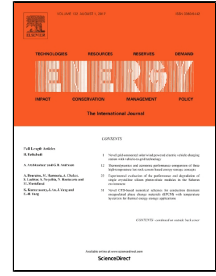


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Abstract

The importance of renewable energy usage is increasing gradually due to the reasons of energy supplying security, environmental pollution and reducing dependency on external sources in all over the world as also same in Turkey. Biomass is a clean and sustainable energy source that can be produced from various kind of organic waste. Turkey has considerable biomass energy potential, and about 6% of the total potential is located in the eastern region. Ardahan is one of the eastern cities of the country whose economy mainly relies on livestock farming. This paper presents biogas energy potential from animal manure and agricultural residue and corresponding CO₂ emission reduction in Ardahan. Calculations were made according to the analysis of the animal manure and the agricultural crop quantities of 2015 data considering of the biochemical methane potential (BMP), availability factors, volatile solid ratio of the manure, harvested area and unit methane potential of cereals. The total electricity production potential of the evaluated biomass sources is 323 GWh/year. The total CO₂ emission reduction is about 2 million tons/year in the case of biogas combustion power plant exists instead of coal fired power plants.

Keywords: renewable energy, biogas, animal manure, CO₂ emission reduction, Ardahan, Turkey.

1 Introduction

Fossil fuels have the major share in the world's energy supply and they are causing the current environmental problems, especially air pollution and global warming. Accordingly, the rapid depletion of their resources and the fluctuation of the prices caused increasing trends for renewable energy sources in all over the world [1].

The European Union (EU) has set a target of 20% share of its gross final energy consumption from renewable energy sources (RES) by 2020 basing on the energy and climate policy. Accordingly every EU country set individual renewable energy targets. For example, the mandatory national target for Slovenia is 25% share of RES in the gross final energy consumption and to achieve 40% share of RES in gross final electricity consumption by 2020 [2]. Germany has pledged at least 80% of the power sector will be from renewable energy by the year 2050[3]. concluded that bioenergy will play a significant role to fulfill the most energy demand and ensure the energy supply security, since it is practically available for flexible power production. On the other hand the EU climate and energy framework contains a binding target to cut greenhouse gas emissions to 80-95% by 2050 from 1990 levels. To achieve this target the entire world's renewable energy using capacity is needed to be developed [4]. Correspondingly various studies have been accomplished towards the use of 100% renewable and sustainable energy [5]. One of these studies presented a scenario for a 100% renewable energy system in the EU by the year 2050. And concluded that the scenario is technically possible and it might be defined by political ambition and implementation ability of the society to convenient technologies [6].

Biomass is a sustainable renewable energy source including broad range of organic waste such as: animal manure, forestry and agricultural residues, municipal and agro-industrial solid wastes.

Biomass is not only making contribution to the sustainable development but also providing energy security for all over the world's population and reducing the GHG emissions. Besides due to the availability and the well-known conversion technologies biomass will be one of the major energy resources in the very near future to fulfil the most demand and ensure the energy supply security [7].

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