REPUBLIC OF CYPRUS

MINISTRY OF COMMERCE INDUSTRY AND TOURISM

ANALYSIS OF CYPRUS SUCCESS IN MEETING THE NATIONAL INDICATIVE TARGETS FOR PRODUCTION OF ELECTRICITY FROM RENEWABLE ENERGY SOURCES

OCTOBER 2007

1. INTRODUCTION

Article 3 of Directive **2001/77/EC** of the European Parliament and of the Council of 27th September 2001, on the promotion of electricity produced from renewable energy sources (RES) in the internal electricity market, requires all Member States, to publish a report staying their national targets and indicating their future consumption of electricity produced from renewable energy sources.

Member States published their first progress report on 27 October 2003 and thereafter every two years. The report includes an analysis of success in meeting the national indicative targets taking into account, in particular, the climatic factors that may affect the achievement of those targets and indicates to what extend the measures taken are consistent with the national climate change commitment.

The promotion of electricity produced from RES is a high community priority as outlined in the **WHITE PAPER** on renewable energy sources with the following targets:

- Help to double the share of renewable energy from 6% to 12% of gross energy consumption.
- Establish a framework to increase the share of green electricity from 14% to 22% of gross electricity consumption by 2010.
- Take actions to compliance with the commitments made by EU Member States under the 1997 **KYOTO PROTOCOL**, on reducing greenhouse gas emissions by 8% between 2008 and 2012. (For the period up to 2008, the Member States undertake to make demonstrable progress in achieving their commitments by no later than 2005)

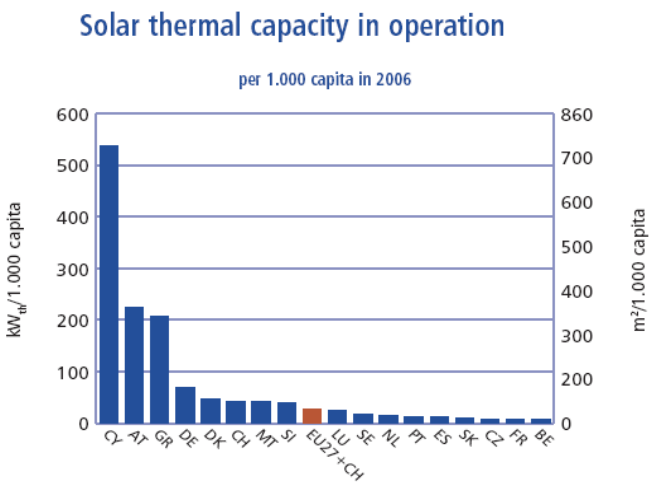
2. BACKGROUND

Cyprus has no indigenous sources of energy and at the moment, it is almost entirely dependent on imported energy. In year 2006, imports of oil products, coal and pet coke for home consumption, amounted to 580 million Euros, representing approximately 18% of the country's domestic imports. Energy is therefore, of vital importance to the island's economy.

The energy consumption in Cyprus is predominantly oil-based and amounts to 92,6% of the total energy consumption. Other forms of commercial energy used are Solid Fuels (coal and pet coke) for the production of cement, amounting to 5,4% of the total energy consumption. The remaining 2,0% is mainly solar energy and at the moment is the only substantial contribution of renewable energy sources, in the country's energy consumption.

SOLAR HOT WATER SYSTEMS SUCCESS STORY

Cyprus is one of the leading countries in the use and construction of solar water heating systems. 90% of households are equipped with solar water heaters and 53% of hotels have installed large solar water heating systems. **According to ESTIF (European Solar Industry Federation), Cyprus has the larger number of solar collector installations per capita.**



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The increased efficiency and cost effectiveness of solar hot water systems contributed to their wide penetration in urban, rural and isolated communities in Cyprus. Local industry characterized by high quality of standards in the construction and knowledge at this field. In Cyprus, manufacturers provide their products directly to the end users. The average market price of a typical thermosymfonic system of 200 lt hot water capacity, with 3m^2 of solar collectors is about 1000 Euro plus 15% VAT. This price includes the installation cost and the hot and cold water storage tank.

ELECTRICITY GENERATION

Electricity power generation is currently oil-based and uses about a third of the oil imports. However, they are plans for importation and utilization of liquefied Natural Gas (LNG) for electricity generation by 2013.

The Cyprus Government energy policy has the following main objectives:

- **Compliance with the relevant European Directives**
- **Securing energy supply**
- **Meeting energy demand**
- **Energy conservation and promotion of renewable energy sources.**
- **Minimization of the negative impact of energy consumption on the environment**

3. ACTION PLAN

The Action Plan is aiming to fulfil the Cyprus Government commitment towards the promotion of RES and Energy Saving. It provides the creation of a special financing mechanism to promote energy conservation and to increase the exploitation of renewable energy sources. The Action Plan sets targets for the increase of the utilisation/contribution of the country's main renewable energy sources, to the total electricity consumption and overall to the total energy balance. It includes a financial mechanism to encourage renewable energy sources and proposes strategies to eliminate administrative obstacles. The Action Plan covers the period 2002 – 2010.

