Renewable Energy 71 (2014) 425–432

Contents lists available at ScienceDirect

Renewable Energy

journal homepage: www.elsevier.com/locate/renene

Assessment of renewable energy incentive system from investors' perspective

Mustafa Ozcan*

Electricity and Electronics Department, Şişli Technical School, Şişli, İstanbul, 34381, Turkey

ARTICLE INFO

Article history:
Received 25 February 2014
Accepted 24 May 2014
Available online

Keywords:
Energy incentives
Energy investment
Renewable energy

ABSTRACT

Countries around the world meet their electrical energy demand by utilizing fossil fuel based, nuclear or renewable energy sources. In contrary to fossil fuel based and nuclear energy sources which have negative environmental impacts and which increase energy import dependency, renewable energy sources (RES) minimize the negative environmental impacts and decrease energy import dependency which places a big burden on the economies. Energy generation from RES is disadvantageous in comparison to conventional energy sources because of its high investment costs and as it is a new technological area. Countries apply different incentive systems with the purpose of eliminating such disadvantages and encouraging the use of RES for electricity. Turkey is highly dependent on external energy sources, has substantial amount of RES potentials and has an incentive system to promote energy generation from these sources. In Turkey and around the world, there are various barriers to RES deployment. Knowing these barriers and taking convenient measures is necessary for the development and deployment of RES. In this study, 18 investors having investments in the area of RES in Turkey were interviewed and the results of RES incentive system and other additional supports in application were assessed through a survey study. As a result of the analysis of the survey data, effectiveness of RES incentive system and other additional supports was assessed and its pros and cons in application were determined.

1. Introduction

Energy security of Turkey, which neighbors countries that have rich oil and natural gas sources and is dependent on such countries for energy to a great extent, can be increased with utilization of domestic and renewable energy sources (RES) it possesses. The non-fossil sources like wind, solar, aero thermal, geothermal, hydrothermal, ocean, hydroelectric, biomass, landfill gas (LFG), sewage treatment gas and biogas are defined as RES[1]. The economically usable hydroelectric energy potential of Turkey is 170 TWh/year. The theoretical wind energy potential of Turkey is about 48,000 MW, 38,000 MW of which could be used onshore and 10,000 MW of this potential is offshore [2]. The geothermal energy potential of Turkey is 600 MW, solar energy potential is 380 TWh/year [3] and biogas potential is 29.77 TWh/year [4].

In realization of energy supply policy and energy market regulations of Turkey, the aim is to ensure adaptation to the energy related policies of the European Union (EU) to which Turkey is a candidate member. The EU, with its renewable energy directive, aims to produce 20% of total final energy consumption from RES by 2020. In the National Renewable Energy Action Plans (NREAP) prepared by the member countries, it is aimed to increase the RES rate of 14.9% in 2005 and in electricity consumption to 34.3% by 2020. According to this plan, by 2020, 14.1% of electric consumption will be obtained from wind, 10.5% from hydroelectric, 6.5% from biomass, 2.35% from photovoltaic (PV), 0.5% from condensed solar power (CSP), 0.3% from geothermal energy and 0.15% from ocean energy [5]. A financial source between 61 and 70 billion Euro/year is required in average to achieve the targets for RES investments in the EU countries [6]. Increasing of RES rate in the energy supply requires powerful political support [6–8]. For this reason, incentive systems to be used and financial volume of the incentive are the indicators of the determination of energy policy makers in attainment of RES targets.

As of the end of November 2013, the total installed power of Turkey is 62,663.9 MW and the rate of installed power for RES,including hydroelectric, is 25,103.6 MW. The distribution of installed power according to the sources is given in Table 1 [9]. It is seen that

* Tel.: +90535 414 45 27; fax: +90212 222 65 48.
E-mail address: ozcanm2000@gmail.com.

http://dx.doi.org/10.1016/j.renene.2014.05.053
0960-1481/

Table 1
The installed power of Turkey depending on source type.

Source	Installed power (MW)	Share (%)
Fuel-oil + asphaltite + naphtha + diesel oil	1038.3	1.7
Hard coal + lignite	8515.2	13.6
Imported coal	3912.6	6.2
Natural gas + LNG	20198.5	32.2
Biomass	224.0	0.4
Multi-fuels solid + liquid	675.8	1.1
Multi-fuels liquid + N. gas	3219.8	5.1
Geothermal	310.8	0.5
Hydroelectric	21874.3	34.9
Wind	2694.6	4.3
Total	62663.9	100.0

the share of hydroelectric installed power in RES is high. The installed power value for sources other than hydroelectric is 3229.4 MW and its share in the total installed power is about 5.15%. When the abundant RES potential of Turkey is considered, this share remains low.

