HELLENIC REPUBLIC

MINISTRY FOR THE ENVIRONMENT, PHYSICAL PLANNING AND PUBLIC WORKS

COUNTRY PROFILE

GREECE

National Reporting to the Fourteenth & Fifteenth Sessions of the COMMISSION for SUSTAINABLE DEVELOPMENT of the UNITED NATIONS (UNCSD 14 – UNCSD 15)

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ABBREVIATIONS

ACCI	Athens Chamber of Commerce and Industry
BAT	Best Available Techniques
CAP	Common Agricultural Policy
CEU	Commission of the European Union
CH_4	Methane
CHP	Cogeneration of Heat and Power
CNG	Compressed Natural Gas
CO	Carbon dioxide
CO_2	Carbon dioxide
CRES	Centre for Renewable Energy Sources
CSF	Community Support Framework
ECMWF	European Centre for Medium-Range Weather Forecasts
EIA	Environmental Impact Assessment
EMEP	Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
ERDF	European Regional Development Fund
ESP	Electrostatic Precipitator
ETHEL	Athens Thermal Bus Company S.A.
ETS	Emission Trading System
EU	European Union
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FGD	Flue Gas Desulphurisation
FGI	Federation of Greek Industries
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Greenhouse Gas (Emissions)
GSRT	General Secretariat for Research and Technology, Ministry of Development
HES	Hydro Electric Station
HFCs	Hydrofluorocarbons
HNMS	Hellenic National Meteorological Service
HTSO S.A.	Hellenic Transmission System Operator
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated Pollution Prevention & Control
JMD	Joint Ministerial Decision
LCA	Life Cycle Assessment
LCP	Large Combustion Plant
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LUCF	Land-Use Change and Forestry Sector
MAP / UNEP	Mediterranean Action Plan / UNEP
MD	Ministerial Decision
MDGs	Millennium Development Goals
MoU	Memorandum of Understanding
MS	Member State
Mtoeq - ktoeq	Million tones oil equivalent – Thousands tones oil equivalent
NO_x	Nitrogen oxides
N_2O	Nitrous oxide
NAP	National Allocation Plan
NAPCC	(2^{nd}) National Action Plan for the Abatement of CO_2 and other Greenhouse Gas Emissions 2000-2010
(3^{rd} and 4^{th}) NCC	(3^{rd} and 4^{th}) National Communication of Greece to the UNFCCC
NCESD	National Centre for Environment and Sustainable Development
NCMR	National Centre for Marine Research
NEIN	National Environmental Information Network
NGO	Non Governmental Organization
NMVOCs	Non Methane Volatile Organic Compounds
NNCAP	National Network for the Control of Atmospheric quality and Pollution

NOA	National Observatory of Athens
NSSD	National Strategy for Sustainable Development
O_3	Ozone
ODA	Official Development Assistance
OEP	Operational 'Environment' Programme
OJG	Official Journal of the Government
OPCOM	Operational Programme 'Competitiveness'
OPE	Operational Programme 'Energy'
PAHs	Polyaromatic Hydrocarbons
PF	Pulverized Fuel
PFCs	Perfuorocarbons
PM_{10}	Particulate Matter less than 10 microns in diameter
PGC S.A.	Public Gas Corporation S.A.
PPC S. A.	Public Power Corporation S. A.
PPP	Public Private Partnerships
PV	Photovoltaic
R&D	Research and Development
RAE	Regulatory Authority for Energy
RES	Renewable Energy Sources
SDR	Special Drawing Right
SES	Steam Electric Station
SF_6	Sulphur hexafluoride
SME	Small and Medium size Enterprise
SO_2	Sulphur dioxide
TEN	Trans-European Networks
TPES	Total Primary Energy Supply
TPF	Third Party Financing
UHVC	Ultra-high Voltage Centre
UNCSD	United Nations Commission on Sustainable Development
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
VAT	Value-added Tax
VOCS	Volatile Organic Compounds
WB	World Bank
WSSD	World Summit on Sustainable Development (Johannesburg, August-September 2002)
YPEHODE	Hellenic Ministry for the Environment, Physical Planning and Public Works

SIGNS & NOTES

. : decimal point
, : thousands' separator
EUR: euros (on average, as of November 2006, 1 euro = 1.28 USD)
USD: US Dollar

CHAPTER II: Energy

■ Status

General

The geography of Greece consisting of a very large number of small islands, represents a significant challenge regarding the power production and supply system of the country. The ele ctricity generation system in Greece consists of an interconnected mainland system, the systems of the islands of Crete and Rhodes and the independent power stations of smaller islands.

Greece's geography and climate provide a large potential for the further development of renewable energy sources (RES). According to the "2nd National Action Plan for the Abatement of CO_2 and other Greenhouse Gas Emissions 2000-2010" (NAPCC, 2002), currently under revision, the largest contributions are likely to originate from wind and solar energy, biomass for district heating and electricity generation as well as from small hydro installations; the Aegean islands are highly suitable for the installation of wind generators whereas the abundant sunshine provides a great potential for water heating. Greece rates first in the EU regarding solar energy while there is also a rapid increase in the domain of wind energy. The market potential for photovoltaic (PV) systems in Greece mainly focuses on isolated systems in remote areas for electrification and agricultural use. Biomass and geothermal energy are also rapidly gaining ground in the context of RES exploitation. The penetration of natural gas in the energy market is also growing intensively in Greece since 1997.

Law 2773/1999, that complies with EU Directive 96/92, enacted the liberalisation of the electricity market in Greece aiming, inter alia, at further promoting RES, adapting the national market to the new institutional framework and increasing competition.

Energy supply and power generation

The Greek power generation system encompasses the operation of Steam Electric Stations (SES) and Hydro Electric Stations (HES) that are up to date managed mainly by the Public Power Corporation S.A. (PPC S.A.) as well as a small but increasing share of RES. In 2004, the total installed capacity of the PPC S.A. generating system amounted to 12.2 GW accounting to an increase of approximately 40% compared to 1990 levels, whereas the net capacity of the auto producers accounted for 257 MW in 2004.

Table 8: Installed capacity of the electricity generation system (in MW) in 2004

Units	Interconnected system	Autonomous islands' systems
Public Power Corporation S.A. (PPC S.A.)		
Lignite	5,288	
Oil	750	1507
Natural gas	1,581	
Hydro	3,060	1
RES	7	30
Auto producers and independent producers		
Auto-producers	257 [1]	
Independent producers - RES	460	

[1)] Net installed capacity *(Source: NOA, 4 NC)*

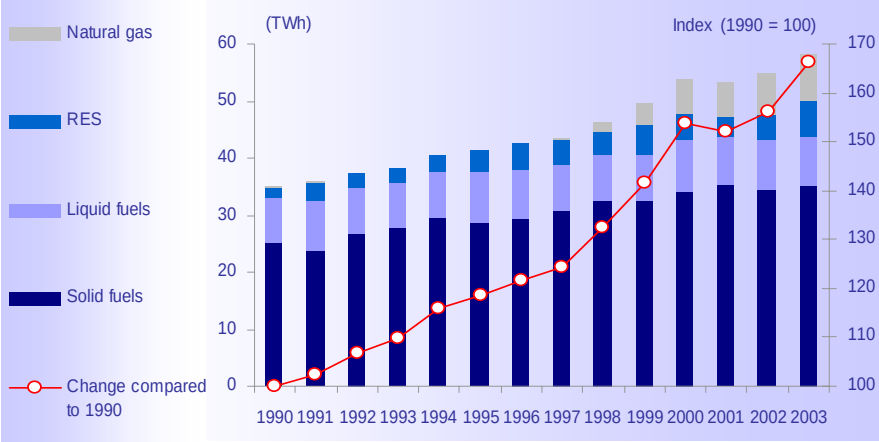
During the period 1990-2003, oil and coal products have provided the majority of the total energy supply (88% - 95%), but since 1997, with the introduction of natural gas, their contribution has been decreasing. Natural gas accounted for 6% of total primary energy supply (TPES) in 2002 and 7% in 2003.

The contribution of RES to power production increased from 5% in 1990 to 6.8% in 2002 to reach approximately 11% today.

Electricity generation increased continuously with an average annual rate of approximately 4% for the period 1990-2003. Gross electricity production in 2003 totalled 58.2 TWh, of which 60% and 15% came from the combustion of coal and petroleum products, respectively; 9% from hydropower;

15% from natural gas; and 1% from other (except large hydro) RES (mainly from wind energy) (see Graph 7).

Import dependency (defined as the ratio of domestic energy supply to gross inland consumption) showed an upward trend during 1990-2003, from 59% in 1990 to 65% in 2000, as a result of the increased demand of oil products and the penetration of natural gas.



Graph 7: Gross electricity generation (in TWh) in Greece for the period 1990-2003 *(Source: NOA, 4 NC)*

The energy supply system in Greece encompasses: (i) primary lignite production, (ii) refining of crude oil, (iii) transportation and distribution of natural gas and (iv) electricity production.

Lignite is the basic significant electricity source in Greece which ranks third in the EU for lignite production and 6th worldwide. The certified geological reserves are approximately 5 Gt with a significant geographic distribution. Based on available technical and economic factors, the reserves suitable for exploitation and energy use are 3.2 Gt while only 1.3 Gt have been excavated up to date. Therefore, based on PPC S.A. estimations and the calculated exploitation rate, the remaining reserves will last for the coming 44 years. The calorific value of greek lignite is low, varying between 900-1100 kcal/kg in the areas of Megalopolis, Amyntaion and Drama, between 1,250-1,350 kcal/kg in the Ptolemais region and between 1,800-2,300 kcal/kg in Florina and Elassona.

Greece has 4 *oil refineries*; there are approximately 50 companies that are active in the petroleum products trading sector as well as a large number of intermediate traders, commissioners and gas stations. Oil product trading companies in Greece either (i) buy refined oil products from the domestic refineries, store them in their installations or distribute them to consumers directly or through intermediary stations, or (ii) import refined oil products from refineries abroad, store them in the installations and consequently channel them to consumers. The annual distillation capacity of the 4 Greek refineries is 19.7 Mt of crude oil while catalytic conversion is only possible in 2 of the refineries.

Since 1997, Greece has supported the supply and use of *natural gas* both institutionally and financially, aiming at the modernisation and diversification of the national energy balance, contributing to the overall objective of energy security. The liberalization of the electricity market is also giving rise to a further penetration of natural gas in the near future, as 98% of the approved licenses for electricity generation by thermal units relate to natural gas power plants. The promotion of natural gas in electricity generation was estimated to reduce GHG emissions by 9.64 Mt CO_2 eq in 2010; plans to further increase these efforts would result in emission reductions of additional 3.35 Mt CO_2 eq. Natural gas in Greece is imported from Russia (80%) through a pipeline, and from Algeria (20%, as liquefied natural gas - LNG) transported by special tankers and is expected to replace mainly imported oil in the national energy balance. The main infrastructure of the Greek transportation, storage and distribution network encompasses: (i) a main pipeline of 512 km length and branches leading to the major consuming centres of 450 km total length, (ii) a terminal station for LNG, including 2 storage tanks of total capacity 130,000 m^3, and (iii) the various distribution networks (of low and high pressure); the total foreseen length of the low pressure network for the cities of Athens, Thessaloniki, Larissa and Volos will reached 5,000 km while 3,100 km were already completed in 2005.