3.1 EXPECTED RESULTS

Increase the share of renewable energy sources to the country's energy balance to 9% by 2010.

Increase of electricity generated from renewable energy sources, from the zero level (0,01%) in 2006, to 6% by 2010.

The above stated targets are indicative and are subject to re-evaluation every two years.

Additional programs for the promotion of renewable energy sources and energy conservation will be introduced in the future, in order to achieve the targets set by the Action Plan.

4. LAW FOR THE PROMOTION OF RES

To enforce the provisions of Directive 2001/77/EC of the European Parliament, Cyprus has introduced relevant legislation for the implementation and monitoring of the announced energy policy.

The Law 33(I)/2003, provides the creation of a Special Fund whose proceeds come from a levy of £0.0013 per KWh (approximately 0.0074 euro cent) on all electricity consumption, donations and government grants. This Fund is used to finance programmes for the promotion of renewable energy sources and energy conservation, which are approved by the Council of Ministers. A Committee, headed by the Permanent Secretary of the Ministry of Commerce, Industry and Tourism, manages this fund.

The Law, voted in 2003 was amended in 2004, 2005 and 2006 so as to fully comply with the provisions of Directive 2001/77/EC. Its implementation is responsibility of the Energy Service of the Ministry of Commerce, Industry and Tourism.

The Energy Service operates its own Applied Energy Centre (AEC), which in close collaboration with the Cyprus Institute of Energy (CIE), serves as the focal point for all efforts in the field of energy conservation and renewable energy sources. The laboratories of the Applied Energy Centre, equipped recently (2007) with more advanced technology and now AEC can perform tests on the efficiency of solar panels and issue certificates of approval based on the European standards.

The Cyprus Institute of Energy was established in 2000 by the Minister of Commerce Industry and Tourism and its primary objectives are to promote the utilization of Renewable Energy Sources and the saving/conservation of energy. It shares the facilities with the AEC and it has the flexibility to cooperate with the private sector. Both the AEC and the CIE played a significant role in the implementation of the national support scheme for the promotion of RES.

4.1 ARRANGEMENTS FOR FINANCING

A special law for the promotion of RES establishes the financing mechanism for programs in the field of renewable energy sources and energy conservation.

The Electricity Authority of Cyprus is obliged by Ministerial decision to purchase all electricity generated from renewable energy sources at the price of 3,7 Cyprus cents per KWh. (Approximately 6,29 Euro Cents per KWh). The purchase price is under examination and the new price will be set at the beginning of 2008.

Additionally by 2010 is expected to be a provision of grants and subsidies between 123 and 152 million Euro for the implementation of programmes related to renewable energy sources and energy conservation.

4.2 REDUCING ADMINISTRATIVE OBSTACLES

Cyprus government, with the cooperation of all competent authorities and bodies has established the legal framework and prepared the necessary infrastructure for the liberalization of the electricity market. As a result 35% of the electricity market opened to competition, from the date of accession (1/5/2004), thus terminating the monopoly of Electricity Authority of Cyprus, in the electrical energy market, that the previous law supported.

Following a decision by the Council of Ministers, the Cyprus government created the Cyprus Energy Regulatory Authority (CERA), an independent authority, responsible to secure the competition, in the energy market, and to protect the consumers. CERA also is responsible for the regulation of the electricity and gas market with exclusive rights to issue licenses for all activities relating to electricity and gas, to approve tariffs, to dissolve disputes, to protect consumers and to secure a reliable electricity system.

In order to expedite examination and facilitate authorization and licensing of large-scale RES installations a special Ministerial Committee was appointed by the Council of Ministers. The committee comprises of the Ministers of Commerce, Industry and Tourism, Interior and Agriculture Natural Resources and Environment.

In parallel the one-stop-shop which comprises of representatives of all bodies involved in processing the applications for licensing RES plants is convened to overcome bottlenecks in the examination procedure. The one stop shop was by Ministerial decision.

4.3 FACILITATING GRID CONNECTION

Moreover, after a decision from the Council of Ministers, the Cyprus government created the Transmission System Operator (TSO), as an independent authority, to facilitate and guaranty the access to the country's transmission and distribution system, with duty to operate, synchronize and control the transmission system with objective, non-discriminatory criteria. In addition, TSO is responsible to take actions for the proper maintenance and development of the electricity network and to arrange the trading of electricity on a daily basis.

5. GRANT SCHEMES

The grants and/or subsidies provided for investments by companies, households and public sector bodies in energy conservation and in renewable energy systems such as wind, solar thermal, photovoltaic, small hydro, biomass and desalination, are the following

Energy conservation

• 1. Energy conservation in existing enterprises.

