



# **ENERGY 21**

## **“INTELLIGENT ENERGY – EUROPE”**

### **STRATEGY FOR ENERGY SUSTAINABILITY & STRENGTHENING OF THE PLANNING OF THE ENERGY USE IN SUSTAINABLE OR POTENTIALLY SUSTAINABLE MUNICIPALITIES**

#### **DELIVERABLE 10**

#### **Database of Energy Prediagnosis in each territory**

**VOLOS, GREECE  
SEPTEMBER 2007**

## CONTENTS

|           |   |           |
|-----------|---|-----------|
| <b>1.</b> | <b>Executive Summary.....</b>   | <b>4</b>  |
| 1.1       | Geographic and Climate Profile.....                                     | 4         |
| 1.2       | Demographic.....  | 4         |
| 1.3       | Economy.....  | 5         |
| <b>2.</b> | <b>Energy Sector.....</b>   | <b>6</b>  |
| 2.1       | Solid Fuels.....  | 6         |
| 2.2       | Oil Sector.....   | 7         |
| 2.3       | Natural Gas.....  | 8         |
| 2.4       | Renewable Energy.....   | 9         |
| 2.5       | Electricity.....  | 10        |
| 2.6       | Market Liberalization .....   | 11        |
| 2.7       | Cooperation with Neighboring States .....                               | 12        |
| <b>3.</b> | <b>Public helps for renewable sources of energy and efficiency.....</b> | <b>14</b> |
| 3.1       | Scopes & Aims.....  | 14        |
| 3.2       | Background & Experiences Encountered.....                               | 15        |
| 3.3       | Energy Production License .....   | 16        |
| 3.4       | Environmental Approvals .....   | 17        |
| 3.5       | Installation & Operation Permits.....                                   | 17        |
| 3.6       | Access to the Grid & Fit.....   | 19        |
| <b>4.</b> | <b>Greek Environment.....</b>   | <b>21</b> |
| 4.1       | Greenhouse gas emissions.....   | 21        |
| 4.2       | Energy consumption.....   | 21        |
| 4.3       | Renewable electricity.....  | 22        |
| 4.4       | Emissions of acidifying substances.....                                 | 22        |
| 4.5       | Emissions of ozone precursors.....                                      | 22        |
| 4.6       | Freight transport demand.....   | 22        |
| 4.7       | Share of organic farming.....   | 23        |
| 4.8       | Municipal waste.....  | 23        |
| 4.9       | Use of freshwater resources.....  | 23        |
| <b>5.</b> | <b>Volos.....</b>   | <b>25</b> |
| 5.1       | Industry.....   | 25        |
| 5.2       | Agriculture.....  | 26        |
| 5.3       | Tourism.....  | 26        |
| 5.4       | Transport.....  | 27        |
| <b>6.</b> | <b>Profile Summary .....</b>  | <b>28</b> |
| 6.1       | Country Overview.....   | 28        |
| 6.2       | Economy.....  | 28        |
| 6.3       | Energy.....   | 28        |
| 6.4       | Environment.....  | 29        |
| 6.5       | Oil & Gas Industry.....   | 29        |



|           |  |           |
|-----------|--|-----------|
| <b>7.</b> | <b>Energy Indicators for Volos .....</b> | <b>31</b> |
| 7.1       | Indicators of Energy Production.....     | 31        |
| 7.2       | Indicators of Energy Consumption.....    | 32        |
| 7.3       | Indicators of Transport Sector.....      | 33        |
| 7.4       | Save Indicators.....                     | 34        |
| <b>8.</b> | <b>References.....</b>                   | <b>35</b> |



## 1. Executive Summary

---

### 1.1 *Geographic and Climate Profile*

The climate of Greece can be categorised into three types that influence well-defined regions of its territory. The Pindus mountain range strongly affects the climate of the country by making the western side of it (areas prone to the south-westerlies) wetter on average than the areas lying to the east of it. The three distinct types are the Mediterranean, the Alpine and the Temperate types. The first one features mild, wet winters and hot, dry summers. The Cyclades, the Dodecanese, Crete, Eastern Peloponessus and parts of the Sterea Ellada region are mostly affected by this particular type. Temperatures rarely reach extreme values although snowfalls do occur occasionally even in the Cyclades or the Dodecanese during the winter months. The Alpine type is dominant mainly in the mountainous areas of Northwestern Greece (Epirus, Central Greece, Thessaly, Western Macedonia) as well as in the central parts of Peloponnese, including the prefectures of Achaia, Arcadia and parts of Laconia, where extensions of the Pindus mountain range pass by). Finally, the temperate type affects Central Macedonia and East Macedonia and Thrace; it features cold, damp winters and hot, dry summers. Volos is located in a transitional area featuring both the Mediterranean and the Temperate types. It averages about 42 cm of rain annually

### 1.2 *Demographic*

According to the National Statistical Service of Greece, Greece's total population in 2005 was 11,082,752, of whom 5,486,632 were males and 5,596,119 females. As statistics from 1971, 1981 and 2001 show, the Greek population has been aging the past several decades. The birth rate in 2003 stood 9.5 per 1,000 inhabitants (14.5 per 1,000 in 1981). At the same time the mortality rate increased slightly from 8.9 per 1,000 inhabitants in 1981 to 9.6 per 1,000 inhabitants in 2003.



### **1.3 Economy**

Today, the service industry (74.4%) makes up the largest, most vital and fastest-growing sector of the Greek economy, followed by industry (20.6%) and agriculture (5.1%). The tourism industry is a major source of foreign exchange earnings and revenue accounting for 15% of Greece's total GDP and employing (directly or indirectly) 659,719 people (or 16.5% of total employment). In 2005, Greece welcomed almost 18 million visitors and in 2006 that figure almost reached 20 million. The Greek banking & finance sector is also an important source of revenue and employment and Greek banks have invested heavily in the Balkan region. The manufacturing sector accounts for about 13% of GDP with the food industry leading in growth, profit and export potential.

High-technology equipment production, especially for telecommunications, is also a fast-growing sector. Other important areas include textiles, building materials, machinery, transport equipment, and electrical appliances. Construction (10%GDP) and agriculture (7%) are yet two other significant sectors of the Greek economic activity.

The shipping industry is a key element of Greek economic activity. Given that Greece is a peninsula, shipping in ancient times was the natural way for Greeks to reach their neighbouring people, trade with them and expand by establishing colonies. Today, shipping is one of the country's most important industries. It accounts for 4.5% of GDP, employs about 160,000 people (4% of the workforce), and represents 1/3 of the country's trade deficit.

