.e seeds, seed oils, etc) are also annually compiled by the National Statistics Services. These will be juxtaposed with data on the biofuels/bioenergy plant capacities, actual production, imports and exports of their raw materials (seeds, oils, biodiesel) that are compiled annually by the services of the Ministry of Environment, Energy and Climate Change, in order to monitor and assess the impact of increased demand for seed oils for biodiesel production on the local seed oils food market.



The impact of the energy use of solid biomass deriving from forests on the forest-based industries, (e.g. saw-mills, particle and fibre board industries) is not anticipated to be high because Greek forests are under-exploited as the normal practice is to use the residues of the forest-based industries for generation of heat and electricity. Tops, branches, stumps are usually left on the forest ground. As data exist for the fellings (annually recorded by the Forest Services in National inventories), for residues from the forest-based industries, for imports/exports of these materials and for the residues from the food industries (regularly reported in National surveys) estimates of relative shifts and possible impacts can be computed and noted. The quality control of all these data will be improved as they are the basis for formulating further administrative measures or improving existing ones and have budgetary implications.

Finally, the impact of the energy use of agricultural residues and other pruning (e.g. olive trees, vineyards) pose no direct impact on other sectors as they are only marginally used by the local communities for energy purposes (space heating).

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

There are currently no official data for amount of the unused arable land.

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

In Axis 2 (Protection of Environment and Sustainable Management of Natural Resources) of the PRDG 2007-2013, there are two measures, 2.1.1 and 2.1.2, regarding financial support for the farmers of "mountainous" and "other disadvantageous areas".

The mountainous areas are characterized by high elevations and high inclinations, characteristics that either alone or in combination limit the choices of farmers for crops and species that can be adapted to such conditions and increase the production costs. As a consequence, large areas are abandoned or about to be abandoned causing negative effects in land conservation, environmental protection and fire prevention. The rest of the disadvantaged areas are low fertility areas with low yields – 20% lower than the national average – and pasture lands.

Consequently, the maintenance of the agricultural activities in these areas is of utmost importance and for this reason financial support of farmers is provided for a number of agricultural activities, including growing aromatic and pharmaceutical crops, leguminous, cereals and other non-food crops. Energy crops being non-food crops are –indirectly– included in the measures. The financial support for non-food crops ranges from 100€/ha to 140€/ha depending on the farmers (younger than 30, others) and on the location of the mountainous areas, and from 100€/ha to 125€/ha for the rest of the disadvantageous areas.

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

The energy use of the available raw materials (like animal manure, agricultural/forest residues) directly depends on the market demand. In Greece, electricity generation via conversion to biogas is the only well developed energy market for this feedstock.



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

Law 3851/2010 distinguishes biogas from other biomass feedstocks. Grids for biomass electricity production are currently promoted. Integration of biogas into the natural gas grid is not a priority at present because the price of the natural gas is very low and biogas upgrading is still expensive. More details on the possibility of integrating biogas into the natural gas grid are found in paragraph 4.2.8

- (f) ***What measures are planned to improve forest management techniques in order to maximise the extraction of biomass from the forest in a sustainable way? (29): How will forest management be improved in order to increase future growth? What measures are planned to maximise the extraction of existing biomass that can already be put into practice?***

The contribution of forest products in the Gross National Income is generally low, ranging around 1,3%. This is because forests in Greece are of low productivity as they have a "protected" characterization and the benefits coming from the forest are not quantified as income.

In Axis 1 (Improvement of the Competitiveness of Agriculture, Forestry and Agri-Foodstuff Sector) of the PRDG 2007-2013, actions are included to support improved forest management (Measure 2 regarding the 'Reform and Development of Biomass Potential and Promotion of Innovation' and in particular Measures 1.2.2 'Improvement of the Economic Value of Forests' and 1.2.3B "Improvement of the Value of Forest Products"). Measure 1.2.2 aims at supporting the owners of forests to implement a multifunctional policy focusing on improving efficiency and retaining the biodiversity. Moreover, Measure 1.2.3B aims at increasing the added value and the competitiveness of forest products through investments in modernizing small processing businesses and improving the trade of raw forest products.

