


SE4JOBS
CASE STUDY

TURKEY

December 2015

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Published by :
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Published by:
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany

E info@giz.de
I www.giz.de

On behalf of:
Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ)
(German Federal Ministry for Economic Cooperation and Development [BMZ])

Responsible:

Steffen Erdle
Head of the Regional Project RE-ACTIVATE:
"Promoting Employment through
Renewable Energy and Energy Efficiency
in the MENA Region"
Email: steffen.erdle@giz.de

Produced by:

Freie Universität Berlin
Forschungszentrum für Umweltpolitik (FFU)
Ihnestr. 22
14195 Berlin
Tel.: 49 (0)30-838-54492

Authors:

Klaus Jacob, Holger Bär

Cover Pictures: (from left to right): 1. A construction worker is taking insulation measures. © GIZ / O. Benbila. – 2. Energy efficiency measurement. © Shutterstock - 3. Technicians are assembling a stator. © Enercon GmbH. - 4. A man is installing a photovoltaic rooftop system. © GIZ / C. Weinkopf.

Berlin, 2016-11-21

Abstract

This study has been produced on behalf of the **Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH**, through its **regional project RE-ACTIVATE ("Employment Promotion through Renewable Energy and Energy Efficiency in the Middle East and North Africa")** in the scope of the SE4JOBS project ("Sustainable Energy for Jobs").

RE-ACTIVATE is working on behalf of the Federal Ministry for Economic Cooperation and Development (BMZ) to help develop markets for employment-intensive renewable energy (RE) and energy efficiency (EE) applications in the countries of the MENA region.

SE4JOBS was launched as a collaborative effort and working platform of several GIZ projects dealing with different aspects of sustainable energy and socio-economic development promotion. RE-ACTIVATE serves as a coordinator and "secretariat" of the project.

Several GIZ sector project have been actively involved in SE4JOBS, specifically those working on "Sustainable Economic Development", "Innovative Approaches of Private Sector Development", and "Employment Promotion in Development Cooperation".

The project has been supported by a consortium of adelphi, a Berlin-based think tank and public policy consultancy for climate, environment and development issues, and the Centre for Environmental Policy Research (FFU) of the Free University of Berlin (FU).

SE4JOBS aims to identify and assess available worldwide experience and good practices in developing and emerging countries on how to strengthen the link between socio-economic development and sustainable energy. The focus is on employment and value creation.

The goal is to support international know-how exchange and policy dialogue by offering a set of specific, application-oriented instruments and recommendations that help policy makers and planners to develop better approaches and institutional settings for an optimal valorisation of the socio-economic benefits of sustainable energy applications while adapting them to the specific needs and conditions of their countries and organisations.

The following key deliverables have been produced in the framework of SE4JOBS:

- A set of good-practice case studies assessing in greater analytical depth and according to a single methodology the specific approaches and trajectories of six selected global front-running countries in Asia, Africa, and Latin America.
- The creation of an application-oriented toolbox based on the results of these studies as well as on available global experiences in this regard, including from MENA.
- A set of capacity building and training modules allowing for the targeted dissemination of the findings and the conclusive strengthening of local stakeholders.

A series of national and international outreach activities and expert workshops was organised by RE-ACTIVATE throughout 2015. Participants mainly included government representatives, technical experts, and practitioners from international organisations who provided insights and inputs that proved in fact instrumental for the success of the project.

These meetings allowed for the first-hand presentation of intermediary results, the collection and integration of comments and suggestions and the consequential refining of the SE4JOBS products. They also permitted an interactive exchange with local stakeholders, which moreover came at an auspicious moment as many of the involved countries are currently in the process of scaling up their RE/EE deployment, often in conjunction with ambitious industrial development and job creation schemes. The outcomes of these exchanges could therefore be used to support and enrich discussions and decisions on the ground.

The authors of the study are Klaus Jacobs and Holger Baer from the FFU. The text was reviewed by Steffen Erdle from RE-ACTIVATE as well as by GIZ experts working in Turkey, notably Doerte Heimann. Proofreading was done by Malte Forstat.

All contributions received in this context are gracefully acknowledged.

Contents

List of figures

List of tables

Abbreviations

EBRD	**European Bank for Reconstruction and Development**
EMRA	Energy Market Regulatory Authority
ESCO	Energy Efficiency Consulting Company
EÜAS	Electricity Generation Company
ETC	Evacuated tube collectors
FIT	Feed-in Tariff
HBP	Higher Board of Planning
FPC	Flat plate collectors
IBRD	International Bank for Reconstruction and Development
IFC	International Finance Corporation
MENR	Ministry of Energy and Natural Resources
MEU	Ministry of Environment and Urbanisation (2011 until today)
MEF	Ministry of Environment and Forestry (2003 until 2011)
RER Certificate	Renewable Energy Resource Certificate
SPO	State Planning Organisation
SWH	Solar thermal water heaters
TEDAS	Electricity Distribution Company
TEİAŞ	Electricity Transmission Company
TETAŞ	Electricity Trading and Contracting Company
TL	(New) Turkish Lira
VAT	Value added tax
WTO	World Trade Organisation

1 Outcomes

1.1 Focus of the case study

The case study on Turkey covers strategies and policies to support the development of renewable energy and energy efficiency as drivers for local employment and value creation. In terms of renewable energies, the study covers both their use as a source of power (particularly wind, solar PV and geothermal sources) as well as for heating (particularly solar thermal and geothermal sources).[1] The review of energy efficiency policies focuses on buildings and, to a lesser degree, on industry.

The natural conditions for RE are good and industry considers Turkey a market with a strong growth potential, even by global comparison – especially once some remaining obstacles have been overcome and the large number of RE installations, which are awaiting approval, can actually be constructed and grid-connected.