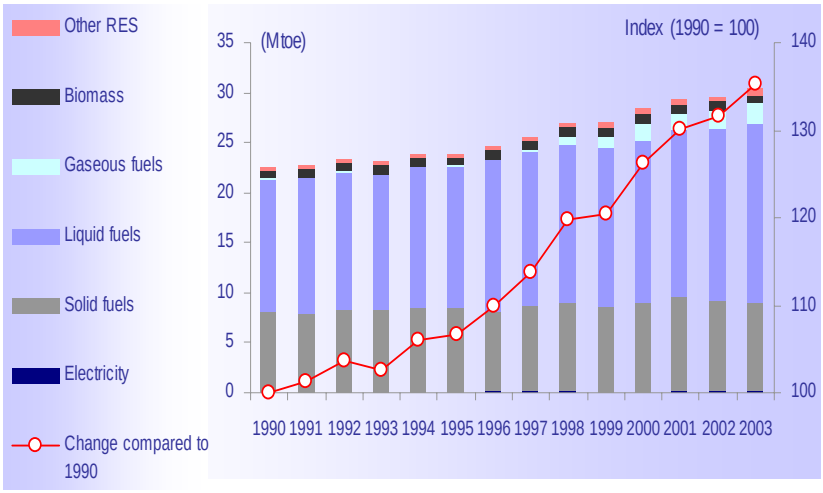
Regarding electricity generation from *RES*, in 2003, it consisted of 79% hydro power, 19% wind power and 2.0% biogas. RES electricity production in Greece was very sensitive to weather conditions; high rainfall in 2003 resulted in a relatively high share of hydro power. Based on the granted licenses, in 2004, 123 small scale plants, including small cogeneration of heat and power plants (CHP), of a total capacity of 613 MW were already in operation, while 141 additional plants of 1,000 MW capacity have been granted an installation permit. Furthermore, 376 more plants of a total capacity of 3,218 MW are under the licensing procedure while they have already been granted the required production permit. The Regulatory Authority for Energy (RAE) has also already consented to the construction of 64 more plants of 484 MW capacity for which the corresponding production permits are still pending. Finally, 412 applications for plants in environmentally vulnerable areas or areas with saturated power networks, of a total capacity of 5,719 MW, are under processing and assessment. Wind parks and the construction of small hydro has reported a considerable boost over recent years, due to the high potential of Greece for hydro and wind energy, the recent technological advances in the sector as well as the state aid with 30-50% of the construction cost subsidised. Limitations to their further promotion arise from constrains in the transportation networks in some cases as well as the from the network stability threshold for the islands which are not interconnected. Law 3175/2003 gives an additional boost to geothermal energy promotion. The first biomass-biogas plants have been installed with a capacity of 24 MWe whereas over 35 new projects, exploiting biomass from forests and agricultural residues to produce electricity, have contributed with an additional combined capacity of 350 MW by 2006. Regarding PV, only 11 systems of a 1.65 MWe capacity were licensed until 2003, 8 of which were installed in the island of Crete. Measures are now taken to support PVs promotion further. On the contrary, the total surface area of the already installed solar accumulators for water heating in the residential sector in Greece was calculated in 2003 to around 3.14 million m^2. New Law 3438/2006 on "production of power using RES or through high efficiency cogeneration of electricity and heat" (see also under "Decision-making, Legal and Regulatory Framework, Policy Instruments and Measures"), is expected to give an additional important boost to power generation from RES.

Over recent years and especially in 2005, *biofuels*' use penetrated the energy balance of the transport sector in Greece. According to the "1st National Report regarding the promotion of the use of biofuels of other renewable fuels for the transport sector in Greece for the period 2005-2010" the consumption of biodiesel and bioethanol will reach 5.75% of total diesel and gasoline consumption in transport by 2010. In the context of OPCOM 2000-2006, the construction of 2 biodiesel production plants in the cities of Kilkis and Volos, of a total capacity of 80,000 tons (one is already in operation while the second will start operation shortly during the first months of 2007) has been financed. Law 3340/2005 introduced in Greece the exemption of excise duty for certain amounts of biodiesel for the period 2005-2007.

Energy demand and consumption

Energy intensity in Greece has been growing in all sectors between 1990-2003, with the exception of year 1993. In 2003, the gross inland energy consumption in Greece reached 30.5 Mtoe, presenting an increase by 35% from 1990 levels. However, despite this increase, the average annual growth rate for the period 1990-2003 has been decreased by 2.4% compared to 3.3% for the 80s. For the period 1990-2003, consumption of oil and coal products reached 88%-95%. In 2003, the share of oil products in gross inland consumption was at 1990 levels (58%), while the share of coal products decreased from 36% in 1990 to 29% in 2003.

Final energy consumption reached, in 2003, 23.1 Mtoe, with 29% used in the industrial sector (including the consumption of the energy industry), 35% in transport and 36% in residential and tertiary sector. The average annual growth rate for final energy consumption amounts to 2.7% for the period 1990-2003. Per capita final energy consumption has increased by 30% from 1990 levels, in 2003 (1.61 and 2.09 toe/cap respectively). All three sectors (i.e. industry, transport, households and tertiary) have demonstrated an increase in energy consumption with the residential and tertiary sector presenting the highest increase (+75%) in 2003 compared to 1990; consumption in the transport sector increased by 34%; consumption in the industry sector increased by 18%. These trends resulted in a total increase by 41% between 1990-2003.



Graph 8: Gross inland consumption (Mtoe) in Greece for the period 1990-2003 *(Source: NOA, 4 NC)*

More analytically, in 2003, the total energy consumption in *industry* (including energy and construction industries) totalled 6.7 Mtoe, accounting for 29% of the total energy demand in Greece. The consumption of the energy sector represents 32% of energy consumption in industry.

The main structural changes regarding energy consumption in industry refer to the gradual replacement of petroleum products by coal products (a trend almost solely attributed to the increased use of steam coal by the cement industry) during the time period 1980–1995 and to the penetration of natural gas for thermal uses and for use as feedstock in the chemical industry.

In 2003, oil products accounted for approximately 47% of the total energy needs of the sector, compared to 48% in 1995 and 69% in 1980. Electricity consumption has steadily increased since 1990, and in 2003 it reached a total of approximately 2.2 Mtoe or 35% of the total energy use of the sector. The use of RES, mainly in food and wood processing industries, represents approximately 3% of total energy consumption in industry for the period 1990 – 2003.

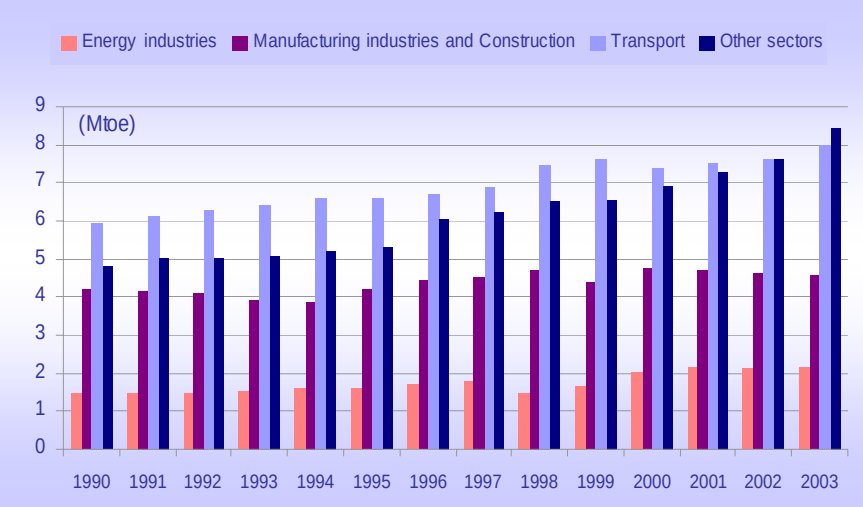
In 2003, the energy use in the *residential, tertiary and agriculture sector* totalled 8.4 Mtoe or 36% of the total energy demand in Greece, compared to 4.8 Mtoe in 1990. This energy was primarily used for space heating and cooling, and domestic hot water production in residential, public and commercial premises. Other energy uses were in the form of electricity for appliances/equipment and for the operation of building services systems in residential, public and commercial premises. The figure also includes energy use in agriculture (mainly for agricultural machinery).

The changes in the energy consumption of the sector reflect both the improving living standards and an increase in the number of dwelling. These two factors have resulted in improved levels of heating and, recently, of cooling, and a rise in the ownership of home electric appliances. The floor area of commercial premises has also increased substantially, thus contributing to an increase in electricity demand for ventilation, lighting and other office equipment. This upward trend is mostly the result of an increased demand for electricity and to a smaller extent for petroleum products.

In 2003, while the consumption of oil products was at 1990 levels, the contribution of electricity to total energy consumption in the sector increased from 29% in 1990 to 35% in 2003. The use of natural gas in the sector is limited as the construction of the distribution networks is under development.

The contribution of biomass to the total energy consumption in the sector decreased by 6% from 1990 up to 2003. Until 1985, most of the biomass was used in the countryside as the primary energy source to meet the heating requirements of households and holiday homes. Since then, however, there is a gradual shift of biomass use from the countryside to large urban areas (as a secondary energy source). This change is the result of both the increasing population of the large cities in Greece and the renewed demand for the installation of fireplaces in both private residences and apartment buildings.

The energy use in *transport* has almost doubled during the 1980–1995 period. In 2003, energy consumption for transportation accounted for 8.0 Mtoe (6.0 Mtoe in 1990) or 34% of the total final energy demand in Greece. Oil products accounted for more than 99% of the final energy use. The energy use is in the form of gasoline consumption mainly by passenger cars, while other uses include diesel oil for trucking, maritime transport and railroads; jet fuel for aircraft; and smaller amounts of LPG and diesel oil used by taxis. Electricity covers the needs of the electric buses (trolleys) and of the Metro and Tram that operate in the Athens area. Due to the Metro planned extension, electricity consumption is expected to increase in the future.



Graph 9: Final energy consumption (in Mtoe) by economic sector for the period 1990-2003 *(Source: NOA, 4 NC)*

■ Decision-Making, Legal and Regulatory Framework, Policy Instruments and Measures

General

The formulation of energy policies in Greece falls mainly within the competence of the Ministry of Development. It has joint responsibility with YPEHODE for policies addressing energy use in buildings and with the Ministry for Transport and Communications for transport policies. The Centre for Renewable Energy Sources (CRES), founded in 1987, has been the national institute for renewable energy sources, rational use of energy and energy savings.

The set of policies of the Ministry of Development, concerning the energy market in Greece, is based on the following targets:

- The complete liberalisation of the electricity and natural gas markets, according to the relevant EU Directives.
- The further enhancement of the efficiency of the production, transmission and distribution of electricity.
- The country's gradual withdrawal from its high oil dependency by further promoting the use of natural gas and RES.
- The further promotion of programmes and policies aiming at a more rational use of energy, energy saving and enhanced efficiency.
- The formulation of a new regulatory framework regarding general procedures and permitting for investing in RES.
- Greece's further accession in the major regional and international energy networks in the field of electricity, oil and natural gas transmission.
- The upgrading of the country's geopolitical role, mainly in South East Europe, through the construction of large international energy projects and the country's active participation in large electricity and natural gas networks (e.g. the Energy Community of South East Europe) (see also under "Cooperation").

Recently, with Law 3438/2006, a "Council for the National Energy Strategy" has been set up, under the auspices of Ministry of Development, aiming at providing a means for a more effective, coherent and coordinated framework for national energy policy-making and strategic planning.