The main target for Turkey is to obtain 30% of its total electrical energy supply from RES by 2023.To achieve this target, the aim is to complete the ongoing construction of 5000 MW hydroelectric power plants by 2013, increase the installed power of wind energy to 10,000 MW by 2015 and to 20,000 MW by 2023 and the installed power of geothermal energy to 300 MW by 2015 and to 600 MW by 2023 [10,11].

The main barriers for the RES deployment in Turkey are [12–17]; financing source difficulty, lacking of detailed assessment studies about RES potentials and bureaucratic barriers for foreign investors. Besides these barriers; there are barriers such as high first investment cost of RES plants, high taxes, ambiguity of economical, environmental and social benefits to be provided by RES, lack of coordination between institutions, lack of preparation for secondary legislation for application of financial incentives and grid connection problems.

In various studies done in relation to RES incentive system of Turkey [12,15,18], it is stated that the applied incentives increase the RES investments, development of incentive systems related to incentive for RES is continued and the government gives particular importance to incentive for RES. It is stated that competitive market conditions have occurred for renewable energy investments and this situation will enable foreign investors to make investments directly or together with a local partner.

Yaniktepe [17] points out that the incentive prices applied in Turkey for wind energy are low in comparison to other European countries, the government must develop new incentive mechanisms to promote wind energy projects, the turbine manufacturing must be made in Turkey, programs to meet qualified personnel needs for the wind energy sector must be established and R&D studies be increased.

Ertürk [19] points out that the existing tariff for the wind energy in Turkey is sufficient for wind speeds at 7.5 m/s and above.

In the literature, there are positive and negative opinions about the existing incentive system being applied in Turkey and as well as opinions about its insufficiency. In this study, first of all, the incentive system and additional supports applied in Turkey are introduced and then, a survey study is conducted to determine the efficiency of incentive system in practice and its results are assessed. The survey study has been realized by means of face-to-face interviews with 18 investors who have investments in areas of RES in Turkey and the closed ended, open-ended questions and Likert-scale questions have been asked. The survey questions have been prepared by examining the national and international literature on renewable energy incentive systems and renewable energy and the related national legislation. The survey contains dependent variable type of expressions such as benefits, risks, experienced difficulties, expectations in renewable energy investments and infrastructure assessments.

2. Incentive system of Turkey

Various incentive systems are applied for the purpose of making of RES compatible with conventional sources. The incentive systems can be classified as regulatory and voluntary incentive systems in general [20]. This classification can be made as investment focused and production-based, direct or indirect, price driven and capacity driven. If financial support amount that is used for the purpose of achieving the determined targets in RES policies is less and collected taxes are low, this means that efficiency of the applied incentive system is high [21]. The purpose in RES incentives is to obtain the desired RES installed power (effectiveness of the incentive system) with high efficiency.

Turkey's primary incentive system for RES has been technology specific feed-in tariff (FiT) which is a production-based incentive system. The incentive system does not include caps which set a maximum amount of electricity to be supported by FiT and there are not any periodic reduction for the FiT rates. This system and opportunities provided under the scope of other additional supports used in stimulating the development and investment of RES are given in Table 2.

Primary legislation of Turkey related to renewable energy is realized with Law no 6094 enacted in 2011" making of amendment on the law of renewable energy resources for the generation of electrical energy". In accordance with this law, technology specific FiT's are given in Table 3[22].

Table 2
Opportunities provided to incentivize the electric generation with RES in Turkey [20,22,23–27].

	Incentive mechanism	Opportunities provided	
Direct	Feed-in Tariff	Technology specific FiT's provided for a period of 10 years	
	Unlicensed electricity generation (Net metering)	Exemption from license up to1 MW, fixed price purchasing guarantee for excess electricity generation and premium for domestic equipments	
	Investment incentive	Related to license	License priority, taking of 1% of licensing price, not to take annual license fee for 8 years
		Grid connection	Grid connection priority
		Land use	Land use facilities, facilities provided for land use prices
	Credits	Renewable energy credits provided by banks	
Indirect	Tax incentives	Under the scope of investment incentive scheme; VAT exemption, customs duty exemption, income tax withholding allowance	
	Premium for domestic equipments	Premium for the first five years of operation, in case of domestically manufactured equipments.	
	R&D	Income tax withholding allowance, social security premium allowance (Employer's share) and stamp duty exemption	