30% of the total eligible cost with maximum amount of grant €170,860

Energy conservation in non-profit organizations.

30% of the total eligible cost, with maximum amount of grants €85,430

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A2. Thermal Insulation of Existing households

30% of the total eligible cost with maximum amount of grant €1,708.60

A3. Thermal Insulation of Existing households in areas with altitude more than 600 meters

100% for the first €1,367, 30% for the rest with maximum amount of grant €2,563

A5. Hybrid Vehicles

€1,196 for each new vehicle. For natural persons (households, non-profit organizations) maximum amount of grant €1,196 . For legal persons (enterprises, profit organizations) maximum amount of grant €8,372.15.

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A6. Fuel Flexible Vehicle- FFV/ Dual Propulsion Vehicle

€1,196.00 for each new vehicle. For natural persons maximum amount of grant €1,196.00. For legal persons maximum amount of grant €8,372.

A7. Electric Vehicles

€683.44 for each new vehicle. For natural persons maximum amount of grant €683.44. For legal persons maximum amount of grant €4,784.

A8. Low Emissions Vehicles (• 120 g CO_2 /Km)

€683.44 for each new vehicle. For natural persons maximum amount of grant €683.44. For legal persons maximum amount of grant €4,784.

R.E.S.

Wind Energy Systems for electricity generation

• 1.1 Small systems of up to 30 KW capacity.

For enterprises 40%, Maximum amount of grant €41,006.43 per unit. For natural persons 55%, Maximum amount of grant €51,258.00 per unit.

The produced electricity is sold at 6.32 euro cents/KWh to the Electricity Authority of Cyprus . No operating support offered.

• 1.2 Windmills. For enterprises 40%, Maximum amount of grant €17,086.00 per unit. For natural persons 55%, maximum amount of grant €25,629.00 per unit.

Solar Thermal Systems

• 2.1 Installation or/and replacement of central water heating systems.

For enterprises 30% of eligible costs. Maximum amount of grant €17,086.00 per unit. For natural persons 45%, Maximum amount grant €25,629.00 per unit.

• 2.2 Installation or/and replacement of space heating and cooling.

For enterprises 40% of the eligible costs. Maximum amount of grant €85,430.00 per unit. For natural persons 55%, Maximum amount grant €117,466.00 per unit.

• 2.3 Domestic solar systems new and / or replacement
€341.73 for each forced circulation system and
€170.86 for thermosyphonic systems.

• 2.4 Installation and / or replacement of swimming pool water, Solar heating systems.
For enterprises 30% of eligible costs. Maximum amount of grant €17,086.00 per unit.
For natural persons 45%, Maximum amount grant €25,629.00 per unit.

• 3 Space Heating using Biomass
For natural persons 55%, Maximum amount grant €18,795

Photovoltaic Systems

• 4.1 Small photovoltaic systems. Maximum capacity 20 KW, connected to the grid.

Option A:
-for households and other entities and enterprises not engaged in economic activities the grant is set to 55% of eligible costs. The maximum amount of grant €64,926.85.
-For enterprises the grant is 40% of eligible costs. The maximum amount of grant is €47,840.84.

Subsidy 20.5 euro cents /KWh - 6.32 euro cents= 14.18 euro cents/KWh.

Option B:
-for households and other entities and enterprises not engaged in economic activities 0% grant and increased subsidy:
38.27 euro cents/KWh- 6.32 euro cents= 31.95 euro cents /KWh

-For enterprises 0% grant and increased subsidy:
33.49 euro cents/KWh - 6.32 euro cents = 27.17 euro cents /KWh

•4.2 Small hybrid/stand alone PV systems (not connected to the grid), of up to 20KWp capacity.

-for households and other entities and enterprises not engaged in economic activities the grant is set to 55% of eligible costs. The maximum amount of grant €64,926.85.

-for enterprises the grant is 40% of eligible costs. The maximum amount of grant is €47,840.84

Desalination using RES

B5 Desalination using RES

-For Small and Medium Size (SMS) enterprises, the grant will be 30% in the form of regional aid plus de minimis aid. In any case the total amount from both forms of aid should not exceed 40% of eligible costs. The maximum amount of grant is €170,860

Hydroelectric systems

B6 Hydro

-For Small and Medium Size (SMS) enterprises, the grant will be 30% in the form of regional aid plus de minimis aid. In any case the total amount from both forms of aid should not exceed 40% of eligible costs. The maximum amount of grant is set to €102,516. Price for generated KWh is 6.32-euro cents. No running support is offered.

A4. Geothermal heat-pumps for space heating/cooling.

For enterprises 30%, Maximum amount of grant €170,860

For Households and nonprofit organizations 30%, Maximum amount of grant €15,377

G1. Co-generation of heat and electricity.