Liberalisation of the Greek electricity market

The liberalisation of the electricity market in Greece was established under Law 2773/1999, which complies with EU Directive 96/92. The principles governing the liberalisation of the electricity market regard the right to choose electricity suppliers, the gradual market liberalisation and the simplification of procedures for production and distribution companies. This Law provides for the entry of independent electricity producers into the market; third-parties' access to transmission and distribution networks; the right of high and medium-voltage customers (around 35% of total annual consumption) to choose suppliers; accounting facilitations for generation, transmission, distribution and mines; implementation of a pricing policy prohibiting inter-company subsidies; tariffs for all electricity producers to be approved by the Minister of Development, on the basis of recommendation by RAE (see below); etc.

In detail, all electricity consumers connected to PPC S.A.'s high or medium-voltage networks, i.e. large industrial and commercial customers, are currently "eligible customers", i.e. those entitled to choose suppliers. However, according to EU Directive 2003/54, as of July 1, 2004, all non-domestic consumers are eligible customers while "non-eligible customers" are mainly domestic consumers and small and medium enterprises which are connected to the low voltage network. However, all consumers living on islands that are not connected to the grid are considered as non-eligible customers.

Law 2773/1999 also regulated the access to the transmission and distribution system and provided (i) for the establishment of the independent Regulatory Authority for Energy (RAE) responsible for the regulation of the liberalised market and for recommending on the approval of generation and supply licenses as well as (ii) for the independent Hellenic Transmission System Operator (HTSO S.A.) responsible for the safety and quality of the electricity supply and for integrating the various generating facilities (of both PPC S.A. and of auto producers) in the system in the most cost-effective way. The duties of HTSO S.A. include accounting management for the market, i.e. calculating who owes what to whom, with transparency and reliability.

Law 2773/1999 and Decree 333/2000 also provided for the transformation of the Public Power Corporation (until then a public monopoly company for power generation and supply) into a joint-stock company, the "PPC S.A.", with effect from January 1, 2001.

The legal framework is complemented with Law 3175/2003 that significantly amended several provisions of the above mentioned Law 2773/1999 aiming at adapting the national market to the new institutional framework and increasing competition. Law 3175/2003 also provided for granting PPC S.A. an electricity generation licence for the installation of additional capacity or refurbishing existing capacity of up to 1,600 MW, provided that the old capacity of an equivalent amount is put in cold reserve. The operation and management of the units in cold reserve shall be conducted as directed exclusively by the HTSO S.A. to provide ancillary services and reserve power to the system.

In May 2005, the regulatory framework governing the liberalised electricity market has been complemented by issuing the new Codes for the "Transmission System Operation and Electricity Trading" (MD D5-EL/b/8311) to comply with EU Directive 2003/54 regarding common rules for the internal electricity market. The new legal framework that has, thus, been established encompasses provisions on the operation of all parties involved in the electricity market in Greece, arrangements on the effective and proper functioning of the market, e.g. third party access, load allocation etc, as well as governing rules for the trading of electricity between the HTSO S.A., the electricity generators and the suppliers. With the actual completion of this new framework for the liberalisation of the electricity market, the "green light" is given to both domestic and foreign interested parties to invest in the Greek energy market in the area of electricity generation.

In December 2005, the third and last enactment/Law that completes the required institutional framework in Greece, providing for a full liberalisation of the electricity market was enacted with Law 3426/2005 (OJG 309/22.12.05). This Law on «speeding further the process for the energy market liberalisation» provides for a full and proper adaptation of the provisions of Law 2773/1999 to the requirements of EU Directive 2003/54. The new Law provides, inter alia, for the further speeding up of the electricity market liberalisation; the enhancement of competition so as by July 1, 2007 all consumers will be able to choose their providers; the promotion of investments and the construction of new additional power generation units; the granting of power generation licenses for the non connected islands; the clear distinction and independence of HTSO S.A. from PPC S.A.; the

accounting simplification for the "non-eligible customers"; the reinforcement of the RAE's competencies; etc.

Moreover, in April 2006, the new "Plan for the Development of the Electricity Transmission System" prepared by HTSO S.A. has been approved, through a respective MD, by Ministry of Development. The new Plan provides for investments of over EUR 1 billion in the electricity transmission sector, for the period 2006-2010, primarily by PPC S.A. as well as by HTSO S.A.. The Plan foresees, inter alia, the construction of an Ultra-high Voltage Centre (UHVC) in Aliveri, the construction of a new UHVC in Shimatari, the submarine connection of the Cyclades islands with Lavrion as well as the construction of an extensive node of 400kV in Peloponnesus that will cover the area Patras-Megalopolis-Korinthos for addressing the continuously increasing demands of the region. Moreover, the new UHVC that will be constructed in Rouf (Athens area) and its subterraneous connection with a 400kV system will help addressing high demands in the Athens Metropolitan area.

Emissions Trading System

In 2005, the European CO_2 emissions trading system (EU-ETS) started operating according to Directive 2003/87/EC.

In line with the basic functional characteristics of the EU-ETS, the trading system in Greece comprises 141 existing industrial installations and 27 new installations that are expected to start their operation during the period 2005-2007 (new entrants). An allowance reserve is also created which is intended to cover possible unknown new entrants during this first period. According to the data presented in the National Allocation Plan (NAP) of GHG emission allowances, total CO_2 emissions from installations included in the EU-ETS are estimated at 228.1 Mt CO_2, for the three-year period 2005-2007, while the allowances that will be allocated during the same period were fixed at 223.3 Mt CO_2 (namely a decrease of emissions by 2.1% is required by the enterprises that participate in the system). JMD 54409/2632/2004 based on EU Directive 2003/87, EU Regulation 2216/2004 and EU Decision 280/2004, provided for the establishment and operation of a National Bureau for Emissions Trading, which was staffed according to YPEHODE's Secretary General Decision of December 2005.

Additionally, the National Centre of Environment and Sustainable Development (NCESD) has been identified in Greece as the responsible authority for the electronic monitoring of GHGs emissions trading and maintaining of the national Registry, which has fully launched its operation in April 2006. NCESD successfully fulfilled the testing-interconnection procedure with the European Central Operator on April 24-25, 2006, and consequently, on April 26, 2006, the operation of the national Registry was officially launched. Aiming at meeting the initial time-schedule that provided for the removal of rights/allowances by April 30, 2006 and in order to avoid further delays, NCESD allocated in time the emission rights to 114 (from total 141) installations for which the National Bureau for Emissions Trading had already issued the required Emissions Verification Reports. On June 30, 2006, the National Bureau for Emissions Trading issued the respective Reports for an extra 20 installations, hence NCESD updated accordingly the national Registry and allocated the corresponding allowances to the additional liable installations (i.e. 134 liable installations in total for 2005). On June 30, 2006, NCESD accordingly removed all allocated allowances for 2005, amounting to 71,301,072 tCO_2. This activity signalled full implementation of EU Directive 2003/87 in Greece.

Moreover, the new NAP for GHGs emissions for the period 2008-2012 was set for public consultation on June 15, 2006; the final draft has consequently been prepared and submitted to the CEU in September 2006 while its final approval is pending.

At the same time, a new updated and revised 2nd NAPCC will be set for public consultation at the end of November 2006 until end of January 2007. The Draft revised 2nd NAPCC is based on new data that emerged since its initial adoption in 2002, regarding actual progress, emission levels, trends, economic parameters etc. Therefore, the aim of adopting a Reviewed NAPCC 2 years before the commencement of the first commitment period under Kyoto, stems from the need to assess actual progress in implementation of the initial measures and to re-orient policy options and priorities so as to ensure achievement of targets and, inter alia, make better use of Kyoto's flexible mechanisms.

Renewable Energy Sources

In the context of EU Directive 2001/77 for the promotion of electricity produced by RES in the internal electricity market, that has been transposed in national legislation with Law 3468/2006 (see

below), an indicative target of 20.1% for the production of electricity from RES was set for the year 2010. This target is compatible with the national commitments under the Kyoto Protocol for keeping total GHG emissions during the first commitment period (2008-2012) below 125% of 1990 levels. Based on the projections for gross electricity consumption in 2010 that is expected to reach 68 TWh, the contribution of electricity produced from RES should amount to approximately 14 TWh. Electricity produced from large hydroelectric installations is expected to be 5 TWh in 2010, thus, electricity produced from other RES should total 9 TWh, corresponding to an installed capacity of 2.7 GW. However, the current installed capacity of units producing electricity from RES currently adds up to a bit over 0.5 GW.

The Ministry of Development has been working systematically towards establishment of a rigid regulatory framework aiming to promote overall investment in RES in Greece. The recent institutional reforms that have been put in place for the simplification of the permitting procedures for RES investments are considered as highly important steps towards this direction. Specifically, in mid 2006, 2 JMDs were issued for (a) the procedures for the preliminary environmental impact assessment and evaluation, approval of environmental terms as well as approval of interventions in forest areas in the context of the permitting procedures for RES installations (JMD 104247/25.5.2006) and (b) the content and requirements for preliminary and final environmental impact assessment studies of RES installations (JMD 104248/25.5.2006). These JMDs aim at completing and simplifying the permitting procedures for RES installations with a view to achieving a better integration of environmental protection and concerns in related works.

Moreover, the institutional framework has been further complemented lately with the recent issuing of Law 3468/27.6.2006 for arranging all legal and operational matters pertaining to production of power using RES or through high efficiency cogeneration of electricity and heat. The preparation of these abovementioned JMDs and Law, and their consequent implementation, required the close collaboration of YPEHODE's competent Service, RAE and Ministry of Development.

This new legislative framework, i.e. Law 3468/2006, has brought about important changes and improvements to the existing legislative system as well as to the authorization and permitting procedures that can be highlighted as follows:

- Streamlining of the environmental permitting procedures through the adoption of stricter terms within which approvals should be granted or consensus rendered by services and bodies involved in the interim stages of the overall licensing procedure.
- Setting up of two central coordinating bodies: one of inter-ministerial character and another on officer level within the Ministry of Development, aiming both at coordination of the control mechanism of the licensing processes and the provision of support and guidance to authorities involved.
- Introduction of a regime of strict follow-up procedures for the holders of generation authorizations, in order to keep them bound to their legal commitments.
- Enable the installation of off-shore wind farms following the successful example of similar projects in the North Sea.
- Direct linkage of the energy tariff regime applicable to hybrid stations that will be installed in islands not connected to the mainland's interconnected system, to the energy and financial savings arising from the operation of the RES units of these stations and the consequent reduction in operation of its conventional units.
- Setting up of a system for issuing guarantees of origin for RES with HTSO S.A. as agency in charge of the mainland's interconnected network; PPC S.A. as agency in charge in the islands not connected to the mainland's interconnected network; and CRES responsible for stand alone electricity systems. RAE is, hence, set responsible for supervising the overall operation of the guarantees' issuing mechanism and dispute settlement.
- Improvement of power purchase contractual terms aiming at facilitating bank financing of projects and ensuring a stable and favorable environment for investors. Moreover, fixing of feed-in tariffs for energy produced in photovoltaic systems of up to 600% with respect to the previous tariffication regime.
- Increasing the fee imposed in favor of the RES-affected local governments to a 3% of gross revenues from energy sales.
- Setting of the threshold for small-scale hydroelectric plants to 15 MW instead of the existing 10 MW limit to allow for a higher number of plants to benefit from favorable feed-in tariffs and priority access to load dispatch.