## 2. Energy Sector

---

The Ministry of Development and the General Secretariat for Energy, in particular, is the state authority that monitors all activities relating to the energy sector. Greece has limited primary energy sources, which, apart from coal (lignite) do not contribute significantly to the national energy balance. The oil and gas fields discovered in the early seventies were relatively small and are being rapidly depleted, whilst the available renewable energy potential is yet to be developed. Furthermore, Greece is highly dependant on imported petroleum, which accounts for almost 69% of its primary energy supply. Indigenous brown coal (lignite) contributes 32% to energy supply with the balance stemming from renewable energies, mainly hydro and biomass. Domestic oil and gas also provide a small proportion. In addition to the high degree of energy dependency, Greece has also the highest energy elasticity in the EU. In 1996, final energy demand was 16.9 Mtoe, up 45% compared to 1980 levels. Industry accounted for 27%; transport 38% and the domestic-tertiary sector 35%. Total energy supply was 25 Mtoe. Energy infrastructure has been expanding to meet continually increasing national energy needs. The on-going construction of new power production units is particularly important in this context.

### 2.1 *Solid Fuels*

Coal reserves are estimated at 2.7 billion tons. Lignite is the main type of solid fuel used in Greece. The Institute of Geological and Mineral Exploration has exclusive right to explore for lignite and other mineral deposits in Greece while the Greek State has exclusive rights over the development and exploitation of lignite deposits. Except for a few private lignite-mining operators (which also provide lignite to the PPC), the state has assigned all rights to the Public Power Corporation (PPC), at no charge. The PPC has priority in the development and exploitation of all coal-fields. Ninety nine percent of the lignite consumption is used for power generation.



## **2.2 Oil Sector**

The Greek State owns the petroleum and other hydrocarbon sources. In turn, the state administers its right to explore, develop and produce fields through the Hellenic Petroleum Corporation (HP former DEP), a public company that is responsible for all activities relating to crude oil and oil products. A 20% share of the company was privatised in 1998, whilst 80% remains in the hands of the State. The Hellenic Petroleum Corporation can lease exploration and exploitation areas to third parties on the basis of royalty/income tax contracts. DEP-EKY, a subsidiary of the Hellenic Petroleum Corporation is responsible for exploration-exploitation activities. Oil exploitation is carried out by DEP-EKY in consortium with private companies. Oil production in Greece, has been declining steadily since it peaked at 25,000 bbl/d in the mid-1980s. In 1997, 14,000 bbl/d of oil were produced. In 1996, the Hellenic Petroleum Corporation awarded four exploration licenses to Enterprise Oil, Union Texas Petroleum, MOL and Triton Energy.

The Ministry for Development is the state authority that monitors the oil products market. Gasoline, gas oil and heavy fuel oil are the three major types of oil products consumed. There is free competition in imports and exports of oil products; but essentially, the importation and exportation of crude oil is an oligopoly. The public Hellenic Petroleum Corporation and the private companies Motor Oil and Petrola are the only importers of crude oil. Imported crude oil and products are processed in four refineries whose combined capacity is 19.7m tons/year. The combined production of oil products covers 56% of market needs. The Hellenic Petroleum Corporation controls two of the four refineries through its subsidiaries ELDA SA and EKO SA. These refineries are to be modernised and expanded by 2001 and they cover 58% of the refined products market. The remaining two refineries belong to private companies: MotorOil, which accounts for 19% of the market and Petrola, which accounts for 23% of the refined products market. The three refinery operators, namely the Hellenic Petroleum Corporation, MotorOil (private) and Petrola (private), are also involved in crude oil storage.



By setting ceilings, the Ministry of Development typically regulates prices. The market turnaround accounts for more than 25% of all commercial sales in Greece. In addition to ELDA-E and EKO, other key players are the private companies BP/Mobil, Shell, , Texaco, AVIN etc. Free competition also exists in the distribution of oil products. ELDA-E and EKO have an 18% share of the retail market. The remaining market needs are covered by private companies BP/Mobil (26%), Shell (12%), Texaco (6%) and others (38%). Greece has a number of oil tanker receiving terminals. In 1997, an agreement was concluded for a 280 km long oil pipeline, with a capacity between 600,000 bbl/d and 800,000 b/d, linking the Bulgarian port of Burgas with Alexandroupolis in Greece. In addition, a study is being carried out for a 230 km long crude oil pipeline linking Greece and the FYROM with a capacity of 200,000 bbl/d.

### **2.3 Natural Gas**

In 1987, Greece decided to introduce natural gas into its energy system and supply contracts for the importation of natural gas have been signed. The Public Gas Corporation - DEPA is a public company that has a monopoly for importation, transmission and storage of natural gas in Greece. It is also partially involved in its distribution. DEPA has already constructed a total of 1,775 km of medium and low-pressure networks. Approximately 1,000 km of low-pressure networks have already been constructed in the areas of Attica, Thessaloniki and Thessaly.

DEPA has recently invited international gas companies to participate in the further development and the management of gas distribution networks. The market structure will probably be that of regional monopolies, each covering the needs of specific geographical areas. These companies will constitute a consortium with DEPA and local authorities. DEPA has signed an agreement with ENI to study the feasibility of connecting the Greek transmission system with the Italian one via the construction of an offshore pipeline through the straits of Otrando. The exploration and exploitation activities concerning Natural Gas are monopolized by DEP-EKY (the subsidiary of the Public Petroleum Corporation). A memorandum has been signed between DEPA and SHELL to study the feasibility of transporting natural gas from Turkmenistan and other



neighboring Countries. An agreement has already been signed by the Organisation for Urban Buses in Athens (OASA) for 295 buses powered by natural gas engines.

## **2.4 Renewable Energy**

To meet European Union mandates, renewable electricity generation projects are on the rise in Greece. The Centre for Renewable Energy Sources (CRES), supervised by the Greek Development Ministry, was created in 1987 to promote renewable energy. In aiming to meet its commitments under the Kyoto protocol, Greece plans to have renewable energy sources make up 20 percent of its energy needs by 2010, compared with 10 percent in 2006.

The CRES estimates that 15 percent of the country's electricity needs can be produced by wind farms, with installed wind-power capacity possibly expanding to 2,000 MW by 2010. Wind farms are already located on the Greek islands of, Crete, Evia, Andros, and Samos. In May 2006, Greek wind farm operator Rokas announced that it would invest \$3.1 billion in a wind farm and power transmission system. The company plans to install 44 wind parks with a combined generating capacity of 1,363 MW and to link them to the Chios, Lesbos, and Limnos islands in the northern Aegean. The project is one of the biggest investments in wind energy in the world. Greece currently has 475 MW of installed wind-power capacity, with Rokas accounting for 40 percent of total Greek wind power production.

