

# Policy plan for the use of biomass and biofuels in Greece

## Part I: Available biomass and methodology

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### Abstract

Greece is a country in which biomass can play an important role in achieving the 2010 national target of 20% electricity production from Renewable Energy Sources (RES) Residues from traditional agricultural activities, but also the cultivation of new energy crops, can lead to a high level of availability and utilization of biomass energy products in Greece. In order for biomass to make a substantial contribution to the 2010 national target, set by the EU RES Directive 2001/77, as well as the corresponding 2020 target, to be set by the upcoming RES Framework Directive, a national policy plan for biomass and biofuels has to be formulated. This plan will assess the available biomass quantities and the potential and routes, by which this biomass can be converted to final energy products. The aim of the present paper is to discuss the current situation and prospects of biomass availability and exploitation in Greece and to develop a coherent and reliable methodology, in order to assess the conversion of the country's biomass potential into useful energy products.

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**Keywords:** Biomass in Greece; Energy crops; Bioethanol; Biodiesel

### Contents

|                                                                                                                                                        |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1. Introduction                                                                                                                                        | 972 |
| 2. Current situation for RES in Greece                                                                                                                 | 972 |
| 2.1. Biomass in Greece                                                                                                                                 | 973 |
| 2.2. Liquid biofuels in Greece                                                                                                                         | 973 |
| 3. Biomass resources in Greece                                                                                                                         | 974 |
| 3.1. Categorization of biomass resources and evaluation methodology                                                                                    | 974 |
| 3.1.1. Biomass distribution and biomass potential in Greece                                                                                            | 974 |
| 3.1.2. Proposed methodology for the assessment of the technically and economically exploitable biomass potential at a given geographic area            | 975 |
| 3.1.3. Proposed methodology                                                                                                                            | 976 |
| 3.1.4. Energy crops and produced primary sources (present experience, efficiencies and application suitability)                                        | 977 |
| 3.1.5. Exploitation of already available biomass and energy crops—the case of power production from biomass                                            | 978 |
| 4. Biomass conversion plants in Greece                                                                                                                 | 978 |
| 4.1. Targets of the penetration of bioenergy in Greece, quantification and selection of the needed primary sources for the fulfilment of these targets | 978 |
| 4.2. Suggested methodology for the installation of bioconversion units                                                                                 | 979 |
| 4.3. Results from the application of the methodology. Technical feasibility of the bioconversion units                                                 | 981 |

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|                           |     |
|---------------------------|-----|
| 5. Conclusions. . . . .   | 984 |
| Acknowledgement . . . . . | 984 |
| References . . . . .      | 984 |

## 1. Introduction

The constantly increasing prices of the conventional fuels (mainly of petroleum and natural gas) and the scenarios of rising average earth temperature (greenhouse effect), lead the European Union (EU) to the promotion of biomass and biofuels usage for both electricity and heat production, as well as for the substitution of liquid fuels in transport (biodiesel, bioethanol, etc.). Ericsson and Nilsson[1] present the biomass potential in Europe as one of the critical points which have to be considered in the way of the EU to fulfil its aims.

Greece, being a member of the EU, is striving to raise the combined heat and power production from biomass and to substitute a substantial amount of gasoline and diesel with liquid biofuels. However, no overall plan exists so far for the country-wide organization of continuous, uninterrupted supply of biomass to the plants that produce these energy products (liquid and solid biofuels, electrical and thermal energy, etc.).

Energy crops have the potential of resolving many issues related to the supply chains of biomass energy production, while being an attractive alternative to a great number of traditional agricultural cultivations in Greece (wheat, corn, tobacco, cotton, etc.), the cultivation of which may not be aligned with the overall framework of Common Agricultural Policy (CAP).

The energy crops that can substitute the relevant conventional cultivations must ensure that a satisfactory long-term income for the farmers is maintained (at least at a comparable level with the present one), while producing biomass in quantities sufficient for the continuous feeding of the plants which convert biomass into other energy products.

The aim of this paper is to study in an analytical way the short-term (5–10 years) perspective of energy agriculture in Greece and to discuss the cultivation of energy crops in the most appropriate areas of the country.

## 2. Current situation for RES in Greece

The RES Directive 2001/77/EC for electricity production [2] states that Greece must produce 20.1% of its total electricity consumption in the year 2010 from renewable energy sources (RES), including hydroelectric plants [3].

The most recent forecasts of electricity consumption in Greece for 2010 are near  $68 \times 10^9 \text{ kWh}_e$ . Therefore, the total electricity production from RES should rise to about  $13.7 \times 10^9 \text{ kWh}_e$  in 2010, in order to meet the aim of the aforementioned directive. Table 1 shows the required installations of RES plants for achieving the 2010 aim.

Table 1  
RES Plants for the achievement of the 2010 aims for Greece

| RES technology      | Required installed capacity in 2010 ( $\text{MW}_e$ ) | Electricity production in 2010 ( $\times 10^9 \text{ kWh}_e$ ) | Percentage of each RES source (%) |
|---------------------|-------------------------------------------------------|----------------------------------------------------------------|-----------------------------------|
| Wind parks          | 3372                                                  | 7.09                                                           | 10.42                             |
| Small hydro plants  | 364                                                   | 1.09                                                           | 1.60                              |
| Large hydro plants  | 3325                                                  | 4.58                                                           | 6.74                              |
| Biomass             | 103                                                   | 0.81                                                           | 1.19                              |
| Geothermal plants   | 12                                                    | 0.09                                                           | 1                                 |
| Photovoltaic plants | 18                                                    | 0.02                                                           | 0.03                              |
| Total               | 7193                                                  | 13.67                                                          | 20.10                             |

Table 2  
Basic scenario for the electricity production from RES in 2010

|              | Installed capacity in 2006 ( $\text{MW}_e$ ) | Additional licences for new plants ( $\text{MW}_e$ ) | Additional RES plants (in planning) ( $\text{MW}_e$ ) | Additional RES plants in Greece ( $\text{MW}_e$ ) | Estimated sum of installed power from RES in 2010 ( $\text{MW}_e$ ) | Estimated electricity generation from RES in 2010 ( $\times 10^9 \text{ kWh}_e$ ) | Percentage of each RES in 2010 (%) |
|--------------|----------------------------------------------|------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------|
| Wind parks   | 622                                          | 505                                                  | 1,240                                                 | 650                                               | 3,017                                                               | 6.34                                                                              | 9.33                               |
| Small hydro  | 100                                          | 62                                                   |                                                       | 90                                                | 252                                                                 | 0.76                                                                              | 1.11                               |
| Big hydro    | 3,018                                        |                                                      |                                                       | 307                                               | 3,325                                                               | 4.58                                                                              | 6.74                               |
| Biomass      | 24                                           | 22                                                   |                                                       | 25                                                | 71                                                                  | 0.56                                                                              | 0.82                               |
| Geothermal   | 0                                            |                                                      |                                                       | 8                                                 | 8                                                                   | 0.06                                                                              | 0.09                               |
| Photovoltaic | 1                                            | 1                                                    |                                                       | 8                                                 | 10                                                                  | 0.01                                                                              | 0.02                               |
| Total        | 3,765                                        | 590                                                  | 1,240                                                 | 1,088                                             | 6,683                                                               | 12.31                                                                             | 18.10                              |

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