With respect to the institutional context, it should also be noted, that apart from the key competent authority in Greece, i.e. the Ministry of Development, CRES which is operating under the supervision

of the General Secretariat of Research and Technology (GSRT) of this Ministry, also plays a very important role in co-ordinating activities in the country in the filed of RES development and research. It plans, implements and executes applied R&D projects, provides technical support and disseminates information. It also investigates the technical and economic potential for renewables. Law 2702/99 appointed CRES as the national coordinating agency for all activities related to RES. CRES is also acting as the technical consultant for the licensing procedures of RAE within the framework of implementing the RAE Regulation on RES and small CHP projects.

The current profile for RES penetration in Greece can be summed up as follows:

- *Wind energy*: The total installed capacity of wind systems in Greece reached 371MW in 2003, generating 1021 GWh of electricity, while in 2005 the installed capacity exceeded 470MW. Through the "Operational Programme Energy" (OPE, under the 2nd CSF) 14 wind farms (of approximately 116 MW) were financed, while additional financing in wind parks was provided through the Development Laws 1892/1990 and 2601/1998. Support for wind energy is continued in the frame of the "Operational Programme Competitiveness" (OPCOM, under the 3rd CSF) through subsidies that amount to 30% of the eligible cost of the investments (in case of generation units) and reach 50% of the investment cost in the case of transmission networks for connecting the installations under development with the electricity grid. The interest of investors for installation of wind systems has been high, and thus RAE has issued, by 2005, initial installation permits for more than 363 units reaching 4,200MW total capacity. The new legislative framework with Law 3468/2006 is expected to considerably assist completion of the related installation works. In parallel, areas of high wind potential (island regions, Evia, Lakonia, Thrace) have already attracted a large number of investors, so that enhancement of the existing transmission lines is now required in order to connect additional planned wind parks. In the framework of OPCOM, the funding for transmission network enhancement is foreseen for both stand-alone island grids (Action 6.3.1 and 6.3.3) and main the interconnected system (Action 6.3.4). It is estimated that the installed capacity of the wind parks will reach 1,281MW in 2010 and 1,670MW in 2015. Also, with the implementation of additional supporting policies the installation of another 600MW is expected in the time horizon of 2010, which can reach 750MW in 2015.

- *Solar energy*: Greece rates among the first countries in the EU using solar energy for water heating, with a total surface of installed solar collectors amounting to 3,140,000 m^2 in 2003, the majority of which is used for the production of hot water in the residential sector. A significant number of Greek industries are engaged in solar thermal systems manufacturing. In more detail, the promotion of solar collectors constitutes one of the most important measures of both the 1st and the 2nd NAPCC. Given however that in the last years the installation rate of new solar collectors has been decreased (to approximately 50,000 – 90,000 m^2 per year), the objective of the 2nd NAPCC for 2010 (i.e. the surface of installed solar collectors to reach 4.5 millions m^2) requires that additional measures be taken (e.g. enhancement of incentives with the form of tax exemptions, etc). The penetration of solar systems for combined space and water heating in the residential sector as well as the exploitation of solar energy in the industrial sector are currently exceptionally low, and additional supporting policies are in the planning stage.

- *Small-scale hydroelectric installations:* The installed capacity of the *small hydro units* (so far defined at < 10 MW and now according to Law 3468/2006 at < 15 MW) in Greece has reached 69MW in 2003. The Development Law financed 12 investments of small hydro of total capacity 35 MW during the period 1998 – 2001, while the OPE financed 9 investments of a total capacity of 11.5 MW during the same time period. The OPCOM (2000-2006) continues to support the realization of small hydro projects under the Action 2.1.3. Support for small hydro projects is also foreseen through the latest Development Law 3299/2004. As regards *large hydro systems* (including pumped-storage units) their installed capacity reached 3,010 MW in 2003. PPC S.A. exclusively operates large scale hydro projects in Greece. In the period 1997-2003, 8 additional units of total capacity 533.6 MW were integrated into PPC S.A. interconnected system while 9 more hydroelectric power plants of total capacity 320.6 MW are scheduled for the period 2004-2009. Based on implemented and adopted policies and planning, it is estimated that the total installed capacity of hydro units in Greece will amount to 3,560MW in 2010 and 3732MW in 2015. Despite already high exploitation of the hydro potential, it is estimated that possibilities for further exploitation of hydro resources is feasible and based on this, interventions are planned for the additional installation of another 150 MW in 2010 that could reach 350MW in 2015.

- *Photovoltaic systems* can also be implemented to provide cost-effective electricity in distant areas,

while interconnected central stations could assist the micro isolated networks on the islands of the Aegean Sea. The market potential for PVs in Greece is mainly associated with stand-alone systems in remote areas for household and agricultural use. Only 29 systems of a 0.7 MW capacity are in full operation, with 6 more of a 0.88 MW capacity under construction and 12 additional ones of 2 MW capacity recently licensed by RAE. Most of the installed capacity is concentrated in the island of Crete. The total capacity of PPC S.A.'s PV units already in operation is 308 kWp. The installation of PV units promoted in the tertiary sector is expected to reach approximately 5 MW up to 2010, however a substantial penetration of PV units in the energy system for the time horizon 2010 and 2015 is not expected.

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- *Biomass*: Exploitation of biomass for steam production in industry as well as in power generation, have been financed in the framework of the OPE and supportive policies continue through OPCOM (Action 2.1.3). Up today, RAE has issued permits for 17 power units with a total capacity of 57MW that use biomass, while in the interconnected power generation system, small power units that use biomass with an installed capacity of about 22MW are already in operation. The implemented and adopted measures are expected to lead to an increase of the installed capacity of biomass units of 52MW in 2010, while with the application of additional policies, the further installation of 70MW up to 2010 reaching 100 MW in 2015 is possible. In the industrial sector the use of biomass for steam production constitutes a widespread practice in various industrial sectors. The application of additional measures aims at the further penetration of biomass in the industrial energy balance, increasing its exploitation by 5% in the time horizon of 2010 and by 10% in 2015.

- *Geothermal energy*: The exploitable geothermal potential of Greece is estimated to 200-300 MW. Its exploitation aims on one hand at reinforcing the electricity balance of Cyclades, Dodekanese and Lesvos islands through local energy resources and on the other at boosting local development by making use of non-electric (thermal) applications. In this respect, PPC S.A. plans to exploit the most important geothermal energy sources in the country, especially on the island of Lesvos. This installation of a geothermal unit with a capacity of 8MW (for which RAE has already issued a permit) is underway, while additional units with a total capacity of 12 MW are planned for the next decade.

PPC S.A. has also been involved in the field of research and development of projects combining technologies for different types of RES, such as the installation of a hybrid system in Kithnos island, a hybrid system in Astipalea island and a combined system of diesel-wind-hydroelectric in Ikaria island (3.8 MW Small Hydroelectric Project & 2.4 MW Wind Park).

Following market liberalisation and recent legislation, the number of license applications for power generation from RES has increased considerably, thus current policies are progressively leading to an increased RES power generation. Particularly, wind energy in Greece has attracted foreign investments amounting to over EUR 85 million while both Greek and foreign investors have demonstrated particular interest in carrying out large-scale investments in wind and solar parks as well as in small hydro plants.

The reduction of GHG emissions in 2000 from RES exploitation has been calculated to 2.1 Mt CO_2 eq while installed and underway RES projects are expected to lead to reduction of 6.4 Mt CO_2 eq by 2010 and 7.5 Mt CO_2 eq by 2015. Planned RES projects and interventions are expected to contribute with an additional reduction of GHG emissions of 3.7 Mt CO_2 eq by 2010 and 5.6 Mt CO_2 eq by 2015.

Other important measures currently promoted for supporting further the increase of the RES share in energy generated in Greece, include:

- The introduction, by YPEHODE, of a "Special Spatial Plan for Physical Planning and Sustainable Development for the promotion of Renewable Energy Sources-RES", under Article 7 of Law 2647/1999 on "Spatial Planning and Sustainable Development" in Greece. The procedure for assigning the related study (technical specifications, tendering, evaluation of proposals, contractors' identification) has been completed in 2005; the 1st phase of the study is already completed while completion of the 2nd phase is underway. The Draft Plan will be presented to the public in January-February 2007 for a public consultation. Consequently, it will be discussed in the National Council and then be approved by the competent government bodies. The budget allocated to this project/study is amounting to EUR 142,800. The Plan is expected to contribute to the country's economic growth, investments' promotion and incorporation of environmental concerns in related physical planning.
- The expansion and enhancement of the national transmission electricity system, particularly in areas were RES production units are located, aiming to fully and efficiently absorb electricity

produced by wind parks, solar parks and hydro units.
- The financial support to all schemes involving RES through state subsidies, aiming to further maximising RES market penetration. As with energy efficiency and co-generation, the two principal funding sources for subsidies are the Development Law 3299/2004 and the OPCOM (2000-2006) (see also under "Financing").

It should be, however, mentioned that there is still a great potential for further improvements regarding market penetration of RES. Delays are expected to decrease progressively now that the new legislative framework is in place and the related Special Spatial Plan for RES is underway, to avoid time-consuming procedures and environmental compatibility issues. Therefore, it is expected that realisation of the planned RES installations as presented above, will allow for a full compliance with EU Directive 2001/77, i.e. to achieve a 20.1% share of RES in the total electricity production of Greece by 2010.

Promotion of Natural Gas

Since 1997, Greece has supported the supply and use of natural gas both institutionally and financially: the Public Gas Corporation S.A. (PGC S.A.) established and supervised by the Hellenic Ministry of Development is owned by the Greek State (65%) and the Hellenic Petroleum Corporation (35%). The natural gas units that were integrated into the PPC S.A. interconnected system from 1997 to 2003 are of total installed capacity 1,551 MW. Moreover, an additional 390 MW installed capacity unit has been recently integrated into the PPC S.A. system at the Lavrion SES.

The introduction of natural gas into the national energy system is one of the largest investments ever carried out in Greece. An important part of the infrastructure that is mainly related to the high-pressure transmission system and the medium-pressure network, which are necessary to transport of natural gas to the main consumption regions, has been completed. The development of low-pressure networks in the cities is ongoing and is also financed in the framework of OPCOM (2000-2006).

According to the energy balance of 2003, the penetration of natural gas seems to be at satisfactory levels in the power generation sector (1,462 ktoe) where the installed capacity of power units that use natural gas has reached 1,581MW as well as in the industrial sector (504 ktoe), but less so in the residential and tertiary sectors (a total consumption of approximately 46 ktoe has been recorded) mainly due to some delays in the development of the low-pressure networks in cities. Small quantities of natural gas (approximately 12 ktoe) were also consumed in the transport sector where CNG buses were introduced into the Athens public transport network in 2000.

With regard to penetration of natural gas into the broader Athens area, which has been one of the key objectives of the greek policy, a specialised company has been set up, namely the "Attiki Gas Supply Company S.A.". Similar companies have been set up for the city of Thessaloniki ("Thessaloniki Gas Supply Company S.A.") and for the Region of Thessaly ("Thessaly Gas Supply Company S.A."), where PGC S.A. holds a 51% stake and the remaining is held by foreign investors (Cinergy-Shell and Italgas), aiming at further promoting natural gas in Greece and gradually, replacing oil with for both industrial and domestic use.