For enterprises 30%, Maximum amount of grant €170,860.

Day Rate: 2.92 euro cents

Night Rate: 2.56 euro cent [Day=07:00-23:00 Night=23:00-07:00]

For households and other entities and enterprises not engaged

in economic activities 45%, Maximum amount of grant €85,430

Day Rate: 6.53 – 2.92 euro cent = 3.61 euro cents/KWh

Night Rate: 5.72 – 2,56 euro cent = 3.16 euro cents/KWh

[Day=07:00-23:00 Night=23:00-07:00]

Biomass

Biomass, landfill and sewage waste utilization

10 to 40% according to the area of installation and the size of the enterprise. The maximum amount of grant is €683,441.

6.32 cent per KWh. No operating support is offered

Electricity production from Biomass and Biogas from Spaces Sanitary Burial of Litter

From Biomass: Systems up to 5MW.

Subsidy 9.48 up to 12.3 euro cents / KWh according to the type and size of the installation

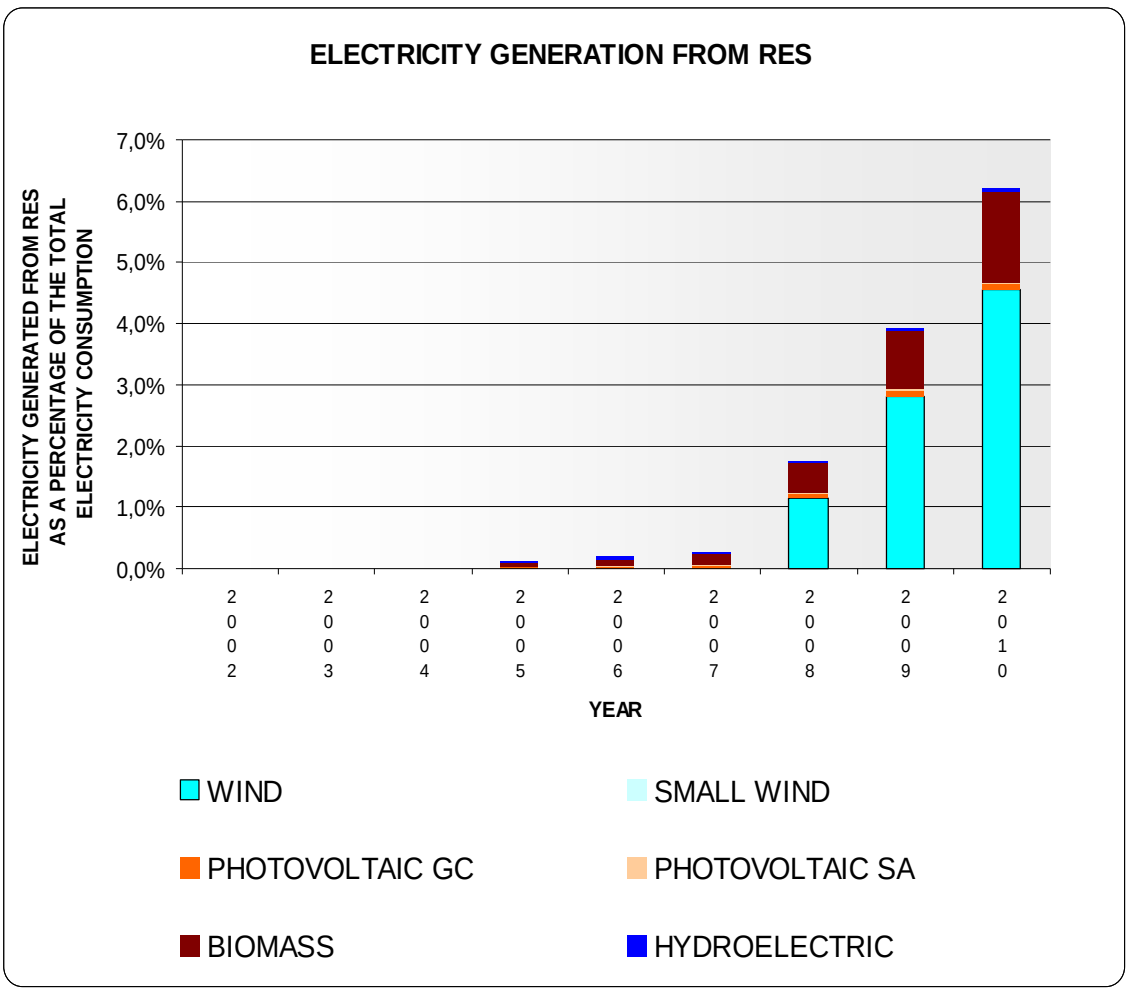
From Biogas: Systems up to 600•W.

Subsidy 6.83 up to 9.1 euro cents / KWh according to the type and size of the installation

6. Expected results per category

The following renewable energy contribution to the country's energy balance, expected by year 2010.