The use of solar technology in Greece has almost tripled since 2000, and an EU report, "Photovoltaics 2010," indicates that Greece could use solar power to meet one-third of its energy requirements. A 50-MW solar power plant, the first grid-connected solar system of a considerable size, is being constructed in Crete and a 100-kilowatt PV park is planned for the island of Gavdos. In 2006, Rokas announced plans to invest between \$190- \$257 million in solar plant construction. The company aims to set up solar power stations of between 30 MW and 40 MW capacity throughout Greece. According to Rokas, solar power energy is significantly more



expensive than wind power, with estimates per MW of solar power at \$6.4 million, compared with \$1.2 million per MW of wind energy.

## **2.5 Electricity**

The electric power industry in Greece is dominated by the state owned electric utility, the Public Power Corporation (PPC). The PPC currently monopolises electricity transmission and distribution. Although the legal framework (L 2244/94) has been modified to encourage private power production, the PPC still generates 98% of all electricity. With huge investments in lignite mining, the company remains vertically integrated to a great degree.

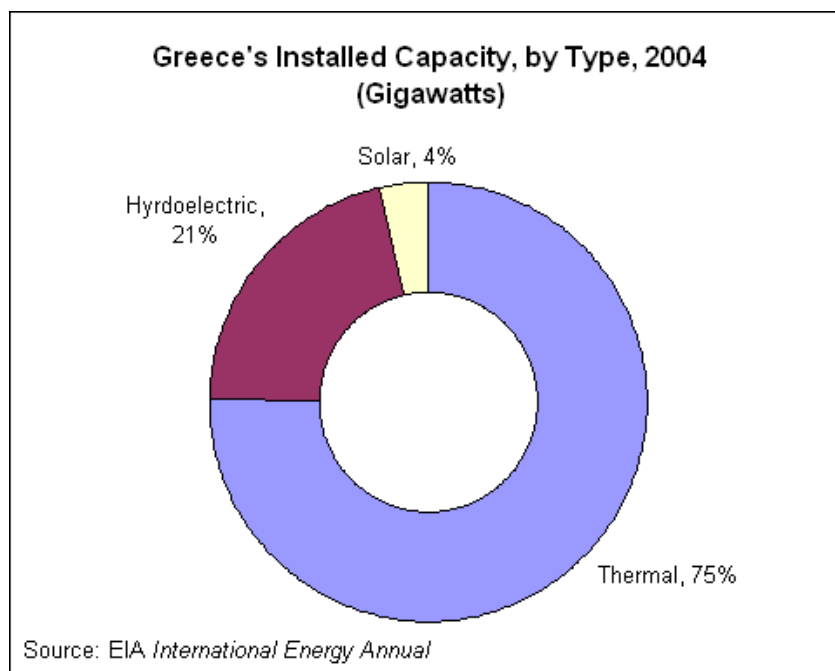
Per capita power consumption in Greece has increased about 4% per year between 1990 and 1998 reaching 4,260 kWh in 1998. The PPC is pressing ahead to bring up to 400 MW/year on line over the next 5 years. At the end of 1998, the capacity of the PPC was 10,296 MW, half of which was lignite-fired steam-electric, 2,859 MW hydroelectric, and the remainder oil-fired and gas-fired. The isolated island systems are mainly diesel engine and gas-turbine based, but renewable energy sources are of increasing importance. PPC's net generation in 1998 totaled 43.2 TWh, whilst 1,600 GWh was purchased from neighbouring countries.

Greece is an exceptionally difficult region for electric power development, with its rugged topography and numerous islands. The mainland transmission system consists of 66, 150 and 400 kV networks. The total length of EGV lines at 66 kV and above, including isolated island transmission systems, is 10,200 km. The PPC has an on-going programme for connecting some of the closer islands directly to its mainland grid. Greece has been unable to import electricity from the EU since 1991, when power lines in former Yugoslavia were destroyed. The 500 MW submarine link planned between Italy and Greece has been delayed greatly. Other options are being examined. Several gas-fired retrofit projects are underway or planned at existing power plants as the government tries to offset the use of lignite for power generation. Plans for the development of electric power include the construction and/or completion

of 3 natural gas and 4 lignite-fired power stations, a bituminous coal-fired unit, as well as a number of wind, biomass, hydroelectric and solar energy units. Changes in support measures for renewables are likely to increase the role of non-PPC generators in renewable energy supply.

## 2.6 Market Liberalization

The Electricity Market Liberalisation Law was passed in 2001 and legally opened 37 percent of the Greek power market to competition. The law enabled the entry of third-parties to compete with PPC (PPC controls Greece's electric production, transmission, and distribution) and required that tariffs must cover all costs and provide reasonable profit. As a result, the generation, distribution, and retailing operations of PPC were unbundled, and the independent transmission system operator, HTSO, was established. By 2006, 70 percent of the market was open, and Greece plans to completely deregulate its market by January 2007. However, in April 2006, Greece was censured and faces legal action by the EU Commission for the country's absence of sufficient legal and management functions to deregulate the country's transmission and distribution systems in the electricity market.





Since PPC lost its legal monopoly, the Greek government has issued licenses for over 2,750 MW of private thermal generating plants. However, most private producers have been unable to finance plants. As a result, PPC still produced 96 percent of Greece's electricity in 2004. Apart from refurbishments, the Greek government has legally prevented PPC from bidding for tenders to build the first round of new capacity, totaling 900MW, until 2010. However, the company has two already-approved combined cycle gas turbine (CCGT) plants that are under construction and has been given approval for a major refurbishing of 1,600 MW of capacity at its current plants.

In 2006, Spain's Iberdola bought a 70 percent stake in Korinthos Power from Motor Oil Corinth Refineries and plans to cooperate in the tenders to develop CCGTs in southern Greece. One tender for a 400 MW CCGT at Aliveri was launched in May 2006, and two additional plants with a combined capacity of 900-1000 MW will be launched by 2007. Investment in the three CCGTs is estimated at roughly \$750 million.

## **2.7 Cooperation with Neighboring States**

Greece's power network is currently connected with the networks of Albania, FYROM, and Bulgaria. In June 2001, energy ministers from Albania, Bosnia and Herzegovina, Bulgaria, Greece, FYROM, and Romania signed a memorandum for the creation of a competitive regional electricity market (REM) with over 55 million customers by 2005-2006. In July 2002, Greece and Italy completed a 500-MW link under the Ionian Sea to connect their national power grids. In October 2005, Greece signed the Treaty Establishing Energy Community between the European Union and South Eastern Europe in Athens. The other parties to the treaty are Albania, Bosnia-Herzegovina, Bulgaria, Croatia, FYROM, Montenegro, Romania, Serbia and the UN Interim Administration in Kosovo. Greece, along with Austria, Hungary, Italy and Slovenia, participates in a non-voting capacity. The Energy Community creates the world's largest integrated competitive electricity market of the European Community, with approximately 500 million consumers.