At the moment, the installed and operational natural gas network has already reached 1,865 km within the Attica region. In terms of users, so far, 100,000 households, 3,400 commercial and 60 industrial users are operating with natural gas in Attica. In 2004, use of natural gas commenced for 100 schools while its use is under expansion also in hospitals within the region. In more detail, during 2005, total natural gas consumption in Greece reached 2.65 billion m^3. In particular, penetration of natural gas in Athens, for 2005, is reported as follows: (i) number of new business-to-customer signed contracts: 6,952; (ii) number of new business-to-business signed contracts: 89; (iii) total number of m^3 of natural gas consumed: 125 million, of which 20% replaced heating diesel, 30% replaced transport diesel, 12% replaced electricity and/or LPG and 38% replaced heavy fuel oil.

In spite of the progress that has been recorded over recent years, Greece still lags behind compared to other EU MS with respect to per capita natural gas consumption. In this regard, other measures already taken include:
- Further expansion of the Greek natural gas network with a very high rate: (i) since 2005 and for four years, PGC S.A. has been and will be realising investment programmes of approximately EUR 400 million financed by its shareholders' equity, national and EU funding, (ii) PGC S.A. is also

extending the national natural gas network for both industrial and domestic use in order to reach an additional 11 Greek cities.
- Continue investment and funding for promoting related infrastructure: In the context of OPCOM (2000-2006), funding of EUR 800 million has been provided to PGC S.A. investment programme for the period 2000-2006 for a number of projects that (i) enhance access to alternative sources of gas supply through the connection of the Greek system with Italy and Turkey (Actions 6.1.1 and 6.1.2 of the OPCOM), (ii) upgrading of the terminal station of LNG of the Revithousa unit (Action 6.2.1 of the OPCOM) (see also under "Cooperation"), and (iii) further increase penetration of natural gas in big industrial consumers as well as in the sector of transports (Actions 7.1.2 and 7.1.3 of the OPCOM). Also, with the Action 7.1.1 of the OPCOM, the extension of the cities networks aiming at a further penetration of natural gas in the residential - tertiary sectors is financed.
- A detailed business plan for the 2005-2008 period of a total budget of USD 150 million, has been prepared and is being implemented by the three natural gas distribution companies active in Greece, namely the "Attiki Gas Supply Company S.A.", the "Thessaloniki Gas Supply Company S.A." and the "Thessaly Gas Supply Company S.A."; according to the business plan, the national natural gas grid in areas of jurisdiction of the three companies, is further developed and enhanced.
- Pricing policy that has been adopted for natural gas, i.e. the Value Added Tax (VAT) is fixed at 9%, while the consumption of natural gas is exempted from any excise tax up to January 1, 2014.

Moreover, other planned interventions for further promoting natural gas foresee: (i) a wider exploitation of natural gas combined cycle power plants units, (ii) the installation of new co-generation units in the industrial and tertiary sectors (an increase of the installed capacity by 50 MW in the time horizon of 2010 is foreseen) and (iii) a further penetration in the sectors of final consumption; for 2010 it is projected an increase of penetration in industry by 20%, in the tertiary sector by 15% and in the residential sector by 5%.

In the context of the power production sector, an increased penetration of natural gas is expected, in the framework of the liberalized market, with additional power units using natural gas as fuel to be installed in the coming years. It should be noted that so far all the permits granted to auto power producers, apart from the PPC S.A., with conventional fuel units of 50 MW equal or higher capacity (total capacity 5,100.9 MWe) regard natural gas operated units.

The related reductions of GHG emissions due to these overall interventions are estimated at 18.6 Mt CO_2 eq in 2010 and at 24.0 Mt CO_2 eq in 2015.

Finally, regarding market liberalisation, as an emerging and isolated gas market, Greece had a derogation from the EU Gas Directive 2003/55 concerning common rules for the internal market in natural gas, until November 2006. However, Greece decided to open its gas market before the end of the derogation period; thus, the implementation of the new legal framework governing the liberalised natural gas market in Greece commenced at the end of 2005 with Law 3428/2005, integrating EU Directive 2003/55 into the national legal system. With the introduction of this new legislation, the liberalisation of the market commenced with a dual approach: all large consumers, such as industrial and commercial consumers, will directly gain from the market opening while domestic consumers will enjoy the same benefits starting from 2007 thereof. According to the new regulatory framework, new suppliers of natural gas will be introduced in the Greek market for the first time, besides the state monopoly of PGC S.A., thus providing the right to final consumers to choose their supplier. In addition, the Ministry of Development, in cooperation with RAE, whose responsibilities cover both the electricity and gas sectors, are preparing the new tariff scheme for the governing of the transmission of natural gas within the country; the recommended tariffs are uniform across the country, with consumers being charged independently of their distance from natural gas entry points.

Biofuels

EU Directive 2003/30 that has been transposed in Greek legislation with Law 3423/2005, aims at promoting the use of biofuels or other renewable fuels to replace diesel or gasoline for transport in all EU MS, with a view to meet climate change commitments and promote environmental-friendly security of power supply and production from RES, by placing a minimum share of biofuels or other renewable fuels in national markets and set national indicative targets. According to Law 3423/2005, consumption of biodiesel and ethanol should reach in Greece a percentage of 5.75% of the total consumption of diesel and gasoline in road transport by the end of 2010. In order to

prepare this Law, Ministry of Development had launched an extensive consultation with other competent stakeholders (e.g. Ministry of Economy and Finance, General State Chemical Laboratory, Ministry of Rural Development and Foods, refineries, fuel trade companies, companies interested in biofuels production, CRES, National Technical University of Athens etc) and experts from other EU MS and the CEU in order to assess:

- the status of the biofuel market and the readiness of Greece to produce biofuels at local level, the gradual introduction of biofuels in the local fuel market and their distribution through existing fuel market infrastructure,
- the status of national legislation regarding the use of transport fuels and additional legislative initiatives required to promote biofuels, and
- the potential to produce biofuels from agricultural crops domestically grown.

The assessments conducted concluded that two biofuels are more promising for Greece: biodiesel and bioethanol. Greece today has a large number of crops which can be made available for the production of biodiesel, of which sunflower oil and cottonseed oil are expected to play an important role, along with rape-seed oil. Tobacco oil and tomato oil are very promising raw material alternatives. Sweet sorghum, which has a higher bioethanol yield per hectare than sugar beet, is expected to play an important role in the production of bioethanol, and trials have shown that it thrives in all parts of the country.

In particular, regarding biodiesel, it has been consumed as automotive fuel, so far in Greece, only during 1998-2000 when small quantities were imported by ELINOIL S.A. (a fuel trade company) for a demonstration field test; ELINOIL S.A. sold blends of regular diesel with a 5%-7% of biodiesel content from 30 of its outlets in the Region of Thraki, with very promising results (with a market share of 40%).

Regarding local biodiesel production, currently two plants financed by OPCOM (2000-2006) are constructed: one in Kilkis already constructed, by ELVY S.A., with a maximum annual capacity of 40,000 tons, and a second of equal capacity to be completed in early 2007 in Volos, by ELINOIL S.A.. An annual total production of around 55,000 – 60,000 tons of biodiesel is estimated for the first year of operation for both plants. These two plants will use mainly imported oils as raw material (mainly rape-seed oil and soya oil). Domestic oils (mainly cotton-seed oil and old cooking oils) will cover a smaller percentage of up to 40%. Several other companies have already expressed their interest to build individual small and medium scale biodiesel production plants (annual capacity of 10,000 – 30,000 tons) in various regions of Greece with some construction works having started in 2006. Additional small quantities of imported biodiesel are also anticipated in order to meet EU obligations. Law 3340/2005 introduced in Greece the exemption of excise duty for certain amounts of biodiesel, for the period 2005-2007.

Regarding bioethanol, so far, there has been no consumption as automotive fuel in Greece, in the form of domestic production or imports and thus, the existing bioethanol production is directed exclusively to the alcoholic-beverage industry. However, recently private investors, e.g. BIEN S.A. have expressed interest and intention to construction the first plant for automotive bioethanol production in the country; this prospect is expected to encourage Greek farmers in the introduction of alternative cultivations of energy crops.

Improvements in the conventional power generation system

PPC S.A., the basic player up to now in the domestic electricity market, has been actively involved in the field of energy conservation both in its internal activities as well as in implementing demand side management projects. The main actions of PPC S.A. include: (a) efficiency improvements in the existing lignite-fired power stations through the technical enhancement of boilers, turbines, lignite mills, cooling towers and remaining equipment, (b) reduction of distribution losses through the replacement of normal loss distribution transformers and (c) implementation of a cogeneration programme in the lignite-fired power plants in northern Greece by setting up district heating networks. The implementation of these programs by PPC S.A. was estimated to decrease GHG emissions by 0.5 Mt CO_2eq in 2000, while emissions have been continuing to decrease, gradually, ever since, with the upgrade/replacement of old units. According to PPC S.A. estimates, in the framework of the ENERGY WISDOM 2003-2004 Program of EURELECTRIC, the estimated emissions reduction amounted at 1.07 Mt CO_2eq in 2003 and at 7.9 Mt CO_2eq in 2004 (see also under "Strategies, Plans, Programmes and Projects").

Energy saving and energy efficiency: energy in the tertiary, domestic and industrial sectors

Since 1990, the improvement of living standards and the increase in the number of dwellings in Greece resulted in an increased energy demand for space heating and cooling and for an increased number of domestic electrical appliances and equipment. Overall measures implemented targeting thermal insulation of buildings, solar heating units and the replacement of inefficient appliances were factors that helped to reduce the rate of increase.

Greece implements EU Directive 89/106 regarding the specifications, properties, certification and labelling of building material. In this regard, the Hellenic Standardisation Organisation has issued more than 80 standards for requirements, control, testing and assessment of building external embrasures with similar work carried out also for other construction material and products related to energy saving. In 1998, under JMD 21475/4707 for the reduction of CO_2 emissions through measures and terms aiming at the energy efficiency improvement of buildings, the Greek legislation was harmonised with the EU SAVE Directive 93/76, which required the implementation of new regulations and the creation of a certification system whereby new buildings have to pass an energy efficiency test to get an "energy and environment" certificate. Currently, the transposition and incorporation in national legislation of EU Directive 2002/91 on Energy Performance of Buildings is also underway: the Draft Law as well as two Draft JMDs on «energy inspections requirements» and on «the Revised National Regulation for Energy Efficiency in Buildings» according to the new 31 related EU standards, have already been prepared to soon be enacted. The Ministry of Development is also currently pursuing the transposition and implementation of the most recent related EU Directive, Directive 2006/32 on energy end-use efficiency and energy services. For its implementation in Greece, the setting up of a National Action Council is planned, among other things, by the end of 2007. In this context, CRES is formulating specific proposals for actions to be adopted on the national level, e.g. planning and managing of a specialised certification system of integrated energy services, specifications and operation of a monitoring system for ensuring fulfilment of national energy services obligations etc.

Moreover regarding appliances, the EU Directives regarding energy labelling of household air conditioning equipment (2002/31) and electric household ovens (2002/40) were transposed in national legislation in 2003 and the Directive regarding energy labelling of household electric refrigerators, freezers and their combinations (2003/66) in 2004. The measures in place today in Greece, are expected to increase the market share of energy-efficient appliances considerably, up to 40 % of the projected stock of appliances.