Increase of electricity generated from renewable energies, from the zero level in 2006, to 6% by 2010.



The following table shows the expected contribution of each RES technology to the total amount of electricity consumption in Cyprus.

Year	WIND (>30 kW)	SMALL WIND (<30 kW)	PV GC	PV SA	BIOMASS	HYDRO	
2002	**0,000%**	**0,000%**	**0,000%**	**0,000%**	**0,000%**	**0,000%**	0,000 %
2003	0,000%	0,000%	0,000%	0,000%	0,000%	0,000%	0,000 %
2004	0,000%	0,000%	0,001%	0,000%	0,000%	0,000%	0,001 %
2005	0,000%	0,001%	0,016%	0,006%	0,072%	0,015%	0,110 %
2006	0,000%	0,002%	0,029%	0,009%	0,114%	0,029%	0,183 %
2007	0,000%	0,004%	0,048%	0,012%	0,180%	0,027%	0,270 %
2008	1,149%	0,005%	0,078%	0,014%	0,472%	0,026%	1,743 %
2009	2,802%	0,007%	0,096%	0,016%	0,970%	0,037%	3,926 %
2010	**4,546%**	**0,008%**	**0,100%**	**0,017%**	**1,482%**	**0,047%**	**6,200 %**

6.1 Monitoring the process and time frame

The Programme initiated in February 2003 was revised in 2007 and will expire the last day of 2010. The progress is moitored by the Energy Service of the Ministry of Commerce, Industry and Tourism.

The programme is a substantially improved version of a previous programme implemented in the period 1999 – 2002, covering a much wider range of sectors of economic activity and providing much more generous incentives. In 2007 the technology of geothermal heat-pumps for heating and cooling was included in the funding scheme.

7. RES POTENTIAL

The main renewable sources for production of **electricity** in the republic of Cyprus, presented by their exploitable potential are the following:

1 **** Wind

2 *** Biomass

3 ** Small Hydro

4 * Solar

7.1 Wind Potential (On shore)

In Cyprus there are some areas with mean wind velocity of 5-6 m/s and few areas with 6,5-7m/sec. The estimated maximum exploitable potential is 150-200MW considering the following restrictions.

- Exclude sub regions dedicated to special activities.
- Sub regions of less than 5m/s are of no interest, at least for the current level of technology.
- Sub regions of very high altitudes or slope.

The wind in Cyprus is affected by the following factors:

- From anticyclones moved from west to east, from the Siberian anticyclone during the winter and from the low pressure created in the area of India and expanded until the area of Cyprus during the summer.
- See breezes generated in coastal areas because of the different heat capacities of see and land, which give rise to different rates of heating and cooling.
- Mountain valley winds, created when cool mountain air warms up in the morning and begins to rise while at the same time cool air from the valley moves to replace it. During the night, the flow reverses.

7.2 Wind Potential (Off shore)

The prospect of installing wind turbines in the Southern coast of Cyprus (near shore applications) is currently been investigated.

Investigations showed that the cost of the installation of the wind turbines would be very high, due to the high depth of the sea at relatively short distance from the shore (more that 30m depth at a distance of 300m from the shore). So that the elevated wind resort, which exists at those areas, will not be enough to compensate with the increase in revenue so that these kinds of projects are economically fusible.

7.3 Solar Potential

The Meteorological service of Cyprus has classified the Island in 14 zones from a climatic point of view. However, from the considerations, affecting the use of solar energy, the classification can broadened to 3 zones – coastal, central plains and mountains.

The collection of sunshine duration data at a number of meteorological stations started in 1959. Statistical analysis shows that all parts of Cyprus enjoy a sunny climate. The mean daily sunshine, i.e. the time interval from sunrise to sunset, for Cyprus varies from 9.8 hours in December to 14.5 hours in June.

The mean Global Solar Radiation in MJ/m2 per day and in KWh/m2 per day is shown on the following table:

MEAN HOURLY GLOBAL SOLAR RADIATION (KJ/m^2) AT ATHALASSA (ON A HORIZONTAL SURFACE)
PERIOD : 1999-2002

Hour	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
TOTAL (MJ/m^2)	9,7	13,3	17,3	20,8	25,1	27,5	27,1	24,2	20,5	15,6	10,9	8,1	18,3
TOTAL (kWh/m^2)	2,7	3,7	4,8	5,8	7,0	7,7	7,5	6,7	5,7	4,3	3,0	2,3	5,1

7.4 Biomass Potential

The theoretical potentials of biomass utilization estimated based on data for the cultivated areas for each crop and the residue yield. Then the available potential can evaluated, assuming that only a portion of the theoretical potential is available for energy exploitation, since there are other uses for most agricultural residues. Current biomass exploitation refers to a significant amount of agricultural residues in connection to the traditional wood stoves and

the prospects of the development of energy crops, even though, further analysis and on site investigation may identify possible difficulties on harvesting of agricultural byproducts for bioelectricity production.