²⁹ Recommendations can be found in the report issued by the Standing Forestry Committee ad hoc Working Group II in July 2008 on Mobilisation and efficient use of wood and wood residues for energy generation. The report can be downloaded at: http://ec.europa.eu/agriculture/fore/publi/sfc_wgii_final_report_072008_en.pdf



Impact on other sectors:

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

Lignocellulosic biomass is already demanded by established markets. Large quantities of woody biomass derived from forests are used by forest-based industries, (e.g. saw-mills, particle and fibre board industries) and their residues are converted to heat and electricity. Agricultural residues (e.g. straw) are used for animal bedding or feeding and the rest are left on the ground unexploited, usually causing fires in the summer. Arboriculture and other pruning (e.g. olive trees, vineyards) are partly used by the local communities for space heating, though the majority is left on the ground. Thus, no direct impact of the energy use of lignocellulosic biomass on other sectors is anticipated in the short and medium terms. The competition for feedstocks, within the lignocellulosic markets, may become significant after 2020, when advances in second-generation biofuel technologies and a governmental support will most probably occur.

On the other hand, increased demand for biofuels could have significant long-term impacts on several commodity markets in the agriculture and forest sector that will require responsible policy. That was particularly evident during 2007 and 2008 when a combination of effects – including biofuels demand – contributed to significant price increases.

In Greece, the vegetable and seed oils available in the food market have the important role of ensuring domestic raw materials. Of these materials, cottonseed, sunflower and soybean oil are present in significant amounts. However, substantial imports of maize seed, soybean and sunflower are also reported. The exports of cotton are of particular interest as Greece is exporting large quantities of cotton at a very low price. This means that significant quantities of domestically produced cottonseed are exported and only reduced quantities within the country could be made available at low prices for biodiesel production.

Increased demand for biodiesel could have significant long-term impacts on the vegetable oil market, shifting from food to non-food cropping systems, the release of areas from agriculture and the reformed CAP, all of which will require careful handling.

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

The high biomass costs, the limited land and water availability, the competition for food and feed, and the environmental constraints limit the technically available biomass supplies of the country and make imperative the improvement of efficiency/productivity of the main agricultural crops to the benefit of the food market. This may impact the available agricultural residues for energy exploitation. However, their vast majority is not actually used. Increased demand of this feedstock in the short and long term could be thus



covered by the existing and not exploited biomass –even at low availabilities- without causing significant impact in the energy market.



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

4.7.1 Procedural aspects

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

Currently such structures have not as yet been formally established; The Special Unit for the Implementation of the ETS Directive including the registry at MEECC will expand to take on this responsibility.

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

Private entities are already participating in CDM and JI projects. With the expansion of the Special Unit a facility will be established to assist and interface with private entities that are interested in starting activity in this area.

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

The criteria for statistical transfers have not been finalized as yet. It should be recalled that Greece expects to have excess amounts available for possible transfer to other parties.

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

No formal mechanism is in place. Informal contacts with other Member States have already been initiated.



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

Currently, there are no plans to support such activity. At a later date, after the policies and actions that have been put in place to meet the RES targets have been in operation and have been evaluated as to their effectiveness, corrective action including support of projects might be considered.

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

Table 9 gives the relevant estimated numbers for surplus, which could be used, for transfer to other MS.

4.7.3 The estimated potential for joint projects

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

It is not yet clear, but possibly to technologies that are currently less developed (i.e. geothermal, CSP, district heating & cooling).

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

A number of CSP projects of different technology including that for storage are under consideration. None have already secured final approval. When they reach a more advanced stage in their planning, technology comparison may produce some useful insights that could be of use.