Regarding the retrofit measures that are implemented in Greece, roof insulation in residential buildings (10% of existing buildings), has been proven one of the most cost-efficient and easier than wall insulation, and replacement of single glazing by double glazing in commercial buildings. Other energy conservation measures enforced and applied include:
- reduction of the cooling load through external shading of buildings,
- night ventilation and use of roof fans,
- restriction of the use of air conditioning systems in public sector buildings, during July-August 2006,
- reduction of the reactive load of electricity consumption in public sector buildings,
- increase of connections of public sector buildings to natural gas,
- reduction of electricity consumption for lighting through the use of advanced lighting control systems, the restriction of lighting of public sector buildings during July-August 2006 as well as the replacement of lamps with lower consumption ones also in public sector buildings. It should be noted that the mitigation effect solely of planned measures to promote the replacement of incandescent lamps was estimated at a minimum of 1.5 Mt CO_2 eq.

Energy-efficiency improvements of heating equipment are also being addressed by systematic maintenance and the replacement of central-heating boilers. With the implementation of a time-based tariff scheme for electricity, Greece is also aiming to reduce the irrational use of electricity and promote the importance of energy saving, especially during the summer.

In 2005, that was declared by the CEU as the year of "Energy Efficiency", Ministry of Development, together with PPC S.A. and CRES, launched, in May 2005, an information campaign focusing on the significance of energy efficiency with particular emphasis on the wider public and citizens.

The promotion of voluntary agreements is also one of the key measures aiming to introduce new

demand side management in the industrial sector in Greece. Voluntary agreements include measures for energy management (e.g. employment of energy managers and energy auditors, application of monitoring and targeting/benchmarking), extension of old capacity or/and building of new capacity, equipment upgrading, application of advanced clean technologies as well as substitution of conventional fuels with natural gas, using third party financing. This action will be assisted by the implementation of the currently under preparation new legislative framework on third party financing to cover both the private and the public sectors.

Finally, the use of energy in the industrial sector can be currently characterised as satisfactory, due to economy reforms and the improvements of energy efficiency. Industrial energy efficiency is being further improved with the implementation of the emissions allocation and trading schemes (see also under "Emissions Trading System" part of this Section) as well as with actions and initiatives in national, regional and local levels, such as the voluntary agreements between energy producers and large energy consumers.

Cogeneration of heat and power (CHP)

The legislative framework for penetration of CHP in Greece has been recently complemented by Law Law 3468/27.6.06 for production of power using RES or through high efficiency cogeneration of electricity and heat, thus setting all the necessary procedures and terms for further facilitation of CHP promotion in terms of a more favorable pricing system for electricity produced through co-generation and of simpler permitting procedures (for more details see also under the "Renewable Energy Sources" part of this Section). Currently, the transposition into national legislation and the implementation of EU Directive 2004/8 is also underway: a Draft Law has already been prepared and will soon be enacted, aiming at supporting a further increase of penetration rates of CHP in the Greek energy system. In this context, an extensive mapping study of the CHP potential of all sectors in Greece is being carried out under Ministry of Development.

However, penetration is still considered rather limited, mainly due to the limited supply of thermal energy which in turn has had so far limited prospects for district heating development in Greece. Main limitations include: small heating period, high cost of network-infrastructure, prevailing autonomous heating and hot water systems, competitive technology of solar thermal systems as well as absence of statutory framework for alternative financing methods for CHP in the public sector.

Since 1989, PPC S.A. has been implementing CHP activities especially in the field of district heating through a programme involving many lignite units e.g. those in Ptolemais, Kozani, Amyntaion, Florina and Megalopolis.

Within the framework of the SAVE programme (TRIGEMED), CRES has investigated the evaluation of penetration potential for trigeneration (electricity – cooling – heating) in the hotel and hospital sector in Greece, based on technical and economic factors. The study indicated that there is a 10 MWe potential – with natural gas, for 17 hotel units in Athens and Thessaloniki and a potential of 14 MWe – with natural gas, for 29 hospital units in four Greek cities. In the case of LPG use, on the islands, the number of trigeneration units increases to 37 hotel units with total installed capacity of 22 MWe and 53 hospital units with total installed capacity of 20.3 MWe. These numbers increase further if the hotel units operate on a yearly rather than on a seasonal (summer months) basis.

Energy in the transport sector

Measures implemented to increase energy efficiency and reduce local pollution in the transport sector include, inter alia, the following (also see for details Chapter I: Atmosphere/Air Pollution):

- Further expansion of the Athens Metro system.
- Improvements in fuel standards, e.g. for lead in gasoline and sulphur in diesel and heavy fuel oil, that have become stricter following the EU standards.
- Systematic pollution controls conducted in exhaust gases for private vehicles, taxis and light trucks.
- Introduction of natural gas-fuelled buses and LPG-fuelled taxis in Athens.
- Rescheduling and re-routing of buses to accommodate distant neighbourhoods or to link neighbourhoods by means of efficient routing.
- Creation of dedicated bus lanes to improve driving conditions with a consequent increase in the average bus speeds from 16 km/h to 30 km/h.

Moreover, according to Law 3423/2005 transposing EU Directive 2003/30 in national legislation, on the promotion of the use of biofuels or other renewable fuels for transport, Greece focuses on ensuring that a minimum proportion of biofuels is introduced in the local market to reach 5.75% by 2010. Production of biodiesel and bioethanol holds positive prospects in Greece, where a significant potential of domestically produced energy crops exists. Two biodiesel production plants are constructed (see also under "Biofuels" part of this Section), while construction of additional plants by interested companies is underway. However, domestic bioethanol production is not expected before the end of 2006.

In the field of car manufacturing, the EU voluntary agreement with car manufacturers (ACEA/JAMA/KAMA) is reported so far to be one of the most effective adopted sectoral measures. The estimated effect (365 kt CO_2 in 2010) assumed an average emission level of newly sold passenger cars of 140 g/km in 2008. Greece is committed to meet this target even though its implementation will be challenging, given the restrictions for diesel vehicles in major Greek cities.

Nuclear Power

The Greek Atomic Energy Commission is an independent Public Service, with competence on Nuclear Energy, Nuclear Technology and Radiation Protection in Greece. Greek Atomic Energy Commission is responsible and coordinates the Environmental Radioactivity Control Program in the country. This program is performed in collaboration with Environmental Radioactivity Laboratory of the Research Institute "Demokritos" and includes measurements all over the country through telemetric networks as well as sampling and laboratory measurements.

Greece, however, has adhered to the principle of non-nuclear power generation, being convinced that the environmental risks by far outweigh any benefits from power self sufficiency.

■ Strategies, Plans, Programmes and Projects

Energy intensity rates have been very high in Greece, especially over the last decade, and are expected to further increase following the increase of quality of life, even though energy consumption in Greece is still among the lowest in EU. Additionally, the energy production system in Greece has been characterised by the use of traditional fuels, mainly domestic lignite used for power production.

In this respect, the key objectives of the Greek National Strategy for Sustainable Development (NSSD, 2002) to be revised by mid 2007, for the energy sector are: to decrease energy intensity and to decouple it from economic growth as well as to further introduce RES and cleaner traditional fuels in the energy and fuel mix. The actions foreseen in the NSSD to that end, include (also see under "Decision-Making, Legal and Regulatory Framework, Policy Instruments and Measures"): rational use and conservation of energy focusing mainly on the industrial and building sectors, promotion of cogeneration, further promotion of the use of natural gas in the secondary and tertiary sectors, dynamic increase of RES's share so as to reach 20.1% of power production by 2010, upgrading and extension of electricity networks focusing mainly on island areas. The economic instruments that are used, on the basis of the "polluter pays" principle, aim at internalising external costs and facing out market distorting phenomena. Moreover, additional mechanisms for the increase of private investments and the regulation of the energy consumption of producers and consumers coupled with information and technical support actions are also foreseen in the NSSD.

Similarly, the 2nd NAPCC of Greece approved in 2003 and also currently under revision, aims at achieving the Kyoto target building on cost-effective polices and measures that were already integral parts of national sectoral policies, including the promotion of natural gas, RES and energy efficiency. The first NAP (for the period 2005-2007) also contributes towards promotion of energy efficiency and savings.

Aiming at further enhancing the efficiency of the electricity system in Greece, Ministry of Development is also promoting an in-depth and integrated programme, focusing mainly on strengthening the stability of the system, through the construction of new UHVCs in Attica and in Peloponnesus, each of total capacity of approximately 400 KV; most of the related works are already completed.

CRES, focusing on the promotion of RES, rational use of energy and energy savings applications at a national and international level, has participated in more than 600 European, international and

national projects relating to: energy policy analysis; development of energy information systems and models; sustainable investments/technical/economic studies; promotion and dissemination of information on RES, rational use of energy and energy savings; specialised training; development cooperation on the national, European and international levels.

Environmental protection has been integrated into all PPC S.A. activities and initiatives aiming at contributing to achieving national environmental commitments while maintaining service credibility and savings in power generation. All PPC S.A. Divisions are involved in environmental related activities and projects ranging from simple training and environmentally friendly waste handling to BAT promotion in power plants, water resources protection and aesthetic and landscape remedial interventions.

Moreover, PPC S.A. has participated in the "Energy Wisdom" programme of the EURELECTRIC members, in cooperation with the Directorate Generals for Energy and for Environment of the CEU, for voluntary actions taken towards a quantifiable improvement of energy efficiency and GHG emissions reduction. During the programme's first phase (1990-2000), PPC S.A. presented 30 projects for 2000 achieving a total reduction of 4 Mton CO_2 eq; during its second phase (1990-2002), it presented 30 additional projects for 2002, achieving a total reduction of 6.5 Mton CO_2 eq; while during its third phase (2003-2004), the estimated emissions' reduction for PPC S.A.'s 33 additional projects for 2004, amounted to 7.9 Mt CO_2 eq.

Other projects implemented by PPC S.A. include, indicatively: (i) design and implementation of an Environmental Management System based on the National Standardisation Organisation's "EN ISO 14001:2004" standard at the West Macedonia Lignite Centre and (ii) upgrading of the existing Quality Management System of the Training Division, based on ISO 9001/2000 standards.

■ Information, Capacity-Building, Education, Training and Awareness-Raising

CRES as well as other Agencies, such as the Technical Chamber of Greece and the Hellenic Association of Mechanical and Electrical Engineers, are organising yearly training courses and seminars on renewable energy technologies and energy efficiency topics in different sectors. The courses, attended mainly by engineers, students and other professionals groups, provide specialised training on energy efficiency issues in various sectors according to their knowledge level. Energy management principles and energy auditing as well as wind power projects development, design and installation of PV systems and small hydro are among the topics most frequently addressed during seminars. Similar training seminars are organised for local authorities aiming to familiarise heads of Prefectural Departments of Environmental Education with the principles of RES, rational use of energy and energy efficiency technologies with a view to transfer this know-how to school teachers within their jurisdiction.

The Athens Thermal Bus Company (ETHEL), in cooperation with CRES, has implemented a pilot action for applying the basic principles of eco-driving (i.e. economically, environmentally and safe driving) on a small number of ETHEL's urban buses through drivers' training, inter alia, on fuel saving practices.

An educational programme, related educational packages and a web-portal have been developed by CRES for school children visiting its premises and laboratories (about 3,000 visitors per year) aiming at education, training and information dissemination on RES, rational use of energy and energy saving. In the context of the «Open Doors» Programme of the GSRT of Ministry of Development, CRES produced and disseminated to all primary schools in Greece picture books and related teachers' manuals, on conventional energy sources and the related environmental impacts of irrational energy use. Audio-visual educational material on RES and renewable energy technologies, i.e. wind turbines, thermal solar systems, passive solar systems, PV systems, geothermal plants and biomass, as well as specialised printed material on RES, have been produced by CRES and disseminated to all high-schools of the country.