Biomass resources in Cyprus include a wide range of biomass residues, agricultural and forest, municipal solid waste, sewage water sludge and a considerable potential of energy crops, which include traditional herbaceous corps, or short rotation woody crops. A moderate energy potential exists from energy crops that c grown on deforested or otherwise degraded lands.

- Exploitation of agricultural residues.(ligrocellulocic, other regetat, animal wastes)
- Energy crops.
  (rape seed, sugar beat, sorghum),
- Forestry wastes
  (woods maintenance, forestry exploitation),
- Exploitation of landfill gas from the following waste disposal plants.
  Lefkosia: 100,000 tn wastes/y, capacity: 1.1MW_e (1.5MW_{th}), 7.5GWh/y
  Lemesos: (150,000 tn wastes/y, capacity: 1.75MW_e (2.5MW_{th}), 15.6GWh/y
  Larnaka: (45,000 tn wastes/y, capacity: 0.45MW_e (0.7MW_{th}), 2.7GWh/y
  Total: 295.000 tn wastes/y, capacity: 3.3 MW_e (4.7MW_{th}), 25.8GWh/y

7.5 Hydro Potential

In Cyprus, the potential for small hydro plants is very limited, especially with the water shortages over the last years. The suitable sites estimated to be adequate for a maximum installed capacity of about 1MW. However, considering the variability of rainfalls and the low hydro potential, in Cyprus, it is clear that significant risk exists in this kind of investments. No applications submitted until today for this category of investment.

8. RES APPLICATIONS

8.1 Wind turbines

Wind energy has become a techno-economically viable source of energy. For the moment, it is the most preferable renewable energy source and this is reflected in the number of applications and total capacity of proposed wind turbine installations.

Applications submitted under the grant scheme for the promotion of wind energy

Category	Applications Submitted	Approved	Installed	Existing	Total installed capacity end of 2007
• 1.1 Large commercial Systems	792,75MW	298,93MW	None	None	None
B1.2 Small systems of up to 30 KW capacity	24KW	24KW	24KW	203KW	227KW

In accordance with implementation schedule of the approved applications the first wind turbines will be in operation in 2008 and by the end of year 2010 a total of about 135MW to 150 MW of wind turbines will be installed and operate. This means that the annual production of electricity from wind turbines by 2010 will be approximately 236 – 262 GWh. Consequently, about 4,5% of the total electricity consumption during 2010 will be produced from wind energy.

8.2 Photovoltaic

Photovoltaics have a very large potential and are widely used for decentralized applications by households not yet connected to the main electricity grids. Although in Cyprus, there are very few areas, not covered by the national grid. Estimations showed that up to 100KWp of PV/small wind hybrid systems can be installed. The major drawback of this technology is the very high cost of initial investment.

Grid connected photovoltaic applications are also on the rise, mainly due to the generous provisions of the grant scheme. With the current level of subsidies such systems have on average an amortization period of approximately 10 years. With the currently available information, we can conclude that about 600KWp of photovoltaic grid connected systems will be installed every year.

Applications submitted under the grant scheme for the promotion of RES

	Average size	Applications Submitted	Approved	Installed	Existing	Total installed capacity. end of 2007
B4.1 Grid connected	• 3.5 KWp	3MWp	2,5MW	760KW	86KW	846KW
B4.2 Stand alone	• 1.6 KWp	350KWp	300KW	170KW	370KW	540KW

According to a report by the Centre of Photovoltaic at the Warsaw University of Technology and the Polish society for Photovoltaics. Cyprus had in 2006 the largest installed photovoltaic power from all the countries that had entered, recently, the European Union.

In 2007, the maximum capacity allowed for subsidy of PV systems increased from 5KW to 20KW. Additionally, Energy Service is planning to install during the next two years (2007 and 2008) 1 to 1,5MW of photovoltaic systems in schools, governmental buildings and military camps. This project will be co funded by the European Structural Funds and the Government of Cyprus. The total cost estimated to be 3 – 5 million euros.

Despite the fact that a relatively large amount of funds that will be offered for these categories of investments, the total contribution of photovoltaic generated electricity is not expected to exceed 0.1% of the total electricity consumption in year 2010. The current contribution of photovoltaic systems is about 0.05%.

8.3 Solar Thermal Power Plants

A second project that the Energy Service is planning to implement within the next 2-3 years, also co funded by the European Structural Funds, is an installation of a solar thermal power plant. Solar thermal power plant that can produce electricity with much lower cost than the photovoltaic systems. It estimated that the production cost in Cyprus would be approximately 14-16 eurocents per KWh. The budget is about 18 million euros and the capacity of the project estimated to be 3-5 MWe. The Energy Service is examining three proposed technologies, the Solar Tower, the Parabolic Dish and the Parabolic Trough. The decision will be made, after consideration of the results of a techno economic study that will finish in the first quarter of 2008.

