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Renewable energy policy framework and bioenergy contribution in the European Union – An overview from National Renewable Energy Action Plans and Progress Reports

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ABSTRACT

The use of renewable energy is projected to increase substantially in the European Union to reach a share of 20% in final energy consumption and 10% renewable energy in transport by 2020. The renewable energy contribution is further expected to increase to 55%–75% of gross final energy consumption in 2050. According to the latest reports, the European Union has made significant progress since 2005 and is on track to reach its 2020 renewable energy targets. This paper provides a review of the policy framework for renewable energy in the European Union and an analysis of the progress made by the use of renewable energy as well as the expected developments until 2020 and beyond. It focusses on the contribution of bioenergy, the major source among renewables in the European Union. As biomass availability is a critical issue for the bioenergy production, this paper provides an analysis of the biomass demand for reaching the 2020 targets, in relation with the expected domestic supply and biomass potential.

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1. Introduction

Renewable energy provided about 19% of global final energy consumption in 2012. The contribution of modern renewable technologies accounts for 10%, while the traditional use of biomass is significant [1]. Renewables experienced an impressive development worldwide, with highest growth of solar photovoltaic (42% annual growth over the last decade) and wind (27% annual growth) [2]. The installed capacity of renewable energy reached 1440 GW in 2012 worldwide, of which 312 GW in the European Union (EU) [3]. In the heating and cooling sector, biomass, solar, and geothermal energies account for a rising share of final heat demand, amounting to 10% worldwide and even more than 15% in the European Union. The use of biofuels has increased continuously to reach about 106 billion litres worldwide in 2012, of which 82.6 billion litres of ethanol and 23.6 billion litres biodiesel. In the European Union, 3.7 billion litres of ethanol and 13.7 billion litres biodiesel were used in 2012, making the EU the highest biodiesel user [1,3].

The International Energy Agency estimated in the Energy Technology Perspectives 2012 that clean energy technologies offer the prospect of reaching the global goal of limiting the increase of the global mean temperature to 2 °C. Renewable energy technologies have made significant progress so far and have a large potential and could contribute to this goal, but still face technical and cost challenges [2]. In the European Union, the basis of a renewable energy at the European Union level was made in 1997 when the European Council and the European Parliament have adopted the "White Paper for a Community Strategy and Action Plan" and when the share of renewable energy was 6% of gross internal energy consumption [4]. Many steps forward have been made ever since and the European Council endorsed in 2007 a binding target of 20% share of renewable energies in the overall EU energy consumption by 2020 and a 10% binding minimum target to be achieved by all Member States for the share of biofuels in overall EU transport petrol and diesel consumption [5]. The use of renewable energy has increased significantly to 6.7 EJ in 2012 and a share of 14% in the gross final energy consumption in the EU. The use of renewable energy is expected to further increase to 10.3 EJ in 2020, to a share of 20% the share gross final energy consumption. The use of renewable energy in transport should also reach 10%, or about 1.5 EJ in 2020. On a longer term, the European Union has established the ambitious goal of building a competitive low carbon economy in 2050 and to reach 80%–95% GreenHouse Gas (GHG) emission reduction objective by 2050 [6]. The share of renewable energy could increase substantially in the European Union between 55% and 75% of gross final energy consumption in 2050 [7], with an intermediary milestone of 27% already set for 2030 [8].

The Member States (MS) had to prepare National Renewable Energy Action Plans (NREAPs) with detailed roadmaps and measures taken to reach the 2020 renewable energy targets and develop energy infrastructure [8]. Several reports have been published on the NREAPs [10,11], providing detailed information on the expected developments in the use of renewable energy in the EU. Several reports have been published on the progress registered on the renewable energy, including [12], providing a database with the data reported by MS for 2009 and 2011. Ecofys [13] has also provided more detailed information about the progress made during 2009–2011 by sector, renewable source and country, in comparison with the minimum trajectory provided along with the NREAPs. In addition, Ecofys also provided an outlook of the renewable energy deployment up to 2020 at the Member State level on the basis of a modelling exercise using the Green-X model and the data on the Renewable Energy Sources (RES) deployment until 2010, considering the current and planned policy initiatives. It concluded that the future progress in the short term (2012) and for 2020 would allow the MS to reach their 2020 targets. Some recent studies [14,15] and [16] also provided a detailed analysis on the progress registered in the 27 Member States of the European Union until 2010, as well as a detailed picture at MS level. EurObserv'ER collects data and provides annual reports on the state of the renewable energies in Europe, as well as on the prospects for future developments until 2020 [17,18]. AEBIOM also publishes annual statistical reports on the progress made by the bioenergy in the EU [19].

This paper provides a review of the policy framework for renewable energy and presents an analysis of the progress made in the field of renewable energy in the 28 Member States of the European Union (including Croatia, who joined the EU in 2013) until 2012. This study also discusses the expected developments until 2020 and beyond with a focus on the contribution of bioenergy, the major source among renewables in the European Union. Biomass availability is a critical issue for the bioenergy production. Competition between alternative use of biomass for food, feed, fibre and fuel is a major concern for bioenergy deployment, as well as the sustainability concerns related to the use of biofuels. This paper also made an analysis of the biomass demand for reaching the 2020 targets in relation with the expected domestic supply and biomass potential.

2. EU policy framework for renewable energy

2.1. Building a European energy policy

In 1997, the *White Paper for a Community Strategy and Action Plan Energy for the future: Renewable sources of energy* [4] set the basis for the European Union policy on renewable energy. This proposed doubling the share of renewable energy in the EU gross energy consumption from 6% to 12% by 2010. Several technology-specific targets were also set for 2010, namely 135 Mtoe of energy production for biomass; 40 GW installed capacity for wind energy; 3 GWp for photovoltaic energy; 5 GWth for geothermal heat; 1 GW for geothermal electricity and 105 GW for hydro. The reality has shown significant progress and the targets for 2010 have already been achieved or even exceeded by some renewable energies. The wind energy has reached an installed capacity of