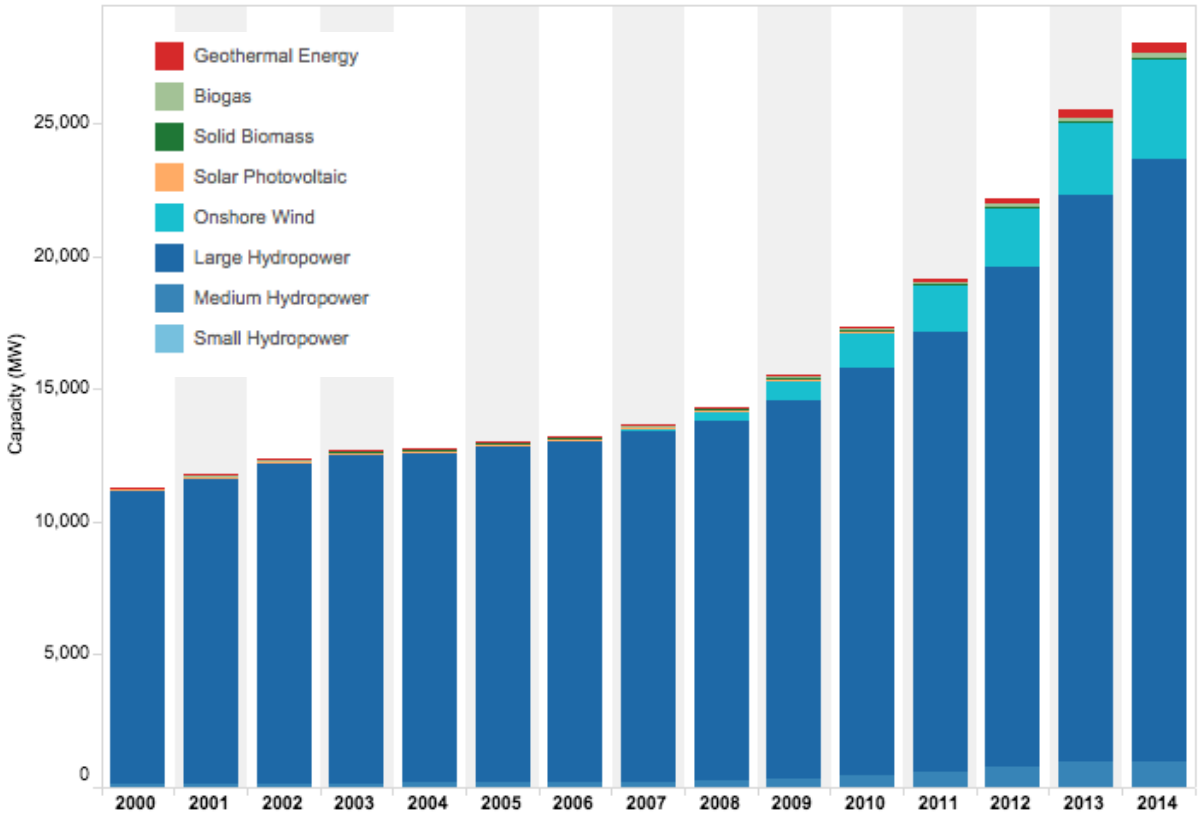
1.2 Renewable energies and energy efficiency in Turkey

1.2.1 Structure and key properties of renewable energies

Turkey is not yet among the countries with the largest RE generation capacities, but it has invested heavily to increase its RE capacities in recent years (see REN21, 2014, p. 16). The power generation capacity from renewable sources is – still – dominated by hydroelectricity, which in 2014 accounted for 23.5 GW or 84% of the RE power capacity, followed by nearly 4 GW in onshore wind power (13%) and by very small shares of around or below 1% for each, geothermal, solar and biomass.

[1] Hydropower and biomass are not covered by this study as they are less relevant to the other MENA countries – in the case of hydropower, because most existing potentials have already been tapped, and in the case of biomass, because the necessary framework conditions for a successful market roll-out remain elusive as of the time of writing.