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

There is no specific active scheme and structure for joint projects and as a consequence it is not clear which stakeholders can be involved and where. The overall physical planning for RES is already set by the Special Physical Planning Plan approved in 2008.



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

Developments in other MSs are closely followed. As Greece plans on meeting its target internally, no specific action has been planned for such support.

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

Support to local enterprises for the development of components especially for use in remote/isolated sites would be of interest.

4.7.4 The estimated demand for renewable energy to be satisfied by means other than domestic production

Please look at Table 9 for the required information.



Table 9: Estimated excess and /or deficit production of renewable energy compared to the indicative trajectory which could be transferred to / from other Member States in Greece

ktoe	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Estimated excess in forecast document							110	114	286	402	482
Estimated excess in NREAP	257	408	513	686	812	856	842	737	743	683	529
Estimated deficit in forecast document											
Estimated deficit in NREAP											



5 ASSESSMENTS

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



Table 10.a: Estimation of total contribution (installed capacity, gross electricity generation) expected from each renewable energy technology in Greece to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in electricity 2010-2014

	2005		2010		2011		2012		2013		2014	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
Hydro:												
<1MW	26	106	29	112	30	116	31	120	32	123	33	127
1MW – 10 MW	63	218	154	593	160	617	166	641	168	647	179	689
>10MW	3018	4693	3054	4283	3054	4330	3236	4599	3396	4838	3396	4839
Of which pumping	700	593	700	776	700	777	700	774	700	772	700	773
Geothermal	0		0	0	0	0	0	0	0	0	20	123
Solar:												
photovoltaic	1	0,9	184	242	357	470	531	698	778	1022	1024	1345
concentrated solar p.			0	0	0	0	0	0	0	0	0	0
Tide, wave, ocean												
Wind:												
onshore	491	1267	1327	3129	1924	4501	2521	5838	3119	7116	3716	8427
offshore												
Biomass:												
solid			20	73	20	73	20	73	20	73	20	73
solid-cofired												
biogas	24	94	40	181	40	182	50	183	60	184	80	364



	2005		2010		2011		2012		2013		2014	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
<i>Bioliquids</i> ³⁰												
TOTAL	2923	5786	4107	7838	4885	9513	5856	11379	6872	13232	7767	15215
<i>of which in CHP</i>			20	73	20	73	20	73	20	73	20	73

³⁰ Take into account only those complying with the sustainability criteria (cf. Article 5(1) of Directive 2009/28/EC last subparagraph).



Table 10.b: Estimation of total contribution (installed capacity, gross electricity generation) expected from each renewable energy technology in Greece to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in electricity 2015-2020

	2015		2016		2017		2018		2019		2020	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
Hydro:												
<1MW	34	131	35	135	36	139	36	139	38	146	39	150
1MW - 10 MW	185	713	191	737	197	760	197	760	210	809	216	833
>10MW	3396	4840	3396	4840	3396	4839	3396	4746	4276	5584	4276	5593
<i>Of which pumping</i>	700	774	700	774	700	773	700	776	1580	1694	1580	1703
Geothermal	20	123	20	123	20	123	20	123	20	123	120	736
Solar:												
<i>Photovoltaic</i>	1270	1668	1456	1913	1642	2157	1828	2402	2014	2646	2200	2891
<i>Concentrated solar p.</i>	30	86	110	314	140	400	170	486	220	629	250	714
Tide, wave, ocean												
Wind:												
<i>Onshore</i>	4303	9674	4856	10425	5430	11538	6003	12831	6576	14790	7200	16125
<i>Offshore</i>			50	107	100	213	150	321	200	450	300	672
Biomass												
<i>solid</i>	20	73	20	73	20	73	20	73	40	147	40	147



	2015		2016		2017		2018		2019		2020	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
<i>solid - cofired</i>			310	64	310	213	310	217	310	217	310	217
<i>biogas</i>	100	431	120	511	140	576	160	579	180	707	210	895
<i>Bioliquids³¹</i>												
TOTAL	8658	16967	9554	18470	10421	20259	11280	21900	12194	24552	13271	27269
<i>of which in CHP</i>	20	73	20	73	20	73	20	73	40	147	40	147

³¹ Take into account only those complying with the sustainability criteria (cf. Article 5(1) of Directive 2009/28/EC last subparagraph).