8.4 Biomass

Since the interest for investment associated with the exploitation of biomass for electricity production during the three first years of operation of the support scheme was low, a new funding support scheme was developed in 2007. This new version of the plan includes the option of an increased subsidy on the produced kWh from biomass and biogas. These modifications made such investments more attractive to investors and as a result, the number of applications increased considerably in the last year. The table below shows the submitted applications under the grant schemes, the total approved capacity and the estimated electricity production from biomass.

YEAR	TOTAL APPROVED CAPACITY (MWe)	ESTIMATED ELECTRICITY PRODUCTION (MWh/year)
2006	3,236	24485,92
2007	11,265	85263,448
TOTAL	14,501	109749,36

Currently only one installation is completed and in operation, it's capacity is 250KWe. The annual production is about 1.200 MWh. It is estimated that by the year 2010 the electricity production from biomass will be about 1,5% of the total electricity consumption in the same year.

9 FURTHER PROJECTS - STUDIES / Actions

Further measures to promote indigenous production of biofuels undertaken by means of research programs. Specifically, a grant aid of 236.000 Euro has been provided by the Research Promotion Foundation of Cyprus for the preparation of a study on the evaluation of energy crop potentials in Cyprus. The ongoing project is aiming at investigating the feasibility of some crop-species as energy plants based on experimental cultivations. Within the framework of the project, bio-ethanol and biodiesel will be produced in order to evaluate their quality and energy content. The project is contacted, by the Cyprus Institute of Energy, the Agriculture Research Institute and the National Technical University of Athens. The project was launched in 2004 and the final report is schedule for March 2008.

Moreover, the National Technical University of Athens was appointed recently (August 2007) to re assess the measures and incentives provided for the encouragement and promotion of wind and PV applications in Cyprus. The assessment will take into consideration the progress achieved so far in relation to the indicative targets as well as any changes that have taken in the sectors since 2001. Additionally, one of the objectives of the study is to estimate the extent at which each renewable energy technology has to be promoted, taking into account the available budget of The Renewable Energy Sources Fund, in order to achieve the indicative target of 6% RES electricity contribution by year 2010. The results of that survey will play an essential role in the formation of the support Schemes for the promotion of RES for the period 2008 - 2010.

In addition since the last report, the Transmit ion System Operator (TSO) has made, considerable progress towards implementing the provisions of Directive 2001/77/EC. The following are some of them:

1.0 Transmission and Distribution Rules

The Transmission and Distribution Rules (Grid Code) issued by the TSO and approved by the Regulator (CERA) under the national Law on Regulating the Electricity Market (harmonizing law with Directive 2003/54/EC). These rules set out the operating procedures and principles governing the TSO's relationship with all the Users of the Transmission and Distribution System and determine the exact procedures to be followed for the operation of the Cyprus electricity system through which the control of the system is achieved on a long, medium and short term basis within conditions of system security and reliability and with the minimum possible cost incurred.

In June 2006, the Transmission and Distribution Rules were amended and new provisions were included to provide for the implementation of articles 5 and 7 of Directive 2001/77/EC. A new chapter, T16, was included in the new edition of the Rules (Issue 2.0.0, June 2006) and includes provisions regarding the certificates of Guarantee of Origin (GO) for RES and the connection charging principles for RES-e producers.

The Transmission and Distribution Rules are also available in english and are published on the TSO's website (www.dsm.org.cy) both in greek and english.

2.0 Grid Issues (article 7 of the Directive)

Article T16.6 of the Transmission and Distribution Rules includes provisions for implementation of article 5 of the Directive. These provisions are also included in the primary (amending) law for RES encouragement of 2006.
In the year 2007 the TSO has also investigated the procedures and practices followed by other European TSOs for the issuing of Certificates of Origin through the Association of Issuing Bodies (AIB). The Cyprus TSO is in the process of preparing a memorandum/directive regarding the issuing of GOs by the TSO and this will be published on the TSO's website.

3.0 Grid Issues (article 7 of the Directive)

Chapter T16 of Issue 2.0.0 of the Transmission and Distribution Rules includes provisions for the implementation of the above article of the Directive. These provisions include the connection and use of system charging principles for RES-e producers, in accordance with clauses 1 and 3 of article 7 of the Directive. Particularly:

- RES-e producers are charged based on the shallow connection methodology.
- RES-e producers bear only 50% of the connection costs. The remaining 50% is born by the Transmission System Owner. This provision was effected in accordance with clause 3 of article 7 of the Directive.
- RES-e producers are not charged with Transmission or Distribution Use of System charges, or for ancillary services. This provision was partly effected in accordance with clause 6 of article 7 of the Directive. Until practical experiences regarding Wind Farm operation and provision of ancillary services are gained within the Cyprus electricity system, Wind Farms do not currently participate in the provision of ancillary services.