Figure 1: Installed renewable power capacity in Turkey, in MW, 2000–2014



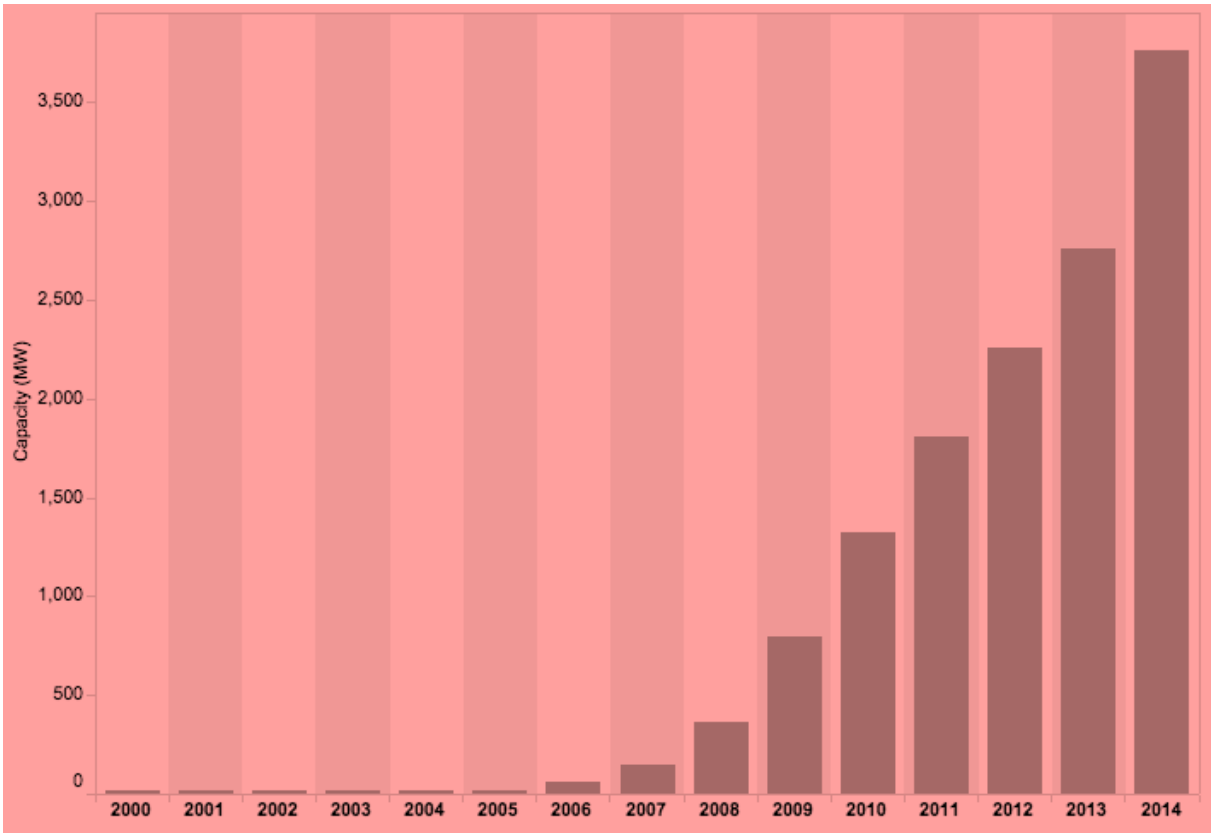
Source: (IRENA, 2015)

Investments in Turkey have been particularly strong in geothermal, hydroelectric and the wind sectors, which have grown significantly. Further, electricity from wind is now close to being cost-competitive with coal and gas-fired power plants – even without support measures – thanks to the high electricity prices for end consumers (REN21, 2014, p. 58).

1.2.2 Wind power in Turkey

The development of wind energy has accelerated over the last few years and the country represents by far the largest wind energy market in its geographical region (EWEA, 2013, p. 13). In 2014, Turkey accounted for about 3.8 GW of installed onshore wind power capacity. So far, there are no offshore installations.

Figure 2: Installed wind power capacity in Turkey, in MW, 2000-2014



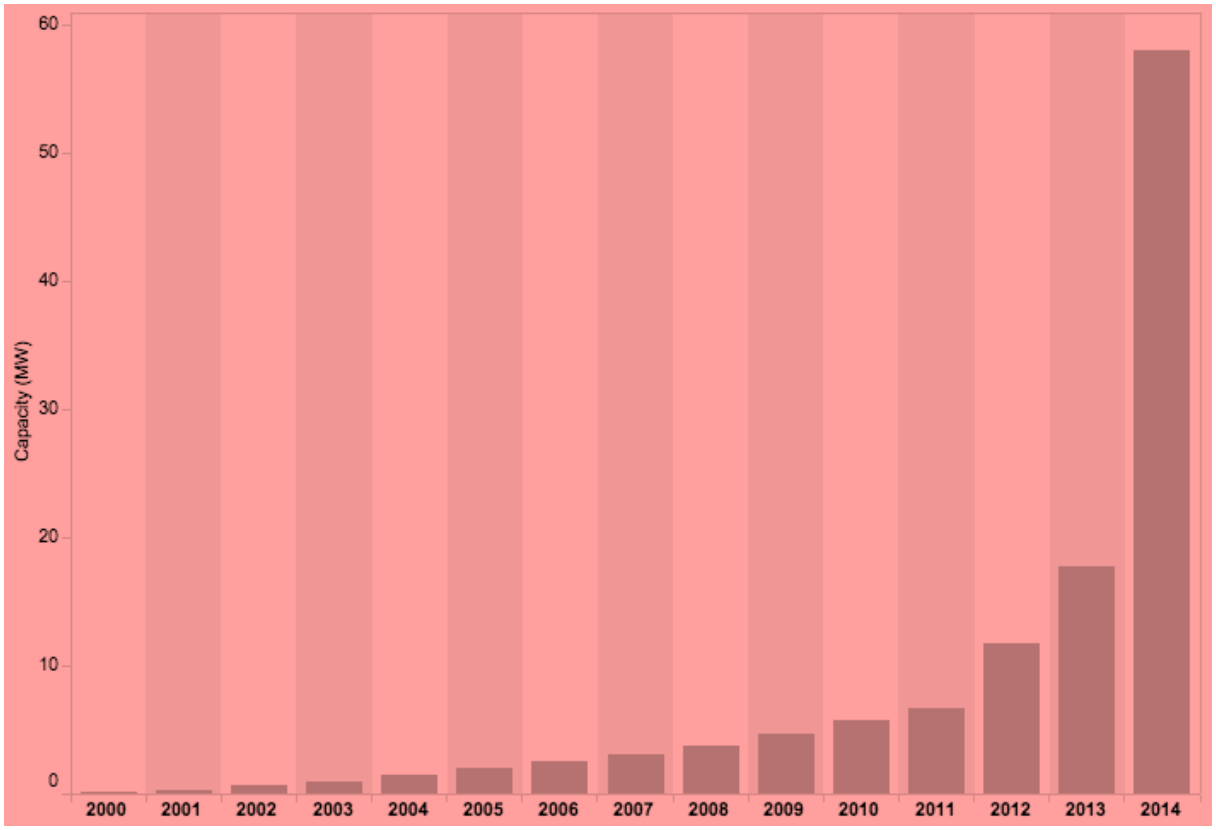
Source: (IRENA, 2015)

1.2.3 Solar energy in Turkey

1.2.3.1. Solar power generation

The Turkish market for solar PV power is still very small, albeit with great growth potential. The cumulated installed capacity of grid-connected PV power in 2014 was a mere 58 MW. The number is however understating the de facto capacity, as most existing installations are small-scale, off-grid and not accounted for in official statistics.

