

THE EFFECT OF FINANCIAL INCENTIVES IN PROMOTING WIND ENERGY IN TURKEY

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Overview

Environmental concerns, increase in the price of fossil fuels and the desire to decrease dependence on imported fossil fuels have affected countries all over the world to accelerate developing their renewable energy resources, particularly the wind energy potentials. Turkey is facing similar problems, as the share of fossil fuels in its total primary energy supply is 91% and the share of imported energy in this supply has increased to roughly 72% in 2011 [1]. Therefore, the utilization of domestic renewable energy resources at an optimal scale is the best option to meet the electricity demands in the future. In order to eliminate the environmental problems, to reduce import dependency for energy and to maintain a sustainable economic growth, the Turkish government plans to supply 30% of Turkey's electricity demand in the year 2023 from renewable energy resources [2]. The estimation of electricity demand of Turkey in 2023 is around 530,000 GWh. Accordingly 160,000 GWh of the demand is to be supplied from renewable energy. Supplying this demand from wind, solar, geothermal energy and hydropower, the estimated project costs are US\$31.000 billion and 1.05 million tones of CO₂ equivalent annual greenhouse gas emission reductions will result. [3].

In Turkey, grid connected production of wind energy started in 1998. With the Renewable Electricity Law of No. 5346 enacted in 2005; there has been more than 100 % yearly increase in the production capacity. With a total number of 39 wind plants, the capacity reached 1329 MW in 2010. It increased to 2013.2 MW in May 2012. The Renewable Energy Law No. 5346 and the accompanying Electricity Market License Regulations provide special feed-in tariff incentives to generation companies. The incentives are structured to promote domestically produced wind system components (local content) to reduce investment costs [4].

This paper presents the results of a study about the economic assessment of the legal incentives under a set of different local content of the wind systems to be developed and also with different wind speed characteristics that prevail in different parts of the country.

Method

Internationally recognized method of calculating the Levelised Cost of Electricity (LCOE) and simple payback period analysis have been employed to compare the implications of different incentives under different wind speed characteristics. The LCOE is the price of electricity required for a project where the present value of revenues would equal costs, including making a return on the capital invested equal to the discount rate. An electricity price above this would yield a greater return on capital, while a price below it would yield a lower return on capital, or even a loss.

The cost data for the study has been taken from a real case in Turkey.

Results

Turkey's wind energy potential has been officially estimated and an accurate map has been published in 2007. The technical potential of Turkey corresponding to the total capacity of the sites having a wind power density greater than 300W/m² (equivalent to a wind speed of 6.5m/s) and suitable to install wind turbines is estimated to

be 114,363 MW at 50 m altitude [5]. This capacity is further divided into different categories of wind power density. The study has been done by using the this official classification.

The results depended on the wind speed characteristics of the potential wind farm sites expressed in terms of capacity factors and the share of domestically produced components in the overall wind system. The greater the capacity factor is, the shorter the payback period becomes and the lower the calculated LCOE is. Similarly, the more the system components are domestically supplied, the smaller the overall costs are and thus the payback periods. These results imply that, projects involving low wind speed categories are not economically feasible and cannot be implemented in the short term with the current feed-in tariff structures. If Turkey wants to utilize more wind energy, she should increase the current feed-in tariff and provide more incentives than the existing law provides. The analysis also showed that Turkey will make an investment of roughly US \$ 25 billion until 2023 to reach 20000 MW capacity target stated in the National Strategy Document.

Conclusions

The overall conclusion is that the partial incentive mechanism proved not to be adequate with the cost assumptions of the study. Should the assumed component costs were lower, the gap between the incentives and the LCOEs could have been smaller or even positive for more wind class evaluations. It should also be mentioned that the partial incentive scheme is quite difficult to implement and it may be creating some doubts in the investors' minds about how fast they will recover their invested funds. Hence, an adequately high single overall feed-in tariff for wind energy may be more encouraging for the investors to securely undertake the steps in developing Turkey's wind capacity. It is known that single tariff incentives have been successful in various countries for the investments to take off. However if it continues to be a priority agenda item for Turkey to promote development of wind energy systems locally rather than importing them, then the partial incentive mechanism would continue to be the choice.

References

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