Improved Greek-Turkish relations also have benefited Greece's electricity sector. In March 2002, Greece and Turkey signed a bilateral agreement to connect their electricity grids along the Greek-Turkish border. The interconnector became operational in 2006, and along with the planned gas interconnector and a proposed CCGT plant in Thrace, Greece will be able to both import gas from and export electricity to Turkey in a long-awaited cooperation scenario. Electricity will be exported via a 400-kilovolt (kV) transmission line between Filippi (Greece) and Hamidabad (Turkey) that is expected to be operational by 2007. In addition, a new cross-border interconnection with Bulgaria is planned in order to relieve import congestion, as well as a second grid connection with Italy.

### 3. Public helps for renewable sources of energy and efficiency

---

On 22 June 2006, the Hellenic Parliament approved Law 3468 referring to, “Production of Electricity from Renewable Energy Sources, High Efficiency Cogeneration of Heat and Power and Other Devices”. Law 3468 was published in the Official Gazette of the Hellenic Republic, see [1], and is in effect since then.

#### 3.1 *Scopes & Aims*

A main scope of the New Law 3468 is to establish an adequate legislative and regulatory framework in order to support investments in the RES and High Efficiency CHP energy sectors and eventually increase the penetration of these resources in the energy mix of the country. Aiming at conveying to the Hellenic legislation Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the “Promotion of Electricity Produced from RES in the Internal Electricity Market”, the National target is set to a 20.1% RES contribution on the total electricity production by 2010. For 2020 the target is 29%. In the internal electricity market, the production of electricity from RES and High Efficiency Cogeneration of Heat and Power (HE–CHP) are promoted in priority over other means of power production with specific regulations and principles.

High Efficiency CHP is meant a cogeneration process that ensures primary energy saving of at least 10% compared to the heat and electricity produced within the framework of separate processes as well as, the production from Small (up to 1MWe) and Very Small (up to 50kWe) scale cogeneration units that ensure primary energy saving irrespective the percentage. The calculation of the primary energy savings is done using the European Directive 2004/8/EC.

The utilisation of the vast renewable energy resource of the country, mainly the wind and solar potential, together with complying with the environmental targets of the Kyoto protocol are promoted as well. The attraction of large scale energy investments



is also envisaged, in parallel with simplification measures for the necessary licensing procedures.

### **3.2 Background & Experiences Encountered**

Act 2244 of 1994 “Regulation of issues related with the production of electrical power from RES and conventional fuel and other provisions”, established the legislative environment for the development of RES in Greece, providing access to the grid for individual energy producers.

A specific regulatory framework for RES was introduced by Act 2773 of 1999, establishing the Regulatory Authority for Energy (RAE) and initiating the deregulation of the electrical energy market. The so-called, “Code for the Management of the System and Transactions of Electrical Energy”, regulates the framework of the energy sector in Greece. The code is valid for grid-connected RE applications coupled to MV or HV lines of the utility. Before the New Law 3468, RAE determined the Feed-in Tariffs from RE power stations, in correlation with the development of electricity price levels.

Concerning support schemes, the Operational Programme for Competitiveness (OPC) has been the major financial tool for developing RE investments, PV plants included. In its last phases, OPC was open for the period 2000 to 2006 and in the latest call, subsidies for PV varied between 40% and 50%, depending on the geographical location of the application.

Act 2244 established the legislative environment for the development of RE resources but proved to be insufficient and a number of modifications and amendments were introduced aiming to resolve important technical and processing issues. In the last decade, some 13 laws, common ministerial decisions, circular decisions, etc. were put in place. Practically, the regulatory and legislation environment was extremely confusing and bureaucratic, restraining the sustainable development of RES in the country.

### **3.3 Energy Production Licence**

RAE receives the applications for issuing the Energy Production License by the interested bodies. In the assessment process, RAE may collaborate with the system Operator in cases that technical details on grid connection issues must be elaborated. If required by the legislation, RAE must forward to the responsible authority the so-called Preliminary Environmental Impact study (PEI) which accompanies the application. Within ~60 days, the responsible authority will have to respond back its opinion to RAE on the so-called Preliminary Environmental Assessment and Evaluation (PEAE).

RAE is obliged to submit an opinion report on an application for an EPL to MoD within 4 months after receiving the response on PEAE. The final decision is then issued by the minister of MoD within a period of 15 days. The Energy Production License has a validity of 25 years and is renewable for an equal time period thereafter.

Exemptions from the requirement of issuing an Energy Production Licence are given in the following cases:

- a) Geothermal power plants of installed power  $\leq 0.5\text{MWe}$ .
- b) Biomass or bio-fuel plants of installed power  $\leq 100\text{kWe}$ .
- c) PV stations of nominal capacity  $\leq 150\text{kWp}$ .
- d) Wind power parks of installed power:  $\leq 20\text{kWe}$  for plants in isolated microgrids;  $\leq 40\text{kWe}$  for plants on the remaining non-interconnected islands;  $\leq 50\text{kWe}$  for plants in the interconnected system.
- e) Power plants of installed power  $\leq 5\text{kWe}$  operated by educational or research institutions of the public or private sector exclusively for RTD purposes.
- f) Power plants installed by CRES for as long as these plants operate in order to carry out certification work or measurements.
- g) Other RES power plants of installed power  $\leq 50\text{kWe}$ .

Except point f) above, the exemptions are valid provided that no grid congestion occurs. The case of exemption from receiving an Energy Production



License is certified by RAE within 10 working days after submission of a relevant application including all the necessary documents. Additionally, autonomous power plants of installed power  $\leq 5\text{MWe}$  are exempted from the issuing of an EPL. An exemption decision by RAE is not required for grid-connected RES or HE-CHP plants of installed power  $\leq 20\text{kWe}$  unless grid congestion on non-interconnected islands occurs, or autonomous plants of power  $\leq 50\text{kWe}$ . Practically, this means that small grid-connected PV systems of power below  $20\text{kWp}$  are excluded from the procedure to submit to RAE even an application for exemption, simplifying in this way the licensing procedures for installers in the household sector.

### **3.4 Environmental Approvals**

Specific environmental concern is taken in Law 3468 for the installation of power plants based on RES. The requirements have been published in the Official Gazette of the Hellenic Republic, see [2], and a summary of the most essential points for PV installations above  $20\text{kWp}$  nominal power are presented in this section. Photovoltaic systems below this power threshold are exempted from the environmental terms procedure.

### **3.5 Installation & Operation Permits**

An Installation permit is required for the setting or expansion of a RES or HE-CHP power plant. The Installation permit is issued by decision of the Prefecture General Secretary in the boundaries of which the plant shall be installed and within 15 days after the relevant application and all supporting documentation of the investor. In the case that the responsible Prefecture General Secretary does not issue the Installation permit within this strict time frame, responsible for its issuing is the minister of MoD to whom the interested body should submit a new application including the decision of the Environmental Terms Approval (ETA). Thereafter, the minister must issue the Installation permit within 30 days.

