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ECONOMIC BENEFITS OF SOLAR ENERGY FOR TURKEY

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Abstract

Purpose: Turkey lies on the shores of the Mediterranean Basin, an area of high solar energy potential in common with Portugal and Spain. This potential can be used as solar thermal, water heating and photovoltaic. Solar energy is mainly used for water heating in Turkey. In this paper I will clarify the economic benefits of solar energy and provide information for future prospects.

Design/methodology/approach: A literature review was carried out.

Findings: There is little investment in thermal panels and photovoltaic resources. According to the Chairman of the Association of Turkish Photovoltaic Industry, Professor Engin Ture, the potential of solar energy is around 380.000 GWh/year, which is tremendously high compared to other clean energy resources. In the meantime, there is a high state incentive for solar energy investments in Turkey. The Turkish economy maintained high GDP levels in recent years. This increased the energy demand of the country respectively. Increased oil prices created a burden on the current account deficit of the country, which may hamper economic growth. Thus new investments in renewable energy resources became inevitable for the Turkish economy.

Keywords: Solar energy, Green economy

Paper type: Literature review



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INTRODUCTION

Turkey has been experiencing high growth rates for a decade and the coming years look very promising with its strong economic performance. One of the main outcomes of this growth is a soaring energy demand for a country which heavily relies on imported fossil fuels. The upward momentum of capacity utilization rate in industrial production reveals that the demand for energy resources will possibly increase in the near future. High dependency on imported energy resources creates collateral damage on the flourishing Turkish economy. The increase in energy resource imports increases the currency demand of the country and creates deficits in the current account in the balance of payments of the Turkish Republic. Even so, the Arab spring and other latest crises in petroleum producing countries increased the price of oil and the economic burden of Turkey. Increasing energy costs in the industrial sector further create an inflationary spiral and possibly move the country towards stagflation, as in previous decades. High dependency on foreign energy resources forced Turkish policy makers to find alternative energy resources for a new century. Renewable sources such as wind and solar energy became a special part of the agenda of planning agencies. Turkey has a significant amount of non-renewable energy resources, such as lignite and hard coal. The industrial consumption of those sources is limited due to their low calorific and containment of high sulfur, dust and ash, and also the quality of coal is low grade. The pollution side effects of those resources during the industrial production process also create high social costs of hazardous waste

	2000	2002	2004	2006
Primary energy production (Ttoe)	27621	24884	24170	28210
Primary energy consumption (Ttoe)	81193	78322	87778	98350
Consumption Per Capita (KOE)	1204	1131	1234	1377
Electricity installed capacity (MW)	27264	31846	36824	40565
Thermal (MW)	16070	19586	24160	27420
Hydraulic (MW)	30912	33732	46142	44371
Electricity import (GWh)	3786	3588	464	573
Electricity export (GWh)	413	435	1144	2236
Total consumption (GWh)	128295	132553	150018	176637

Table I.
Developments of
energy production
and consumption
(Yarbay 2011)

Table 2. Primary energy production targets of Turkey (Yarbay 2011)

	2005	2010	2015	2020	2025	2030
Hard coal and lignite	21259	28522	31820	39385	42732	45954
Oil and natural gas	2127	1735	1516	1604	1505	1465
Central heating	495	884	1336	2018	2427	2758
Hydropower	5845	7520	8873	9454	10002	10465
Wood and waste	6760	6446	6029	5681	5498	5413
Geothermal	1380	3760	4860	4860	5400	5430
Nuclear	0	3657	9143	18286	26988	29600
Solar	459	907	1508	2294	2845	3268
Wind	250	620	980	1440	1786	2154

management expenditures. The governments tried to lessen the high dependency ratio of imported energy resources, so the importance of renewable sources is significant.

Yarbay (2011) commented on the previous energy production and consumption figures of Turkey. She concluded that the energy consumption per capita is increasing with economic growth and the need for extra energy resources become inevitable (Yarbay, 2011).

The mobility of social life and change in consumption patterns has nexus with the energy consumption of a country. Increase in urbanization and industrial production and the domination of European lifestyle in metropolitan areas will sharply increase country' energy consumption in the future.

In order to contain the soaring energy demand of Turkey, the country needs to increase energy production in the future. Figure 2 shows the targeted energy production figures for Turkey.

SOLAR ENERGY IN TURKEY

Future production of renewable energy resources is expected to increase. Hydropower, geothermal, nuclear and wind energy resources are promising in the future. Solar energy is a unique opportunity for

matching the deficit in energy resources supply. The cleanness, low cost production and easy access to resources in most parts of Turkey make the solar energy business very lucrative, profitable and efficient. Flat plate solar collectors for hot water in coastal areas are commonly used. Electricity generation via photovoltaic collectors is limited to some research institutions. Because of the desirable environmental and safety aspects, it is widely believed that solar energy should be utilized instead of other alternative energy forms, because it can be provided sustainably without harming the environment (Celiktas, 2010).