Figure 3: Installed solar PV capacity in Turkey, in MW, 2000-2014



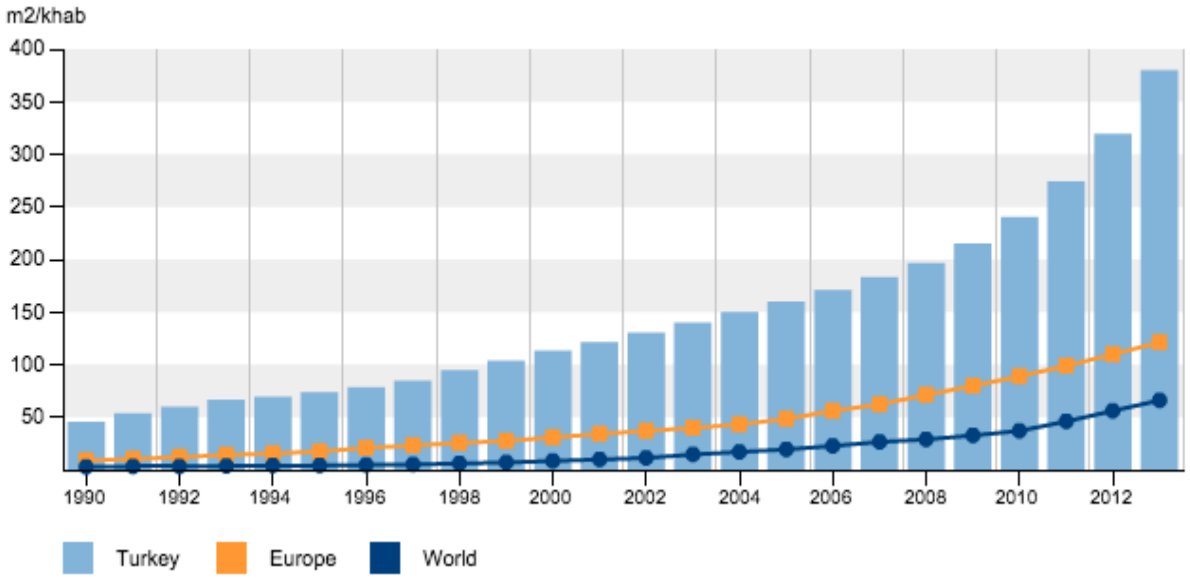
Source: (IRENA, 2015)

There are indicators that the installed solar PV capacity is likely to expand very quickly in the next few years: A first ad-hoc auction for solar power in 2014 that aimed at auctioning off 600 MW of capacity received project proposals totalling nearly 9 GW of capacity. This shows that there is a very significant potential for growth in PV installations in Turkey (Ernst and Young, 2015, p. 11) (IEA, 2014d, p. 32). However, not even those project proposals submitted in 2013 had received their licenses by the spring of 2015 (Inal, 2015).

1.2.3.2. Solar thermal water heating

A significant market, however, exists for solar thermal water heaters (SWH) in Turkey. Installed capacity has grown by roughly 10% annually since 2000 and in 2013 reached 380 m^2 per 1000 inhabitants. With that, Turkey is far ahead of European and world averages and has the fourth largest installed capacity worldwide (World Energy Council, 2015).

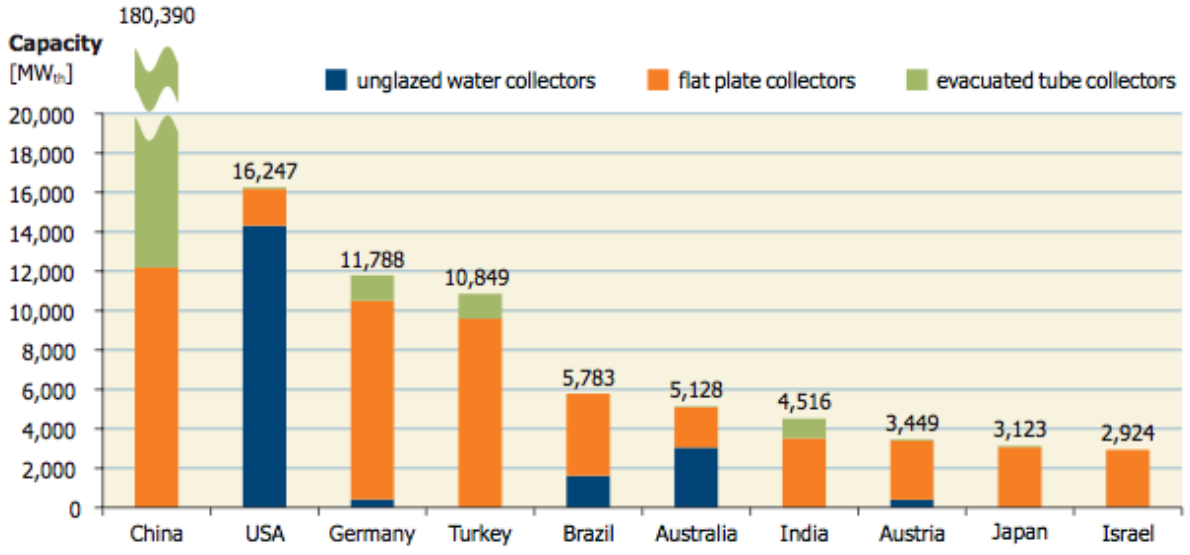
Figure 4: Installed capacity of solar thermal water heaters, m^2 per thousand inhabitants



Source: (World Energy Council, 2015)

Turkey offers a market for both glazed and unglazed water collectors. About 90% of the market are in flat plate collectors, 10% in evacuated tube collectors (Mauthner & Weiss, 2014). The most recently available data is for the year 2012.