The validity of the Installation permit is 2 years and can be extended for another 2 years in the cases that at least 50% of the investment has been realised or in the

case that the project has not yet began for reasons provably irrelevant to the willing of the permit owner, all the necessary contracts for the procurement of hardware equipment have been signed with the suppliers.

Additionally, an Operation permit is required for the operation of RES or HE–CHP plants. This permit is granted by decision of the body that is responsible for issuing the Installation permit as described above, after the submission of a relevant application by the investor. The responsible authorities are responsible to certify the fulfilment of the technical terms of installation during the delivery phase and CRES to control on the operational and technical features of the plant equipment. Should these controls are positive, the Operation permit is issued within 15 days time frame and has a validity of 20 years, renewable for an equal period thereafter.

Issuing the Installation and Operation permits is not necessary in cases of exemption of the Energy Production Licence, see section 4.1 above. In any case, all power plants require an environmental permit according to the existing legislation. In the following Table 1, a summary of the licensing procedure is presented, together with the time frame indicated in Law 3468 and in [2].

Licences and permits required and timetable

| Description of Activity   | Days Required | Total Days |
|---|---------------|------------|
| 1. Issuing of PEAE  | 55            | 55         |
| 2. Issuing of ETA   | 85            | 140        |
| 3. Consultation of RAE to the minister of MoD on the EPL                  | ~90           | 230        |
| 4. Decision of the minister of MoD on the EPL                             | 15            | 245        |
| 5. Issue of the Installation permit from the Prefecture General Secretary | 15            | 260        |

| Description of Activity  | Days Required | Total Days |
|--|---------------|------------|
| 6. Issue of the Installation permit from the minister of MoD (if failure in 5. above)    | 30            | 290        |
| 7. Issue of the Operation permit from the authority that granted the Installation permit | 15            | 305        |

The days indicated in Table 1 are working days. Thus, 305 working days correspond to approximately 14 months total period.

### 3.6 Access to the Grid & Fit

During dispatching and provided that the safety of the System or the Grid is not endangered, the New Law 3468 obliges the Operator to give priority to RES power plants irrespective their installed capacity, except hydro plants of more that 15MWe. This applies in both the interconnected system and the non-interconnected islands. In order RES or HE-CHP plants to be integrated into the System or the Grid, including the non-interconnected islands Grid, the system Operator is obliged to sign an Electricity Sale Contract with the Energy Production Licence owner. This contract is valid for 10 years and may be extended for another 10 more years after a written declaration of the energy producer. Remuneration of the energy producers is based on a Feed-in Tariff (FiT) model, which is presented in Table 2 for the different technologies.

#### FiT in Law 3468 for RES and HE-CHP

| Power Supply Source | Feed-in Tariff, [Euro/MWh] |                            |
|---------------------|----------------------------|----------------------------|
|                     | Interconnected System      | Non-interconnected Islands |
| Wind                | 73.0                       | 84.6                       |
| Wind, off-shore     | 90.0                       | 90.0                       |
| Small Hydro <15MWp  | 73.0                       | 84.6                       |

| Power Supply Source | Feed-in Tariff, [Euro/MWh] |                            |
|---------------------|----------------------------|----------------------------|
|                     | Interconnected System      | Non-interconnected Islands |
| PV Solar <100kWp    | 450.0                      | 500.0                      |
| PV Solar ≥100kWp    | 400.0                      | 450.0                      |
| Other Solar <5MWe   | 250.0                      | 270.0                      |
| Other Solar ≥5MWe   | 230.0                      | 250.0                      |
| Geothermal, Biomass | 73.0                       | 84.6                       |
| Other RES           | 73.0                       | 84.6                       |
| HE-CHP              | 73.0                       | 84.6                       |

Pricing of the electricity produced is done on a monthly basis, except the case of power stations connected to the LV grid where pricing takes place every 4 months. For “self-producers”, tariffs presented in Table 2 are valid for a maximum power capacity of 35MW for the surplus energy fed into the grid with upper limit a 20% of the total energy produced by the plant on an annual basis. For hybrid power plants installed on non-interconnected islands, pricing is based on the MW power installed and is done monthly.

## 4. Greek Environment

---

Progress has been made integrating environment into sectoral and economic policies to reduce environmental pressures. The most important environmental issues in Greece are: land use, waste management and water resources management. The relatively non-degraded natural environment has a rich biodiversity, a large variety of habitats, high-quality bathing waters and coastal areas and relatively good air quality.

### 4.1 *Greenhouse gas emissions*

Greenhouse gas emissions increased steadily during the last decade, the most important gases being CO<sub>2</sub> and CH<sub>4</sub>. The production and use of energy, as well as waste disposal and agriculture are the primary sources of emissions. Recent projections indicate that with a consistent implementation of its 2003 plan Greece will come close to meeting its target. An upcoming evaluation of the effectiveness plan will indicate if, and to what extent, Kyoto mechanisms need to be used.

### 4.2 *Energy consumption*

Per capita demand for primary energy in Greece is lower than the EU average. The high energy intensity presents opportunities to reduce the energy demand through rational use of energy resources and the promotion of energy-saving technologies. Up to now, the Greek energy sector has been dependent on conventional fuels, contributing significantly to the release of atmospheric pollutants. More specifically, in the electricity production sector, the choice to exploit domestic lignite resources as an appropriate response to the energy crisis of the 1970s, needs reconsidering in the light of network integration, market liberalisation and environmental protection. The total operational electrical capacity of natural gas plants will be increased by 52 % by 2010, of hydropower plants by 18 % and of renewables by at least 100 % while the capacity of lignite plants will be decreased by 3%.

#### **4.3 Renewable electricity**

Renewable energy sources contributed 4.7 % of total energy demand in 2002 (5 % in 2003). Two-thirds of the total production comes in the form of heat from biomass and active solar systems, and the remaining third comes from hydropower plants and wind. It must be noted that electricity production from large hydro is largely affected by weather conditions (rainfall) and the availability of water in the reservoirs. The share of electricity from RES to total electricity consumption was 6 % for 2002, which was below the EU-15 average of 13.5 %. Due to high rainfall it was 9.6 % in 2003, almost half of the target set by the RES-E directive of 20.1 % by 2010.

#### **4.4 Emissions of acidifying substances**

Emissions of air pollutants increased following GDP growth with the exception of NOX and SO<sub>2</sub>. The reform and diversification of the energy sector offer:

- rational use and conservation of energy in the building sector;
- measures for the transport sector;
- measures for industry; and
- institutional and organisational measures.