The renewable energy resources, especially solar energy, became a priority for most of the European countries due to the need to get rid of toxic carbon polluted nonrenewable fossil based energy sources. One of the main problems of exhausting fossil fuels is global warming by the excess creation of carbon dioxide, which does not allow heat radiation from reemergence, in common with the glass in a greenhouse. The “greenhouse effect” of such energy resources consumption increases global heat (Bilgen *et al.*, 2007).

Solar energy may provide an important part of the future energy needs of Turkey. Turkey has an average annual sunshine duration of 2640 h and an average solar intensity of 3.6 kWh m day. Residential and commercial sectors, especially in the southern and western regions, frequently use installed flat plate collectors (Evrendilek, 2003).

Solar energy usage in Turkey can be categorized as follows: conventional water heating, solar drying of agricultural products in organic farming, heat pump and photovoltaic energy. With the exception of the first two of these, there is a limited utilization of this source. Meanwhile, conventional water heating is common, and thermal energy storage for more efficient production is still very rare (Bilgen *et al.*, 2007).

Source	Potential (Gwh/Year)
Hydro	135.000
Wind	130.000
Geothermal	5.000
Biomass	230.000
Solar	380.000

Table 3.
Renewable Energy
Potential of Turkey
(Ture, 2012)

ECONOMIC BENEFITS OF SOLAR ENERGY IN TURKEY

Solar energy is a very environmentally friendly source of energy production. The production process is environmentally friendly and creates positive external economies of production, which in turn increase productivity in country. In addition to this external positive economy, there are a number of economic benefits for solar energy investments in Turkey.

1. The high energy demand in the near future makes those investments very popular and profitable in the coming years

High growth rate and increasing industrial production expectations in the near future create soaring energy demands in Turkey. Low cost, alternative and renewable energy sources become much more attractive for the consideration of opportunity costs. Implementation of new technologies in photovoltaic devices decreased the application expenditures of solar energy investments. The nexus between high energy demand and new investments in solar energy production is positive. Thus the expectations for the solar energy market are very promising.

2. Government financial incentives for solar energy production are very high in order to attract new investment

In order to match the energy demand, the Turkish government started monetary benefits of new investments. So there are financial incentives to increase private solar energy investments in Turkey. Per kWh incentives for renewable energy investments are shown in Table 4. Government policy is very supportive of private renewable energy investments that create extra employment for national resources. Solar energy investment received the biggest share of support, with 22,5 USD cents per kWh energy production.

Table 4. State incentives for alternative energy production (Ture, 2012)

Facility	State incentive \$C/kWh
Hydroelectric	9,6
Wind	11
Solar photovoltaic	20
Concentrated solar power	22,5
Biomass	18,9
Geothermal	13,2

3. The high availability of free land for solar farms

The Ministry of Energy's solar energy action plan covering 27 of the country's provinces includes eventual investments topping 2,8 billion USD (Ture, 2012). The potential of free and unoccupied lands in these regions are available for solar energy production investments with relatively low initial costs. The top provinces chosen as solar energy sites were: Konya province (82 mgws), Van province (77 mgwts), Mersin province (35 mgws) and Karaman province (38 mgwts).

4. Turkey has high solar energy potential due to its geographical location

Turkey's geographical location is in a sunny belt between 36 and 42 N latitude and global solar radiation on horizontal surfaces and sunshine hours are measured by all recording stations in Turkey. The yearly average solar radiation is 2,6 kWh/m² day and the total yearly radiation period is approximately 2640h. That provides a splendid opportunity for the production of solar energy in Turkey.

5. Solar energy is widely accepted and recognized by citizens of Turkey

The public awareness of the benefits of solar energy is very significant. Turkish citizens are generally well informed about the advantages of solar energy. The renewability of this source makes it very profitable for home consumption for inhabitants, especially in southern and western provinces.

The scientific research reveals that the penetration of solar energy production will increase in Turkey as well as Europe. DELFI analysis was applied to solar energy industrial manufacturers. The results of this SWOT analyses application conclude that 25% of all electricity production in our country will be by solar energy by 2050 (Celiktas, 2010).

CONCLUSION

Turkey has to increase the usage of alternative energy sources in order to cope with the soaring energy demand of the country. This will also enable citizens to have clean efficient, renewable and affordable energy resources. The country's geographical location is very suitable for the effective production of solar energy. Besides primitive usage for hot water, the new technologies enable electricity production from solar fields. The increase in the solar energy production will also decrease the importation

of fossil energy resources from abroad. This would be a remedy for the current account deficit problem of the Turkish economy. Implementation of new technologies and state financial incentives will also diminish initial investment costs of solar energy farms. Public awareness is good enough in Turkey regarding the positive impacts of solar energy. Meanwhile, the time liberalization of the energy market has increased private enterprises in electricity production. Thus the share of the private sector in solar energy supply is increasing in electricity production in Turkey.

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