Figure 5: Cumulated installed capacity of glazed and unglazed collectors, in MW_{th}, in 2012



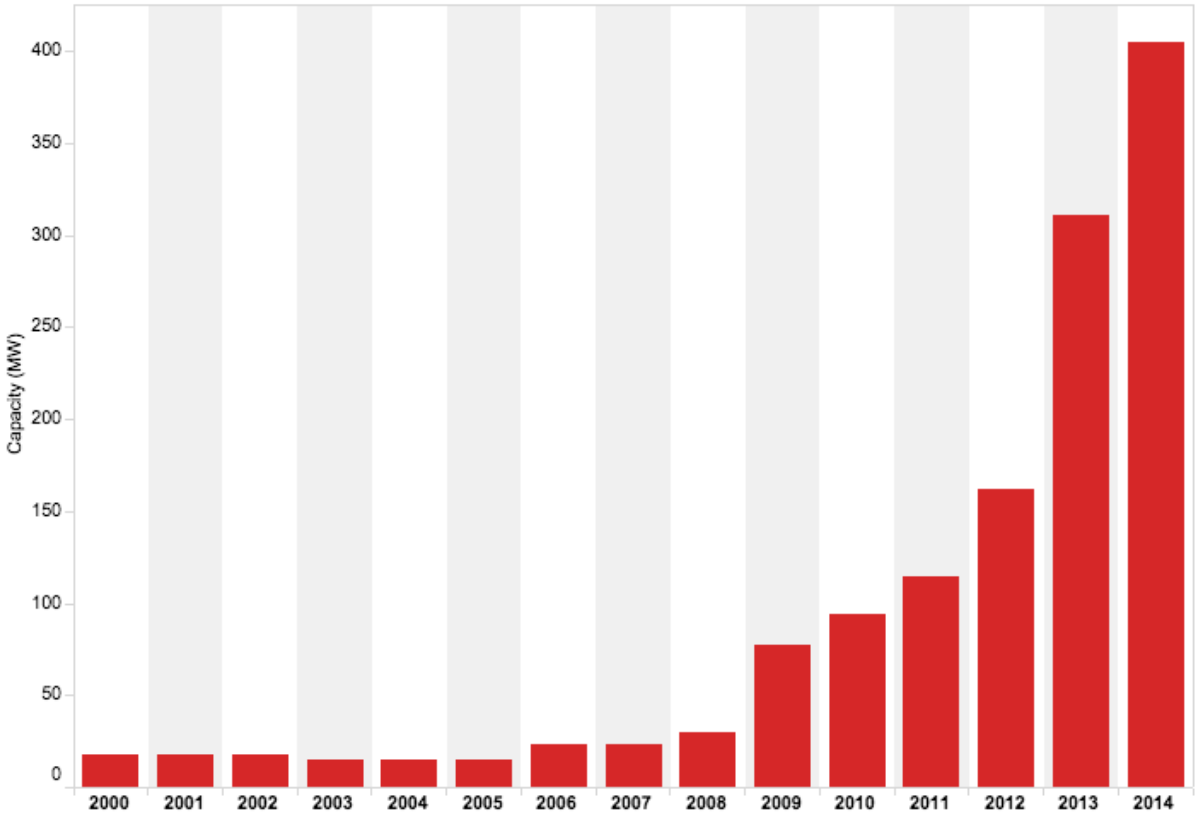
Source: (Mauthner & Weiss, 2014)

1.2.4 Geothermal energy in Turkey

1.2.4.1. Geothermal power

In Turkey, geothermal energy is used to generate power as well as heat. The installed capacity for electricity generation from geothermal sources in Turkey accounted for 405 MW in 2014. The growth in installed geothermal power has been accelerating in recent years and investments have been the second-highest in the world, only behind Kenya. Out of 640 MW of global capacity additions, 107 MW were added in Turkey (REN21, 2015, p. 130).

Figure 6: Installed geothermal power capacity in Turkey 2000-2014



Source: (IRENA, 2015)