Table 11. Estimation of total contribution (final energy consumption ⁽³²⁾) expected from each renewable energy technology in Greece to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in heating and cooling 2010-2020

<i>ktoe</i>	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Geothermal (excluding low temperature geothermal heat in heat pump applications)	10	24	21	21	22	22	23	25	28	36	43	51
Solar	101	216	226	230	260	263	271	280	302	323	341	355
Biomass:												
<i>solid</i>	951	1012	1035	1058	1081	1105	1128	1158	1147	1170	1189	1222
<i>biogas</i>												
<i>bioliquids</i> ⁽³³⁾												
Renewable energy from heat pumps	4	17	29	48	60	81	127	161	181	199	206	279
— of which aerothermal	3	14	24	39	49	66	104	132	149	163	169	229
— of which geothermal	1	3	5	9	11	15	23	29	32	36	37	50
— of which hydrothermal												
TOTAL	1066	1269	1312	1358	1423	1471	1548	1624	1658	1727	1780	1908
<i>Of which DH</i> ³⁴												
<i>Of which biomass in households</i> ³⁵	585	614	611	609	606	604	602	600	599	597	596	595

³² Direct use and district heat as defined in Article 5(4) of Directive 2009/28/EC.

³³ Take into account only those complying with the sustainability criteria (cf. Article 5(1) last subparagraph of Directive 2009/28/EC)

³⁴ District heating and / or cooling from total renewable heating and cooling consumption. (RES- DH)



Table 12: Estimation of total contribution expected from each renewable energy technology in Greece to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in the transport sector 2010-2020 ⁽³⁶⁾

ktoe	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bioethanol/bio-ETBE		43	142	171	198	226	256	287	316	346	380	414
<i>Of which Biofuels ⁽³⁷⁾ Article 21(2)</i>												
<i>Of which imported ⁽³⁸⁾</i>		43	142	171	198	226	256	287	316	346	380	414
Biodiesel	1.2	64	69	83	97	113	130	146	161	175	190	203
<i>Of which Biofuels ⁽³⁷⁾ Article 21(2)</i>												
<i>Of which imported ⁽³⁹⁾</i>												
Hydrogen from renewables												
Renewable electricity		2,4	3,3	4,0	5,1	6,2	7,2	8,3	9,4	12,1	14,5	16,5
<i>Of which road transport</i>		0,7	0,7	0,8	1,0	1,2	1,3	1,4	1,6	3,3	4,5	5,1
<i>Of which non-road transport</i>		1,7	2,6	3,2	4,1	5,0	5,9	6,9	7,8	8,8	10,0	11,4
Others (as biogas, vegetable oils, etc.) — please specify												
<i>Of which Biofuels ⁽³⁷⁾ Article 21(2)</i>												
TOTAL	1.2	110	214	258	300	345	393	441	486	534	584	634

³⁵ From the total renewable heating and cooling consumption.

³⁶ For biofuels take into account only those compliant with the sustainability criteria (cf. Article 5(1) last subparagraph).

³⁷ Biofuels that are included in Article 21(2) of Directive 2009/28/EC.

³⁸ From the whole amount of bioethanol/bio-ETBE.

³⁹ From the whole amount of biodiesel



5.2 Total contribution expected from energy efficiency and energy saving measures to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in electricity, heating and cooling and transport.

Please check the relevant information in Table 1.

The estimates presented take into consideration the expected effects of energy efficiency and saving measures to be introduced during the period 2010-2020.

The Background document (<http://www.ypeka.gr/Default.aspx?tabid=285>) summarizes the main EE & ES measures considered as well as their effectiveness.