RES-e producers also have a priority for connection to the system and energy dispatch, in accordance with clause 1 of article 7 of the Directive (this is affected through article T16.5 of the Transmission and Distribution Rules).

For compliance with clauses 2, 4 and 5 of article 7 of the Directive, the TSO has published on his website the unit prices for High (132kV, 66kV) and Medium (22kV, 11 kV) Voltage equipment. In addition, a typical document of the Connection Agreement for Wind Farm connections to the network is also published on the TSO's website. The Connection Agreement sets out, among other things, the obligations of each Party (the TSO and the Producer) with respect to the execution of the connection works and also includes the cost of connecting the Wind Farm to the network. At present the practice applied is a 50% reduction on the capital expense of the connection with the remaining 50% being born by the Transmission System Owner (TO) that is the Electricity Authority of Cyprus (EAC). The Producer though has to submit to the TSO a bank guarantee for the remaining 50% (the amounts of the guarantee are withdrawn gradually and after a five year period of operation of the Wind Farm the guarantee is completely withdrawn).

4.0 Ten Year Transmission Development Plan

According to the primary legislation regarding the liberalization of the electricity market in Cyprus (Laws Regulating the Electricity Market of 2003 to 2006), the TSO prepares together with the Transmission System Owner (TO) the Ten Year Transmission Development Plan, which then has to be approved by CERA. This plan includes all the transmission system projects (e.g. transmission substations and high voltage lines) that are planned for the next decade with an estimated time schedule and budget. The Ten Year Transmission Development Plan is reviewed yearly by the TSO and the TO and all revisions are approved by CERA.

Different scenarios for Wind Farm connections to the Transmission System are carried out with the use of load-flow software tools. In particular, new transmission lines are included in the latest review of the Ten Year Development Plan which are planned to interconnect Wind Farms that are anticipated to be connected in the area within the period under investigation. In the Ten Year Transmission Development Plan for the period 2007-2016 the TSO has included the construction of several lines for such purposes namely "Vasilikos Cement Works - Kophinou 132KV" line and "Kophinou-Anglisides-Alambra 132KV" line.

10. PREVENTED EMISSION IN CONNECTION WITH NATIONAL CLIMATE PROTECTION COMMITMENTS

The Kyoto Protocol tackles emissions of six greenhouse gases as follows:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrus oxide (N_2o)
- Hydro fluorocarbons (HFCs)
- Perfluorocarbors (PFCs)
- Sulphur hexafluoride (SF_6)

Even though, Cyprus does not have a target under the Kyoto Protocol, it is one of the country's priority because the protocol represents an important step in the effort against global warming as it includes binding, quantified objectives for limiting and reducing greenhouse gases.

The increased use of renewable energy sources prevents the release of greenhouse relevant gases that are emitted when fossil sources of energy are used and is thus a crucial component of Cyprus climate protection strategy. Additionally in order to reduce the emission of CO_2 the government give an economic support for low emission vehicles.

Other components of the Cyprus climate protection strategy, with equal and perhaps greater importance than the various renewable energy sources are the following:

- Decarbonization of Electricity and Fuels
    1. Substituting natural gas for oil
    2. Storage of carbon captured in power
- Efficiency and conservation
    1. Improve fuel economy of vehicles
    2. Reduce reliance on cars
    3. More energy-efficient buildings
    4. Improve power plant efficiency
- Natural gas
    1. Forest management
    2. Agricultural soil management

Available data for emissions of greenhouse gases (kt)

Greenhouse gases	1999	2000	2001	2002	2003
CO2	6351.9	6675.1	6584.5	6790.5	7176.9
CH4	41.26	42.08	44.28	45.94	47.36
N2O	3.02	3.10	3.05	3.11	3.23

Please note that data for HFCs, PFCs and SF6s are not available.

11. CONCLUSION

The accession of Cyprus in the European Union entails the need to comply with European energy policy and commitments.

Today Cyprus is almost entirely dependent on imports of fossil fuels. It is therefore crucial importance for Cyprus to utilize all the available RES potential on the island and achieve high levels of energy savings in order to comply with the relevant European directives, continue to meet energy demand, reduce the impact on the environment from energy consumption and most importantly reduce the dependence on imported energy.

Using the experience and knowledge gained during the previous years, and taking in to account the suggestions from the investors and experts in the field that associated with the energy Service, a more ideal funding schemes and more efficient strategy plans are being formulated and implemented. This couple with the acknowledged co-operation of all associated authorities will help to the establishment of any additional legislation and mechanisms that may be required in order to increase the contribution of renewable energy sources in the total energy consumption in Cyprus, making the target of 6% RES electricity contribution by 2010 more attainable.

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