1.2.4.2. Geothermal heat

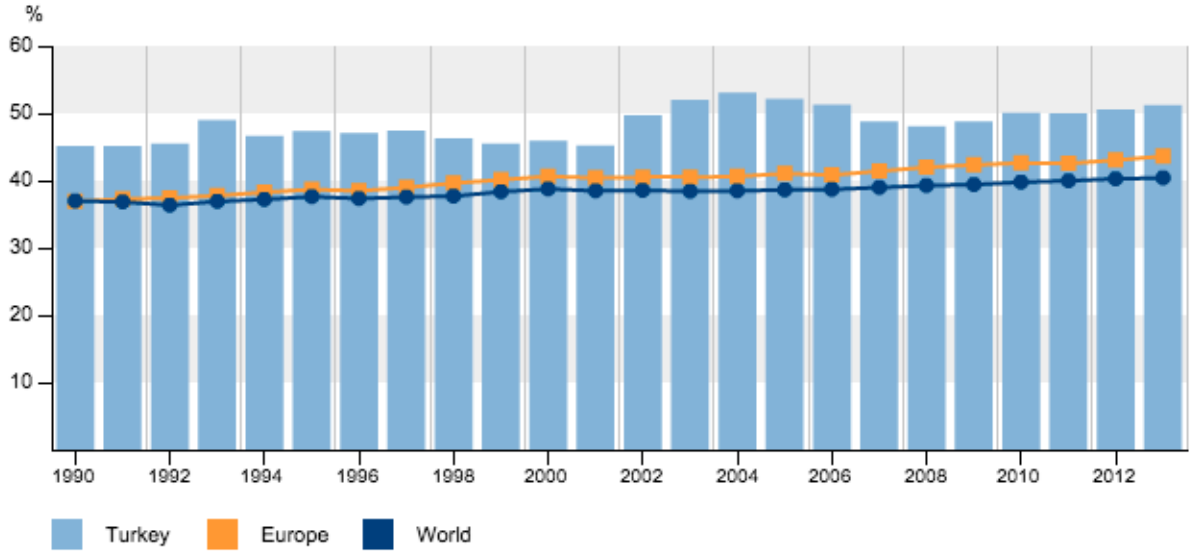
Of greater importance is the use of geothermal energy to produce heat. In 2014, Turkey ranked second in globally installed geothermal heating capacity (behind China) (REN21, 2015, p. 20). The installed capacity was estimated at 10,849 MW in 2012 – about 9,6 MW from flat plate collectors and about 1,2 MW from evacuated tube systems (Mauthner & Weiss, 2014). The installed capacity used for district heating is the second greatest in Europe behind Iceland (European Geothermal Energy Association, 2014, p. 14).

1.3 Energy efficiency in Turkey

1.3.1 Energy efficiency in power generation

The efficiency of Turkish power generation plants is high (51.2% in 2013) by international comparison. The reason for this is the relatively young age of Turkish power plants that have been installed to meet a power demand that has increased seven-fold since 1985 (see section 2.3). The relatively high share of hydro power also plays a role.

Figure 7: Efficiency in power generation[2], compared to Europe and the global average, 1990-2013



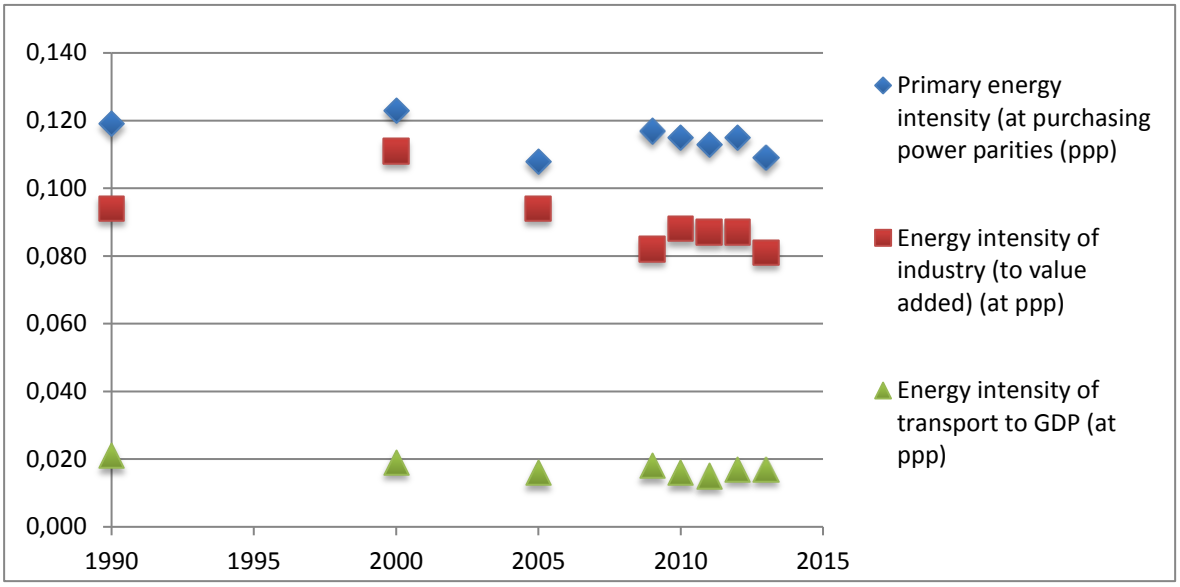
Source: (World Energy Council, 2015)

1.3.2 Energy efficiency in different sectors of the economy

The energy intensity of the economy in general, and of industry and the transport sector in particular, have declined since 1990 – despite the high levels of economic growth (compare section 2.4). The primary energy intensity of the economy overall fell by nearly 1% annually between 2000 and 2013. This trend was mainly driven by much higher improvements in the energy efficiency of Turkish industry: Its energy intensity fell between 2000 and 2013 at a rate of 2.4% per year (see below) (World Energy Council, 2015).

[2] The efficiency of power generation is calculated as the total net production divided by the energy inputs.