5.3 Assessment of the impacts (Optional)

Table 13: Estimated costs and benefits of the renewable energy policy support measures:

Measure	Expected renewable energy use (ktoe)	Expected cost (in €) – indicate time frame	Expected GHG reduction by gas (t / year)*	Expected job creation
L.3851/2010, new feed-in-tariffs for RES technologies, optimization of the licensing procedure	Cumulative additional RES-E contribution from new RES plants until 2020: appr. 8600ktoe Annual RES-E contribution in 2020 in relation to 2010: 1650ktoe	Expected investment of €16,4 B for the 2010-2020 period	Cumulative reduction in 10 years: appr. 90300 ktn CO ₂ Annual reduction in 2020 in relation to 2010: 17500ktnCO ₂	Estimated around 6000 direct jobs during installation phase and more than 2000 new direct jobs during the operation of the plants
New Energy Performance of Buildings Regulation and Article 10 of L.3851/20, along with the implementation of specific measures from the Greek NEEAP and actions of the NSRF	Cumulative additional RES-H&C contribution until 2020: appr. 3100ktoe Annual RES-E contribution in 2020 in relation to 2010: 639ktoe	not estimated,	Cumulative reduction in 10 years: appr. 32500ktn CO ₂ Annual reduction in 2020 in relation to 2010: 6700ktnCO ₂	Not estimated
Actions “Green Tourism” and “Green Enterprise” of the NSRF	Not estimated	Public funding of €60M: €30M per action, start date:2010	Not estimated	Not estimated



<p>A Public-Private partnership that refers to the programme between Piraeus Bank & MEECC-MECS for “greening” the existing industrial zones and developing new green entrepreneurship parks</p>	<p>Approximately 6.4ktoe/ year (only calculated for the target of 50MW of PV parks)</p>	<p>€1,5 B - 4yr duration</p>	<p>67 ktn CO₂/yr</p>	<p>Estimation of 12000 for the whole programme (total jobs in the industrial zones)</p>
<p>Upgrading of grid interconnections in the mainland</p>	<p>Cumulative additional RES-E contribution from new RES plants until 2020: appr. 3300ktoe Annual RES-E contribution in 2020 in relation to 2010: 470ktoe</p>	<p>Period 2010-2020</p>	<p>Cumulative reduction for the scheduled period: appr. 34500 ktn CO₂ Annual reduction in 2020 in relation to 2010: 4950ktnCO₂</p>	<p>Not estimated</p>
<p>Interconnection of the non-interconnected islands</p>	<p>Cumulative additional RES-E contribution from new RES plants until 2020: appr. 1150ktoe Annual RES-E contribution in 2020 in relation to 2010: 380ktoe</p>	<p>Period 2012-2020</p>	<p>Cumulative reduction for the scheduled period: appr. 11800 ktn CO₂ Annual reduction in 2020 in relation to 2010: 3950ktnCO₂</p>	<p>Not estimated</p>
<p>Tendering procedure for the construction and operation of offshore wind farms</p>	<p>Cumulative additional RES-E contribution until 2020: appr. 140ktoe Annual RES-E contribution in 2020 in relation to 2010: 56ktoe</p>	<p>Period 2016-2020</p>	<p>Cumulative reduction for the scheduled period: appr. 1500ktn CO₂ Annual reduction in 2020 in relation to 2010: 590ktnCO₂</p>	<p>Not estimated</p>

* calculated on the basis of CO₂ emission factor: 0.9kg CO₂/kWh_e



5.4 Preparation of the national Renewable Energy Action Plan and the following up of its implementation

(a) How were regional and/or local authorities and/or cities involved in the preparation of this Action Plan? Were other stakeholders involved?

The regional and local authorities, through the Central Union of Municipalities and Communities of Greece, were involved in the initial consultation phase that took place in January 2010 and made specific comments in relation to the development of RES at local level. Additionally, other stakeholders from scientific and RES development associations, NGOs, universities and institutional bodies participated in the National 20-20-20 Committee that was established for the preparation of the NREAP. They participated either directly as members or as collaborating experts.