#### **4.5 Emissions of ozone precursors**

Despite the partial decoupling of air pollutants from economic growth recorded during the last few years, considerable efforts are underway to ensure a permanent downward trend and to meet the targets set within the EU framework, particularly for NOX and non-methane volatile organic compound (NMVOC) emissions. Between 1990 and 2002 emissions increased and were above the level that would be needed to meet 2010 NECD targets. Focus for these actions is the energy sector, responsible for the largest part of air quality degradation.

#### **4.6 Freight transport demand**

Following trends recorded throughout the EU during the last decade, the demand for transport services in Greece is rapidly growing. The main reason is change in the pattern of production and consumption. However, when comparing



transport demand per capita and GDP, Greece is ranked among the best performing countries.

#### **4.7 Share of organic farming**

Organic farming in Greece started in 1992 with the inception of the Common Agricultural Policy (CAP) reform. The percentage of land dedicated to organic farming compared to total cultivated area has increased impressively over the last years reaching 1.41 % in 2004. Olive and citrus tree plantations were the dominant early organic cultivations, but during the last decade increased consumer demand and CAP incentives have given rise to a greater variety of crops such as arable and vineyards. One additional area of significant increase has been organic livestock production.

#### **4.8 Municipal waste**

Economic development, intense urbanisation and changes in consumption patterns have resulted in an increase in solid waste generation. The quantity of municipal waste generated increased 42.5 % from 1995 to 2002. Initiatives by local municipalities to reduce packaging waste, and the extensive involvement of private companies mainly in paper packaging recycling, are examples of Greece's practical approach to improving the waste management situation. Inappropriate waste disposal and management practices still persist, leading to the degradation of surface and groundwaters, air pollution and forest fires. However, significant progress has been made in the management of hazardous waste, and sludge and electricity production from biomass gases and waste has increased from 1 GWh in 1999 to 126 GWh in 2002.

#### **4.9 Use of freshwater resources**

The problems of water management mainly concern issues of quantity and not of quality. The uneven distribution of water resources and rainfall creates water availability problems. Agriculture is the most significant water consumer and demand for irrigation has doubled in the last twenty years. Irrigation is of paramount importance for agriculture productivity in Greece where water deficiencies in arid and



semi-arid areas can severely curtail crop yields. Irrigation accounts for over 80 % of total water abstractions. Between 1992 and 2002, water abstraction for agricultural use was reduced by about 2.5 %. It is estimated that over the next years, further reductions will be achieved. These will arise from the implementation of new CAP and EU regulations, modernisation and renovation of irrigation networks, application of new technologies for irrigation, and the training of farmers in good agricultural practices. Significant progress has been made in wastewater management and approximately 70 % of the national population was serviced by wastewater treatment plants in 2004. For the 2004 bathing season, 99.9 % of Greek coasts complied with national requirements, while 97.6 % of coasts met EU requirements.



## 5. Volos

---

Volos is a city situated at the centre of the Greek mainland, about 326 km north from Athens and 215 km south from Thessaloniki. It is the capital of the Magnesia prefecture. Magnesia hosts 198.500 people and the two biggest municipalities which are next to each other Volos and Nea Ionia have population of 85.000 and 32.000 respectively. The city is built in the deepest recess of Pagasiticos Gulf, at the foot of Pilio mountain. Volos has the third in a size order port of the country and it is the only way out to the sea of the largest agricultural circumference of the country, which is Thessaly. The contemporary city of Volos, having learned from the lessons of the past, and utilising its full potential, has grown to be a very important commercial centre. The port of Volos is currently holding the third position in Greece, in terms of the exchange of people and goods. Tourism, trade, industry and the high standards of local services are currently the focus of its financial and social growth. At the same time, the operation of an innovative and modern university, in conjunction with a major artistic infrastructure, and a vibrant cultural scene, offers the public the opportunity to choose from a variety of edifying events, including theatrical productions, concerts and art exhibitions. Thus Volos is gradually turning into a business and cultural metropolis on the Greek, as well as on the European map.

### 5.1 *Industry*

Volos is also home to two major industrial parks and a planned small industry zone, established to take full advantage of the region's traditional industrial strength, agricultural production, and emerging high-tech expertise. More than 140 businesses operate within the planned confines of Magnesia's business and industrial support zones and enjoy the benefits of unified and coordinated services.

Magnesia has long been one of Greece's centres for metallurgy and steel production. MIRTEC S.A., the Metallurgical Industrial Research & Technological



Centre in Volos, is a unique laboratory to conduct metallurgical research and to monitor quality control of metals. Konti Steel Hellas, a member of the French group USINOR-SACILOR, manufactures metal sheets and panels that are exported throughout Europe. Coca Cola and other global drink brands have their bottles produced exclusively by the VPI company in Volos. In the cement industry, AGET Heracles, one of the largest cement producers in Europe and a member of the French Lafarge Group, finds the location and infrastructure highly suited to its industry.

The Technological Park of Volos is the region's leading centre for research and development, and offers SMEs a wide variety of partnership opportunities. Working in consort with local industry, the University of Thessaly, and other universities, the park supports innovative research for industries that further the area's development goals.

## **5.2 Agriculture**

In agriculture, the region is a leading producer of tomatoes, wheat, cotton, milk, and apples, and has established a pilot program to support investments that focus on value added products and services in the areas of organic farming and food processing. Wood products, especially furniture, are also becoming the centre of renewed interest as European and Balkan markets show an increased demand for such goods and new and improved transport links allow quick and economical delivery to these markets.

## **5.3 Tourism**

Tourist development presents exciting opportunities due to the bountiful and attractive natural resources of the region. Pelion is the centre of year-round activities that include skiing, climbing and hiking, as well as summer tourism at the seaside. The Sporadic islands of Skiathos, Skopelos, and Alonissos are the favoured destinations of many visitors from around the world. One focus area, eco-tourism, offers new and novel opportunities, especially since the EU has designated parts of the Sporades as protected areas, including the marine park at Alonissos that is home to the monachus



monachus monk seals.

#### **5.4 Transport**

Volos is one of central Greece's primary transport hubs. The city's harbor propels sea transport, the national railway connects to Athens and Thessaloniki, and the Volos airport serves local and international routes. With the completion of the PATHE Highway, originating in the city of Patras, passing through Athens and Volos, and continuing to the northern Greek capital of Thessaloniki, Magnesia will enjoy unparalleled access to every major market within Greece and throughout Europe.