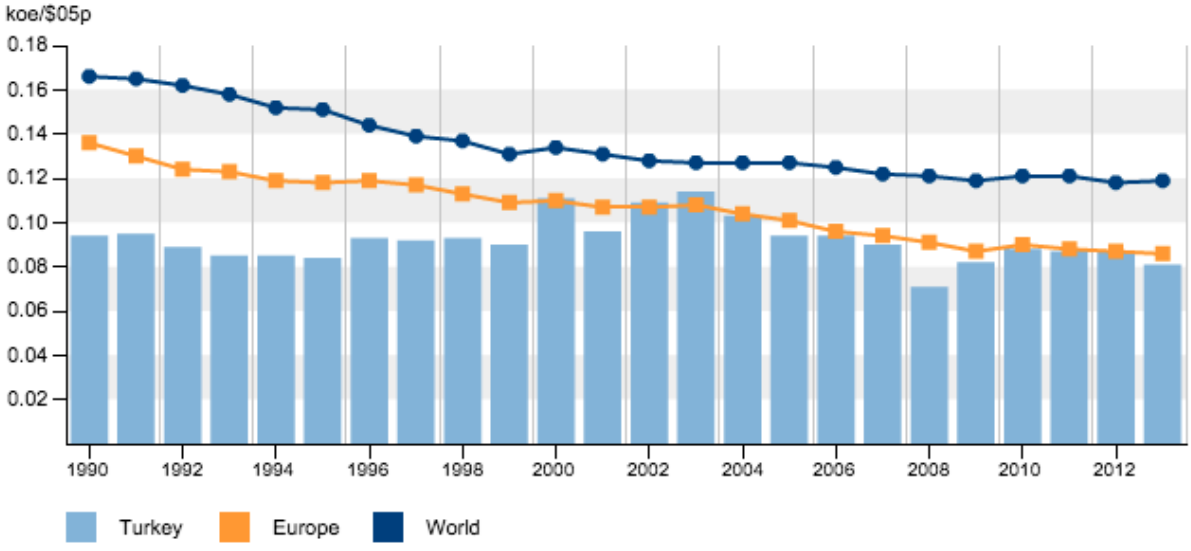
Figure 8: Development of the primary energy intensity overall, in industry and in transport, 1990-2013



Source: (World Energy Council, 2015)

Data on the energy intensity of Turkish industry shows that the country was on a par with the European average in 2013 and is significantly more efficient than the global average.

Figure 9: Energy intensity of industry in Turkey, compared to Europe and the global average, 1990-2013



Source: (World Energy Council, 2015)

1.4 Domestic value added and employment

1.4.1 Investments in renewable energies

In 2014, Turkey attracted investments of over US$1.8 billion into renewable energies (FS-UNEP Collaborating Centre, 2015, p. 20). Because of the country's potential to develop RE, it is considered an attractive market for investments, particularly in wind, geothermal and (large) hydroelectricity, ranking 9th and twice 6th worldwide in the Ernst & Young RE Attractiveness Index (Ernst and Young, 2015). It is particularly noteworthy that Turkey takes a leading position in the world with regard to renewable heating: In 2014, the country ranked second in the world in terms of investments in geothermal and solar thermal heat production (REN21, 2015, p. 20).

1.4.2 Employment in renewable energies

Data on employment in renewable energy or energy efficiency is still very scarce for Turkey. The IRENA Resource gateway contains only two entries about direct employment in RE in Turkey: about 1,700 jobs in biofuels and 400 in the solar PV market. However, both figures lack sources and are likely to be out-dated. There are no employment figures available for the wind power sector or the strong geothermal and solar thermal markets.

The International Labour Organisation (ILO) is currently working with the Turkish government on assessing the potential employment from green jobs. The results of the assessment have not been publicised yet. Besides this quantitative work, the ILO Green Jobs programme is also working on improving job quality in the field and ensuring 'decent working' standards. It has published case studies of Turkish businesses in the green economy that discuss the challenges of providing such 'decent' working standards (ILO, 2015). The collaboration between the ILO and the Turkish government ultimately aims at developing a Turkish Green Jobs strategy that focuses on providing the skills needed to create domestic employment in the green economy (International Labour Office, 2013).

1.4.3 Manufacturing capacities in renewable energies

Domestic manufacturing is particularly strong in the wind and solar thermal sector. For both, the domestic market is the most important driver. Most wind power sites currently under development are close to major centres of power consumption in the provinces of Balikesir, Hatay, Canakkale, İzmir and Istanbul and are being developed by a broad range of Turkish companies – five of which control half of the market (EWEA, 2013, p. 71).

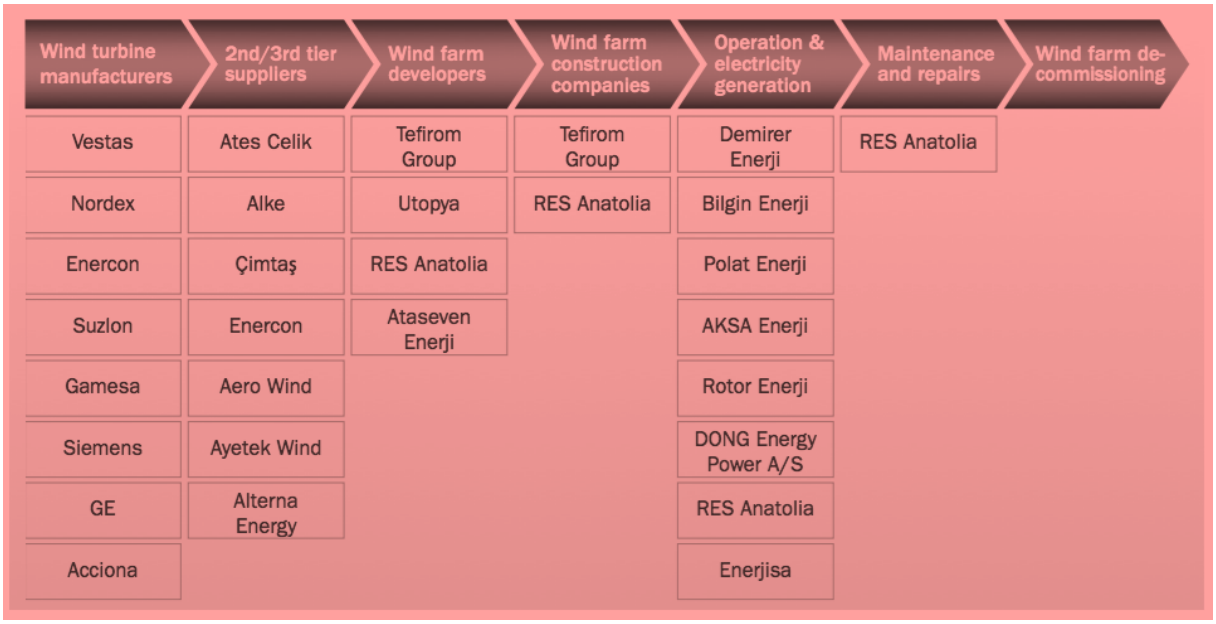
Figure 10: Main wind energy developers in Turkey, 2009–2011 (in MW)