Related modules are being increasingly encompassed in the educational curricula of most high-schools and Greek Universities; new modules indicatively cover topics such as: active and passive systems in buildings, bioclimatic architecture, incorporation of RES in energy strategic planning, investigation and analysis of relations of the human community with the environment (artificial, social, cultural, natural), etc. Other types of education are also being promoted; a characteristic

example of continuous education was the "summer school" (an initiative promoted by a number of NGOs and also supported by competent Ministries) on "Energy and Environmental Planning of Buildings" that took place in July 2004 on the island of Milos, aiming at informing scientists involved in the design and construction of buildings about EU Directive 2002/91 on energy efficiency of buildings, as well as at introducing them in the process and methodology to be followed for the elaboration of specific energy and environmental studies required. Similar "summer schools" on other general environmental matters take place on an annual basis, usually on a Greek island.

On 5 June 2002, YPEHODE started a «do your bit» campaign that covered the whole country, focusing on awareness raising of all ages, with emphasis on providing school children with practical information for protecting the environment including through behavioural changes on energy saving and rational use of energy, by means of leaflets and educational material, questionnaires, interactive dialogues etc. This campaign is repeated on a yearly basis. In the framework of OEP (2000-2006), funds have been bound for environmental awareness raising programmes, with a total budget of EUR 2.8 million. In 2005, that was declared by the CEU as the year of "Energy Efficiency", Ministry of Development, together with PPC S.A. and CRES and in the context of OPCOM (2000-2006), has carried out a wide information campaign, from January 2005 to January 2006, on RES, CHP and the significance of energy efficiency, targeted to the general public, including workshops, technical meetings, public spots, articles in the technical press, leaflets etc.

PPC S.A. also implements a communication and awareness raising strategy, encompassing both "internal" communication initiatives targeting the company's employees mainly through training seminars on environmental management systems as well as "external" communication activities promoting the company's environmental profile, targeting the general public and the company's clients, through publications, leaflets and brochures, children's books, videos, participation in international Conferences and organisation of workshops. In the context of its communication strategy, PPC S.A. sponsors universities and other entities to organise conferences and carry out research on environmental related issues.

Greece has developed a "National Information System for Energy" to improve the availability and quality of energy data. The system that is accessible through the Ministry of Development website (www.ypan.gr), has been created to assist in monitoring the energy sector, support decision-making in energy policy and planning and provide energy data to all interested parties. Other related websites include: CRES (www.cres.gr), RAE (www.rae.gr), HTSO S.A. (www.desmie.gr), Institute for Environmental Research and Sustainable Development of the NOA (www.climate.noa.gr) etc. It should be noted that under Ministry of Development's website, there is a specially devoted URL that provides on-line tools (models and on-line e-tests) to interested consumers on simple ways to reduce their energy consumption, calculate their more energy-intensive daily activities as well as was on how to reduce their power bills. These special e-pages also provide scenarios and examples of applied case studies for special cases with step-by-step practical guidelines/manuals (e.g. power supply to isolated villages by using PVs). Information on climate change policies is provided on YPEHODE's URL (www.minenv.gr)

Publication and diffusion of information material as well as information exchange through related activities, including websites' keeping, is also carried out by the NCESD (www.ekpaa.gr, that contains, inter alia, information on the national Registry for emissions' trading and on sustainable development indicators including on climate change, air pollution, energy etc) and several NGOs and Institutes throughout the country.

Finally, several Greek Regional and Local Authorities participate in various networking programmes for the promotion of RES on the local level. Indicatively, the Region of Crete has participated, together with Research Institutes and local authorities from Italy, Spain, Sweden and Denmark, in an EU ALTENER Programme coordinated by ISLENET (Network of European Islands on Energy and environment) and EREC (European Council for RES), entitled "European Renewable Energy Island" aiming at capacity building, training and awareness raising of local communities for the full promotion and application of RES.

■ Research and Technology

Within the framework of the 3rd CSF and under the umbrella of the OPCOM 2000-2006, the GSRT of the Ministry of Development supported projects promoting collaboration between business enterprises and research entities. In 1999, the overall amount spent for research equalled 0.68% of

Gross Domestic Product (GDP). Two of the main GSRT research programmes were particularly related to climate change: "Natural Environment and Sustainable Development" (total budget EUR 32.7 million) and "Renewable Energy Sources and Energy Saving" (total budget EUR 15.8 million).

Advanced research on low energy buildings, climate change, energy efficiency, air pollution monitoring and abatement technologies etc, is carried out by the related Laboratories and Departments of most Greek Universities

The NOA is undertaking specific climate-related research with a core funding from both GSRT and YPEHODE; CRES (with a R&D budget of over EUR 2 million in 2004) also carries out advanced research on energy efficiency, energy saving and RES as well as on the commercial exploitation of related innovative technologies with a view to constitute a link between academic research and applied industrial technologies; the National Agricultural Research Foundation of the Ministry of Agriculture carries out research on the impact of climate change on agricultural activities.

PPC S.A. is also implementing a series of projects in collaboration with Universities and academic institutes, aiming at assessing specific environmental issues related to the operation of power plants as well as developing innovative pollution abatement technologies, that are consequently applied in its power plants (e.g. technological upgrading of boilers, turbines, lignite mills, cooling systems etc). Apart from these, advanced technologies of pulverized fuel, combustion in fluidized bed and integrated gasification combined cycle are investigated. PPC S.A.'s research activities, together with universities and other research institutes, also encompass thee integrated rehabilitation of grounds for high environmental and health standards' cultivations where mining activities for lignite extraction take place.

Regarding other specific innovative technologies, CRES is carrying out a pilot programme for the production of hydrogen from wind energy, using water and air, within the 5th EU Framework Programme; the establishment of a unit for the production, storage and compression of hydrogen as a commercial by-product from wind power infrastructure, is being explored for the Lavrion (Attica) Wind Farm following the necessary procurement of fuel cells by CRES. It is expected that by 2010 a few pilot hydrogen units will be installed in Greece with a total capacity of approximately 500 kW. CRES is also participating in a 6th EU Framework Programme entitled "RENEW" investigating the potential of biomass to liquid fuels, with Volkswagen as the coordinator.

Private sector entities are also active in this field; indicatively, ELINOIL S.A., since 1998, has carried out 3 consequent ALTENER projects in order to explore the feasibility and the specifications for the penetration of biodiesel in the Greek fuel market and the construction of an integrated supply chain (production plant and supply network) of biodiesel in Greece. Currently, the construction of this plant in the Industrial Area of the city of Volos is being finalised with operation expected to commence in early 2007, with funding provided by OPCOM 2000-2006.

Wave energy is another field where R&D is being promoted with a considerable fast pace over recent years; the newly established "Wave Energy S.A." has internationally patented two devices for the production of electricity and drinking water from sea water by means of reverse osmosis and wave energy and for electricity production from an "energy carpet" spread on highways by means of micro-pistons linked to a hydraulic motor and a generator. Both technologies are expected to soon enter production phase.

■ Financing

Energy efficiency and RES projects have been and are still subsidised under the framework of the Greek Development Laws for the promotion of Private Investments and the Operational Programmes for "Energy" (OPE) and "Competitiveness" (OPCOM) in the context of the 2nd and 3rd EU CSFs.

The Development Law 2601/1998 granted public financing of up to 30% of the eligible costs to investments in RES and CHP, with a total capacity of 600 MW until 2010. It also provided financial support to investments in energy saving in the industrial and tertiary sectors. By 2003, the Development Law had financed 20 wind-energy projects and 12 small hydro projects with installed capacities of 175 MW and 3.5 MW respectively. The new Development Law 3299/2004 provides for state subsidies for biofuel and biomass production for electricity generation, for electricity production from RES and in particular hydroelectric, solar, wind, biomass and geothermal energy, for CHP

promotion and for conventional fuel substitution. A minimum required own funding from the investor is up to 25% of total investment cost.

Within the 2nd (1994-1999) and 3rd (2000-2006) EU CSFs, considerable funding has been provided from national and EU sources to the OPE and OPCOM, respectively. These programmes have subsidised a large number of energy-related projects in Greece and assisted the establishment of RAE and HTSO S.A.

The OPE was launched in January 1994 and continued in practice until the end of 2001 with last contracts made at the end of 1999. The total budget for the programme was EUR 1.116 billion; 33.8% derived from EU funds under the 2nd CSF, the PPC S.A. contributed with 39.6%, other private sources with 21% and state sources with 5.6%. Energy-efficiency investments were subsidized at 45% of project costs, CHP investments at 35% and RES investments at 55%. In addition, the European Investment Bank supported several OPE projects with loans of up to 50% of project costs. Most of the objectives set out in OPE in the fields of installed capacity of large-scale electricity generation, CHP and generation from RES have been successfully achieved, however private investments were smaller than estimated.

Under the 3rd CSF, OPE was replaced by the OPCOM for the project period 2000–2006. Within OPCOM, 276 proposals for RES, CHP and energy efficiency projects have been approved, with a total budget of EUR 1,032 billion. Investments in RES and CHP with a total capacity of 930 MW and electricity production of 3.4 TWh were subsidized at 30–50% of the eligible costs. For electricity generation project proposals, the prerequisites for approval include either a production licence or a positive recommendation from the RAE to the Ministry of Development. Implementation of the OPCOM funded projects is estimated to reduce CO_2 emissions by 3.95 Mt in 2010.

OPCOM applies not only to the energy sector but also to a variety of other economic activities. The four sub-programmes with energy objectives are described in table 9, below.

Table 9: Sup-programmes with Energy-related objectives under OPCOM 2000-2006

	Sub-programmes	Energy objectives
1	Support and encouragement of entrepreneurship	Increased use of RES and CHP of entrepreneurship; energy conservation; fuel substitution; environmental protection.
2	Promotion of energy efficiency in enterprises	Improvement of the quality and management of CHP, RES and energy conservation technologies; increased competitiveness of Greek energy technology.
3	Security of energy and promotion of liberalised energy markets	Energy infrastructure to support security of electricity supply in the islands and security of gas supply; reinforcement of energy infrastructure to further promote electricity generation from RES; improved operation of the liberalised electricity market; support for the establishment and operation of the RAE and HTSO S.A.; preparation for gas market liberalisation.
4	Energy and sustainable development	Environmental-friendly transmission and use of energy; rational use of natural resources.

Exploitation of RES is among the key energy policy priorities for Greece; the OPE, OPCOM and Development Laws have provided important investment cost subsidies, in this respect. The mitigation effect of adopted polices and measures to promote RES in electricity generation was estimated at 2.11 Mt CO_2 eq; planned policies and measures would further reduce emissions by 4.4 Mt CO_2 eq. Moreover, construction of wind energy projects in Greece, in 2005, has attracted foreign investment amounting to over EUR 85 million; both Greek and foreign investors have demonstrated particular interest in carrying out large-scale investments in wind and solar parks as well as in small hydro plants.

Under YPEHODE, the Operational "Environment" Programme (OEP) 2000-2006, within the 3rd CSF, includes Priority Axis 4 on "Air and noise pollution" with a total budget amounting to EUR 21,473 million with approximately EUR 16,105 million coming from EDRF, that aims, among other things, to the reduction of air emissions especially in urban areas, abatement of pollution from energy and fuel combustion point or diffused sources and meeting national obligations under the UNFCCC and Montreal Protocol on Ozone layer protection.