## 6. Profile

---

### 6.1 Country Overview

|                    |            |
|--------------------|------------|
| Population (2005E) | 10,668,354 |
|--------------------|------------|

### 6.2 Economic Overview

|                                |                 |
|--------------------------------|-----------------|
| Gross Domestic Product (2005E) | \$238.6 billion |
|--------------------------------|-----------------|

|                              |             |
|------------------------------|-------------|
| Real GDP Growth Rate (2005E) | 3.7 percent |
|------------------------------|-------------|

|                           |             |
|---------------------------|-------------|
| Unemployment Rate (2005E) | 9.9 percent |
|---------------------------|-------------|

|                       |                |
|-----------------------|----------------|
| External Debt (2005E) | 106.8 % of GDP |
|-----------------------|----------------|

|                 |                |
|-----------------|----------------|
| Exports (2005E) | \$17.2 billion |
|-----------------|----------------|

|                       |   |
|-----------------------|---|
| Exports - Commodities | food and beverages, manufactured goods, petroleum products, chemicals, textiles |
|-----------------------|---|

|                                |  |
|--------------------------------|--|
| Exports - Partners (2005 est.) | Germany 12.4%, Italy 10.4%, UK 6.7%, Bulgaria 5.9%, US 5.3%, Cyprus 5.2%, Turkey 5.1%, France 4.2% |
|--------------------------------|--|

|                 |                |
|-----------------|----------------|
| Imports (2005E) | \$54.1 billion |
|-----------------|----------------|

|                       |  |
|-----------------------|--|
| Imports - Commodities | machinery, transport equipment, fuels, chemicals |
|-----------------------|--|

|                            |   |
|----------------------------|---|
| Imports - Partners (2005E) | Germany 12.7%, Italy 12.4%, Russia 7.8%, France 5.7%, Netherlands 5.5%, Saudi Arabia 4.1% |
|----------------------------|---|

|                                 |                 |
|---------------------------------|-----------------|
| Current Account Balance (2005E) | -\$17.8 billion |
|---------------------------------|-----------------|

### 6.3 Energy Overview

|  |      |
|--|------|
| Proven Oil Reserves (January 1, 2006E) | None |
|--|------|

|                        |   |
|------------------------|---|
| Oil Production (2006E) | 4.7 thousand barrels per day, of which 35% was crude oil. |
|------------------------|---|

|                         |                                |
|-------------------------|--------------------------------|
| Oil Consumption (2005E) | 423.9 thousand barrels per day |
|-------------------------|--------------------------------|

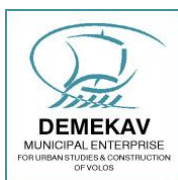
|   |                              |
|---|------------------------------|
| Crude Oil Distillation Capacity (2006E) | 413 thousand barrels per day |
|---|------------------------------|

|  |      |
|--|------|
| Proven Natural Gas Reserves (January 1, 2006E) | None |
|--|------|

|                                |      |
|--------------------------------|------|
| Natural Gas Production (2004E) | None |
|--------------------------------|------|

|                                 |                         |
|---------------------------------|-------------------------|
| Natural Gas Consumption (2004E) | 95.1 billion cubic feet |
|---------------------------------|-------------------------|

|                                   |                          |
|-----------------------------------|--------------------------|
| Recoverable Coal Reserves (2003E) | 4,299 million short tons |
|-----------------------------------|--------------------------|



|  |   |
|--|---|
| <b>Coal Production (2004E)</b>                     | 79.5 million short tons   |
| <b>Coal Consumption (2004E)</b>                    | 80.3 million short tons   |
| <b>Electricity Installed Capacity (2004E)</b>      | 11.4 gigawatts  |
| <b>Electricity Production (2004E)</b>              | 55.5 billion kilowatt hours   |
| <b>Electricity Consumption (2004E)</b>             | 53.5 billion kilowatt hours   |
| <b>Total Energy Consumption (2004E)</b>            | 1.4 quadrillion Btus*, of which Oil (62%), Coal (26%), Natural Gas (7%), Hydroelectricity (3%), Other Renewables (1%), Nuclear (0%) |
| <b>Total Per Capita Energy Consumption (2003E)</b> | 129.6 million Btus  |
| <b>Energy Intensity (2004E)</b>                    | 7,391.2 Btu per \$2000-PPP**  |

## 6.4 Environmental Overview

|  |  |
|--|--|
| <b>Energy-Related Carbon Dioxide Emissions (2003E)</b>             | 104.3 million metric tons, of which Oil (61%), Coal (34%), Natural Gas (5%)  |
| <b>Per-Capita, Energy-Related Carbon Dioxide Emissions (2003E)</b> | 9.5 metric tons  |
| <b>Carbon Dioxide Intensity (2004E)</b>                            | 0.5 Metric tons per thousand \$2000-PPP**  |
| <b>Environmental Issues</b>  | air pollution; water pollution   |
| <b>Major Environmental Agreements</b>                              | party to: Air Pollution, Air Pollution-Nitrogen Oxides, Air Pollution-Sulfur 94, Antarctic-Environmental Protocol, Antarctic-Marine Living Resources, Antarctic Treaty, Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Environmental Modification, Hazardous Wastes, Law of the Sea, Marine Dumping, Ozone Layer Protection, Ship Pollution, Tropical Timber 83, Tropical Timber 94, Wetlands signed, but not ratified: Air Pollution-Persistent Organic Pollutants, Air Pollution-Volatile Organic Compounds |

## 6.5 Oil and Gas Industry

|                                    |   |
|------------------------------------|---|
| <b>Organization</b>                | Partially-privatized  |
| <b>Foreign Company Involvement</b> | BOTAS (Turkey), GN (Spain), Gazexport (Russia), Edison (Italy), Sonatrach (Algeria), Regal Petroleum (UK), Foster Wheeler Ltd. (US) |
| <b>Major Oil Fields</b>            | Prinos (4,000 bbl/d), Kallirachi (1,400 bbl/d)  |
| <b>Major Pipelines</b>             | South Caucas Pipeline (124 Bcf/y); Turkey-Greece pipeline (28 Bcf/y); Poseidon pipeline(370 Bcf/y);                                 |
| <b>Major Refineries</b>            | Aspropyrgos (146,500 bbl/d), Elefsis (100,000 bbl/d), Thessaloniki (67,000 bbl/d)   |

\* The total energy consumption statistic includes petroleum, dry natural gas, coal, net hydro, nuclear, geothermal, solar, wind, wood and waste electric power. The renewable energy consumption statistic is based on International Energy Agency (IEA) data and includes hydropower, solar, wind, tide, geothermal, solid biomass and animal products, biomass gas and



liquids, industrial and municipal wastes. Sectoral shares of energy consumption and carbon emissions are also based on IEA data.

\*\*GDP figures from OECD estimates based on purchasing power parity (PPP) exchange rates.