This National 20-20-20 Committee was established last November by the Minister of Environment, Energy and Climate Change and was tasked with the preparation of the Greek NREAP to MEECC for final adoption.

(b) Are there plans to develop regional/local renewable energy strategies? If so, could you please explain? In case relevant competences are delegated to regional/local levels, what mechanism will ensure national target compliance?

In the past, planning for RES utilization was carried out and agreed mainly at central level. It was based primarily on the local physical and technical potential for the development of RES installations, limitations for the protection of the environment and nature and grid development plans. A consultation phase with the local administration bodies (municipalities, prefectures) was also included especially in the compilation of the SPPF-RES (OG B' 2464/2008).

Several Regional Operations Programmes of CSF and the current National Strategic Reference Framework for the period 2007-2013 have also included identification, assessment and mapping studies of RES potential and existing installations in order to line-up more effectively future investment programmes with local development plans.

The new national law on "New Architecture of Local Governance and Decentralized Government", known as "Kallikratis", affects directly the role and level of responsibilities at local level, redraws the administrative boundaries, reduces significantly the number of municipalities (by 65%), replaces the prefectures with 12 regional authorities and could further assist the development of such integrated approaches at local level. The plan for this drastic merge of the number of municipalities is based on economic, geographic and demographic parameters and mainly affects rural, semi-urban and island regions.

This plan is expected to bring fundamental and much-needed reforms to the administrative structures of the public sector and the Government considers this bill as an essential part of the Stability, Development and Reconstruction Program.

Further coordination between the different levels of local administration will be undertaken by the One-stop Shop Agency of MEECC. An initiative at local level that should be highlighted is the "Green Islands" initiative, which is developing a specific roadmap for a



group of non-interconnected islands in order for them to become more energy autonomous by exploiting mainly the local RES potential.

Section 4.2.1d also describes the general framework for development of local RES installations and highlights some specific changes that were introduced by the new L3851/2010.

The overall responsibility for ensuring that Greece meets the RES targets rests with MEECC.

(c) Please explain the public consultation carried out for the preparation of this Action Plan.

The public consultation for the preparation of the NREAP was carried out in two phases; the first, in January 2010, where all the interested parties and private citizens could send their comments on the draft law of "Accelerating the Development of Renewable Energy Sources to Deal with Climate Change and Other Regulations in Topics under the Authority of MEECC", which included specific targets for the RES share until 2020. The national committee that was responsible for the preparation of the Greek NREAP conducted a second round of consultation among appropriate stakeholders in the beginning of June 2010 where market and institutional actors were asked to provide their comments and suggestions on a specific draft report that presented the key figures and targets per technology and sector. This consultation phase proved to be extremely useful as it managed to assess the market reaction for the specific RES targets and to provide useful input for the 20-20-20 Committee in order to consider appropriate tuning of the planned specific targets for various technologies.

(d) Please indicate your national contact point/the national authority or body responsible for the follow-up of the Renewable Energy Action Plan?

The relevant authority that will be responsible for the follow-up and evaluation of the NREAP will be the General Secretariat for Energy and Climate Change of the Ministry for Environment, Energy and Climate Change with the assistance of the National 20-20-20 Committee.

(e) Do you have a monitoring system, including indicators for individual measures and instruments, to follow-up the implementation of the Renewable Energy Action Plan? If so, could you please give more details on it?

A specific action within the NSRF for the period 2007-2013, addresses this need and describes the development of a national information system for the monitoring and support of the National Planning in order to achieve the national 2020 RES targets. This system will be developed by CRES under the supervision of MEECC, and foresees the development of databases, implementation of energy models, monitoring of indicators in order to assist towards the direction of monitoring and evaluation and proper implementation of the specific RES policies.