Further expansion of the Greek natural gas network is also being supported and implemented with a very high rate: since 2005 and over four years, PGC S.A. has been and will be realising investment programmes of approximately EUR 400 million financed by its shareholders' equity, national and EU funding.

■ Cooperation

The general aim of Greece's cooperation policies focus at establishing strong bilateral and regional collaborations as well as its role and position as an important player in a crossroad connecting Eastern and Western energy markets. Greece's active participation in the wider regional electricity and natural gas networks is one of the pillars of the country's energy policies to which end a series of projects and initiatives are being promoted. The following are indicatively mentioned:

(i) The total volume of international electricity to and from Greece amounted to 4.9 and 2 TWh respectively in 2004. Greece both exported electricity to and imported electricity from Italy, Albania, FYROM and Bulgaria through the upgrading of existing electricity interconnections. Greece has been reconnected with Western Europe, after the line with Croatia was repaired.

(ii) The construction of the first actual electricity interconnection line linking the power grids of Greece and Turkey, of a total carrying capacity of 1000MW, to be completed in 2007, has been agreed in 2006 and is promoted at a fast pace. In parallel, the construction of a second interconnection line of a 500MW capacity with Italy is being explored.

(iii) In April 2005, Energy Ministers of Greece, Bulgaria and Russia signed a trilateral Protocol of Cooperation for the construction of an oil pipeline connecting the ports of the cities of Burgas (Bulgaria) and Alexandroupoli (Greece) for the transferring of Russian oil from the Black Sea to the EU, USA and Asian markets through Greece. The pipeline's capacity, with a total length of 280 km, reaches 35 million tons yearly with the possibility for a further extension to 50 million tons; its construction is expected to be completed by the end of 2009 and its total budget reaches EUR 750-800 million.

(iv) Greece is currently developing a gas market to diversify its energy supply and to reduce the environmental impacts of electricity generation. Natural gas imports began in September 1996, when the first deliveries of Russian gas were made via a new high-pressure pipeline from Bulgaria. Imports of LNG from Algeria began in February 2000 after a LNG terminal at Revithousa (near Athens) started operation in November 1999. In 2000, Russian imports totalled 1.54 billion m^3 and Algerian imports 0.51 billion m^3, whereas for 2004 total imports from Russia amount to 2 billion m^3 and those form Algeria to 0.5 billion m^3.

(v) In April 2004, Greece ratified a Bilateral Agreement with Turkey for the construction of a transmission pipeline for the transportation of natural gas via and the procurement of natural gas from Turkey. The Greek-Turkish natural gas transmission pipeline, the construction of which begun in late 2005 and which is expected to be in operation in the beginning of 2007, constitutes a very important project: in combination with the existing supply of natural gas from Russia via Bulgaria and the supply of LNG from Algeria, it will contribute to the further penetration of natural gas in the Greek energy market. This pipeline, with a total length of 300 kilometres, stretches from Komotini (Northeastern Greece) to Karacabey in Turkey. The pipeline will have an initial transfer capacity of 3-3.5 billion m^3 of natural gas from the Caspian region, with the possibility of extension of up to 11 billion m^3 annually. The budget for the construction of the 90 km Greek section of the pipeline is estimated at approximately EUR 80 million.

(vi) In November 2005, a bilateral Agreement between Greece and Italy was signed for the construction of a Greek-Italian natural gas pipeline linking the two countries' systems, with initial capacity of 8 billion m^3 of natural gas with a possibility for further extension. Gas will be transmitted from Komotini to Nea Mesimvria in western Greece, via the existing grid, and with a new constructed pipeline of 300 km, to Stavrolimenas (western Greece). Construction of the submarine part of the pipeline of 212 km, from Stavrolimenas to Italy, is estimated to EUR 300 million, to be completed by the end of 2009. This construction, already included in PGC S.A.'s investment plan, is of major financial and geopolitical importance, as it will create a key channel for the transportation of natural gas from the East and the Caspian region to the western markets. The project's feasibility study has already been completed and PGC S.A. has already signed a Memorandum of Understanding (MoU) with the Italian company "Edison", forming a new company entitled "Poseidon", to undertake the construction of the pipeline.

(vii) The country's active role in the promotion of the EU initiative for the creation of the «Energy Community of South East Europe», that aims to extend the EU internal energy market to the South

East European region, has turned Greece into an important player concerning energy affairs in the wider area of the Balkans. The main goals of the Community are to create a stable and regulatory market framework capable of attracting investment; to create a single regulatory space for trade; to enhance security of supply; to improve the environmental situation and to develop electricity and gas market competition on a broader geographical scale. To this end, all Southeast European countries agreed to adapt their national legal frameworks to the EU one and to set up a joint structure for monitoring the market, by signing a MoU, in Athens in November 2002. In March 2003, the MoU was extended to cover also natural gas, as well as the new EU electricity and gas Directives. With a need to put in place a more binding mechanism, the Energy Community Treaty was consequently signed in Athens in October 2005, by Italy, Hungary, Slovenia, Bulgaria, Romania, Albania, Bosnia-Herzegovina, Croatia, Serbia, Montenegro and FYROM. Donors also play an important role given the considerable investment load needed: it is expected that in the coming 15 years investments of over EUR 21 billion will be realised in the region. Greece has undertaken the headquarters for both the Forum for the Development of Electricity Networks in the region, as well as that of the Regulatory Board of South East Europe.

PPC S.A. has also developed a long tradition of co-operation with the electricity companies of other South East European countries, focusing on the study and construction of interconnections among the electricity systems of neighbouring countries, followed by the development of commercial relations through the exchange and the buying/selling of power (e.g. existing interconnections with Albania, Bulgaria, FYROM and Italy). PPC S.A. has also signed Agreements of Co-operation with electricity companies of various countries in the broader geographic region of Greece.

Greece cooperates actively, with other EU MS, in the dissemination and promotion of RES and energy efficiency projects. The policy of the Ministry of Development incorporates and supports several EU programmes, such as Intelligent Energy - Europe (2003-2006), TACIS, PHARE, as well as other EU initiatives such as the "EU Energy Initiative-Johannesburg Renewable Energy Coalition (JREC)" launched in 2002 during the World Summit on Sustainable Development (WSSD) and the "Energy Charter" launched in 2003.

Greece has singed and ratified MoUs with Cyprus (ratification July 4, 1996), Turkey (entry into force June 30, 2001), Bulgaria (entry into force July 15, 2005) and Albania (entry into force July 19, 2005) covering, inter alia, issues of bilateral cooperation and experience exchange on environment and sustainable development also relevant in the "sustainable energy context". MoUs have also been signed, but not yet ratified, with Georgia and FYROM. Greece has also ratified the Aarhus Convention and respective Protocols on access to environmental information, public participation in decision making processes and access to justice with Law 3422/2005.

The Greek Government represented by the Ministry of Economy and Finance contributed to Global Environment Fund's (GEF) Replenishments as following:

- To the First Replenishment of GEF for the period from July 1, 1994 to June 30, 1998, Greece contributed USD 5 million, allocated in four equal yearly installments;
- For the Second Replenishment of GEF (July 1, 1998 to June 30, 2002), Greece contributed SDR 4 million while for the Third Replenishment (July 1, 2002 to June 30, 2006), Greece's contribution amounted to EURO 5.73 million, allocated also in four equal yearly installments;
- Finally, for the Fourth Replenishment of GEF (July 1, 2006 – June 30, 2010), Greece committed to contribute EURO 5.73 million, allocated in four equal yearly installments.

Financial resources have been provided by Greece to bilateral and regional funding, as well as to multilateral institutions and programmes including on capacity-building activities relating to technology transfer for limiting/reducing GHG emissions, implementation of the Convention and preparations for effective participation in the Kyoto Protocol. In particular, contributions to United Nations Conventions and their secretariats are channelled through various competent ministries. YPEHODE contributes annually with the amount of approximately USD 86,000 to the UNFCCC Fund. During 2000-2004 has contributed annually with the amount of USD 10,000 to the FI Trust Fund for participation in the UNFCCC process. In 2005, it contributed with USD 36,000 for the support of the Kyoto Protocol implementation, while in 2006, with the amount of USD 65,631.

Greece's net bilateral Official Development Assistance (ODA) disbursements have increased almost fourfold from USD 27 million to USD 99 million since 1996 to reach over USD 226 million in more recent years, representing 0.2% of its GDP. Greece's contribution to bilateral development assistance is centred on its geographic region, the security and welfare which are closely aligned with stability and economic prosperity in the countries of the Balkans, the Black Sea and the

Mediterranean. Rational use of energy, RES as well as energy security have been some of the field areas of the HELLENIC AID's (under the Hellenic Ministry of Foreign Affairs) «Second Medium Term Five-Year Development Cooperation Programme» (2002-2006). During the period 1999-2003 the total amount allocated to energy-related development assistance projects in the context of sustainable development by "HELLENIC AID" was USD 0.49 million. The projects concerned were related to energy generation and supply, mainly gas distribution. Recipient countries included Bulgaria, Romania, Armenia and Serbia-Montenegro. In 2000, YPEHODE launched the implementation of 6 additional projects, with a total budget of approximately EUR 1.11 million, focusing on assisting the efforts of 6 Balkan countries to develop the required capacities, infrastructure and institutions to address climate change, in the framework of the Kyoto Protocol requirements, including assessment of possibilities for developing Kyoto Protocol's flexible mechanisms between Greece and partner countries.

In the context of the WSSD Type II initiatives and the Johannesburg Plan of Implementation, Greece leads, funds, coordinates and participates in the assessment of climate change impacts in African countries; this Type II initiative promoted by Greece (with a start up budget by YPEHODE of EUR 125,000) and implemented by NOA, aims to contribute to the implementation of the UNFCCC in Africa.

Furthermore, during the Euro-Mediterranean Summit held in Barcelona in November 2005, on the occasion of the 10th Anniversary of the Euro-Mediterranean Partnership, the results of which Greece strongly supports, has stressed, inter alia, the importance of implementing sub-regional energy projects to strengthen the Euro-Mediterranean energy market, such as: the progressive integration of Maghreb electricity market with the EU electricity market, the integration of Middle East gas markets and several other important pipeline connections to which Greece will seek to play a key role.

Finally, Greece, in the context of the 14th and 15th Sessions of the UN Commission on Sustainable Development (UNCSD – 2nd cycle) on energy, air pollution, climate change and industrial development, follows closely all related initiatives and fora in the field of development cooperation aiming at highlighting the role of energy for achieving the Millennium Development Goals (MDGs) and supporting the development process of least developed countries particular African ones. Based on the outcomes of the High-level Meeting on "Integrating Energy Interventions into Development Cooperation" organised by the Austrian Presidency of the EU on January 2006, the Greek Development Assistance and Cooperation will seek to adjust its objectives so as to better address issues pertaining to: the wider access to energy services for the poorest parts of societies; promotion of biofuels; development assistance for GHG emissions' reduction; promotion of RES, clean technologies and PPPs; fair use of the Kyoto mechanisms; scepticism regarding use of nuclear power; and promotion of energy security and energy autonomy for developing and least developed countries. Such elements are expected to be adequately addressed within the "Third Five-Year Development Cooperation Programme" (2007-2011), currently under preparation.