---

## 7. Energy Indicators

---

### Region of Volos

#### 7.1 *Indicators of Energy Production:*

|  |                          |
|--|--------------------------|
| Solar installation for thermal energy (m <sup>2</sup> / habitants) | 0.6 estimate (year 2001) |
| MW of Solar Installations for Photovoltaic Energy                  | None                     |
| MW of Wind Power Installations                                     | None                     |
| Biomass Installations for thermal energy (tep)                     | None                     |
| Biomass Installation for electric energy (Mw)                      | 0.23MW (year 2002)       |
| MW of cogeneration installations                                   | None                     |
| MW from no renewable sources                                       | Not available            |
| MW produced by Mini Hydraulic installations                        | 1MW                      |

## 7.2 Indicators of Energy Consumption:

|   |  |
|---|--|
| Consumption by Sectors: agricultural, industry, services and market, residential sector, public administration and services, others (MWh / habitants) | See table 1 below                                      |
| Total Consumption of electrical energy (MWh / habitants).   | 9.3 in Magnisia (year 2005)                            |
| CO2 emissions   | 95258 ( in thousand tonnes) in Greece (2001) (table 2) |

### Electric energy consumption by great geographic area, region and department and by category of use for 2005 in thousand kwh

| Great geographic area, region and department | Total   | Domestic Use | Commercial Use | Industrial Use | Agriculture Use | Public & Municipal Authorities | Street Lighting |
|--|---------|--------------|----------------|----------------|-----------------|--------------------------------|-----------------|
| Thessaly                                     | 4126383 | 951072       | 702884         | 1590945        | 700408          | 115648                         | 65426           |
| Magnisia                                     | 1860516 | 290328       | 224103         | 1198198        | 91630           | 37845                          | 18412           |
| Per Habitant in Magnisia (MWh)               | 9.3     | 1.45         | 1.12           | 6.0            | 0.46            | 0.19                           | 0.09            |

Table 1. (Source: [http://www.statistics.gr/gr\\_tables/s503\\_sin\\_7\\_ts\\_an\\_93\\_06\\_y.pdf](http://www.statistics.gr/gr_tables/s503_sin_7_ts_an_93_06_y.pdf))

### Carbon Dioxide Emissions for Greece by Main Sector - 2001(in thousand tonnes)

| Electricity and Heat | Energy branch | Industry | Transport | Other  |
|----------------------|---------------|----------|-----------|--------|
| 44 098               | 3 473         | 11 269   | 21 757    | 14 661 |

Table 2 (Source: <http://www.cres.gr/kape/pdf/datainfo/KS-DK-04-001-EN.pdf>)

### 7.3 Indicators of Transport Sector:

|   |   |
|---|---|
| Number of private vehicles by gas-oil and gasoline                                    | 33100 vehicles (2006)   |
| Number of vehicles of collective transport and hard transport (gas-oil and gasoline). | Collective transport:<br>Long distance busses 84<br>Urban buses: 49 and 5 minibuses<br>Private buses – No information available<br>Hard transport – No information available. |
| Combustible Consumption (tonnes of gasoline and gas-oil)                              | No information available  |
| Bio-Fuel Consumption (tonnes of Bio-diesel and Bio-ethanol)                           | None  |
| Supply Points of Bio-Fuel   | None  |
| Number of installations for Bio-Fuel production                                       | One   |
| Bio-diesel and Bio-ethanol tonnes produced.   | 40million litres (2006)   |
| CO2 emissions   | 2 tonnes per habitant in Greece. Eurostat (2001) <sup>1</sup>   |

<sup>1</sup> CUTTING TRANSPORT CO2 EMISSIONS: WHAT PROGRESS? - ISBN 92-821-0382-X - © ECMT 2007



## 7.4 Save Indicators

|  |  |
|--|--|
| Number of Energy Audits made for municipalities  | Numerous audits have been made by the Regional Energy Centre of Thessaly and by private companies. |
| Investments amount for energy save and efficiency (external public lighting)                                     | At least 1.100.000 €   |
| Investments amount for energy save and efficiency (public buildings lighting)                                    | 75.000€ have been granted for public lighting for the municipality of Volos (8/2007)               |
| Amount of public helps for energy save and efficiency (for energy audits and installations of renewable energy). | See chapter 3  |

## 8. References

---

Centre For Renewable Energy Sources (CRES) - Department of Energy Information Systems 2001, "Collection of statistical data on Solar Energy Applications in Greece"

CRES, Energy, transport and environment indicators Data 1991-2001. Available at: <http://www.cres.gr/kape/pdf/datainfo/KS-DK-04-001-EN.pdf>

DEMEKAV, Volos Municipal Enterprise for Urban Studies – Construction & Development & Regional Energy Centre of Thessalia (2007). Available at: <http://www.demekav.gr>

European Conference of Ministers of Transport (2007), Cutting Transport CO2 Emissions: What Progress? - ISBN 92-821-0382-X - © ECMT 2007



European Environmental Agency (2005), The European Environment, State & Outlook 2005. Available at: <http://www.minenv.gr/4/41/00/The.European.Environment-State.and.Outlook.2005-full.report/>

General Secretariat of National Statistical Service of Greece, Electric energy consumption by great geographic area, region and department and by category of use, available at: [http://www.statistics.gr/gr\\_tables/s503\\_sin\\_7\\_ts\\_an\\_93\\_06\\_y.pdf](http://www.statistics.gr/gr_tables/s503_sin_7_ts_an_93_06_y.pdf)

Hellenic Transmission System Operator, Statistics on Renewable Sources of Energy & CHP July 2007 Press

Hellenic Centre for Investment, MAGNESIA: Regional Development & Growth Opportunities (2003)

International Energy Agency (2006), Energy Policies of IEA Countries Review, Monthly Electricity Statistics May 2007

Life Programme, «Applying European Emissions Trading & Renewable Energy, Support Mechanisms in the Greek Electricity Sector (ETRES)» LIFE03 ENV/GR/000219

National Observatory of Athens, Institute for environmental Research, Weather Statistics for Volos. Available at: (<http://www.meteo.gr/stations/volos/>).

Protogeropoulos C. (2006), the New Law for Renewable Energy Sources in Greece & Measures for the Development of Photovoltaic Applications in the Country (Greece) 21st European Photovoltaic Solar Energy Conference, 4–8 September 2006, Dresden.

Region of Thessaly (2002), Statistical Information, Indicators of Wellness in Thessaly, Available at: [http://www.thessalia.gov.gr/mediaupload/meletes%20-%20Statistika/deiktes\\_evimerias\\_ana\\_nomo.pdf](http://www.thessalia.gov.gr/mediaupload/meletes%20-%20Statistika/deiktes_evimerias_ana_nomo.pdf)

United States – Department of Energy, Energy Information Administration, Country Analysis Briefs – Greece. Available at: <http://www.eia.doe.gov/emeu/cabs/Greece/Full.html>