Producer	2009	2010	2011	2011 share
DEMIRER Enerji	230	256	302	16.8%
BILGIN Enerji	65	245	245	13.6%
Rotor Elektrik	135	135	135	7.5%
Polat Enerji	31	112	112	6.2%
AKSA Enerji	41	41	109	6%
Others	299	540	897	49.9%
Total	**801**	**1,329**	**1,800**	

Source: (EWEA, 2013, p. 71)

The figure below illustrates different segments of the wind power supply chain and the domestic and international companies involved. For example, turbine manufacturing is still completely dominated by foreign companies, while other parts of the supply chain, such as towers and blades, are now also being delivered by Turkish companies such as Alke (EWEA, 2013, p. 72). The development of Turkish component manufacturers has partly been fostered by the use of local content premiums that aim at strengthening the domestic shares in the value chain. The local content premiums on top of the RE feed-in tariffs (see section 4.3.1.1) are designed to support the competitiveness of Turkish companies, to reduce the dependence on technology imports and to create domestic employment.

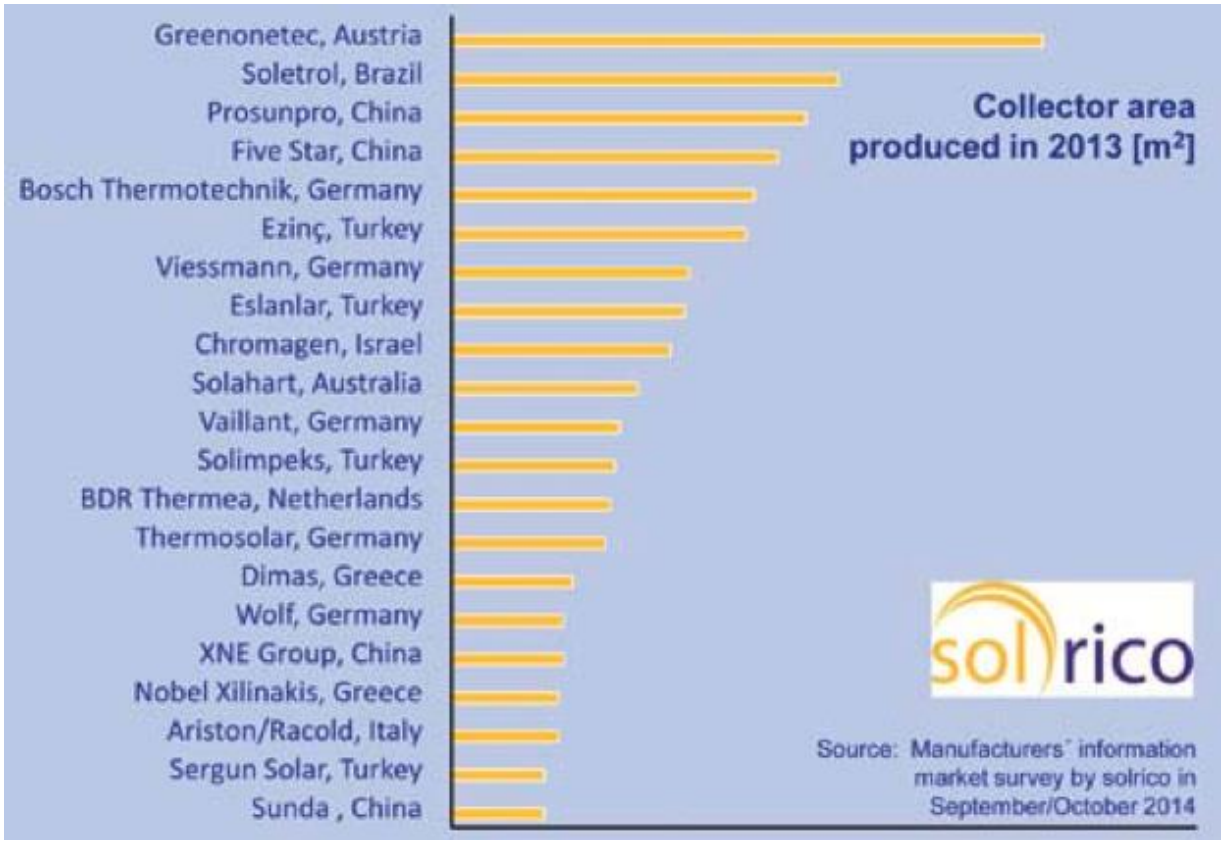
Figure 11: Wind energy supply chain in Turkey, active international and Turkish companies by sub-sector



Source: (EWEA, 2013, p. 71)

Beyond wind power manufacturing, the development of the domestic SWH market has spurred the growth in Turkish manufacturing of solar thermal systems. In 2013, Turkish manufacturers produced over 800,000 m^2 of flat-plate collectors, 100,000 m^2 of vacuum tube collectors and 500 m^2 of glazed air collectors. Among producers of flat-plate collectors, four Turkish companies feature among the global top 20 (see below).

Figure 12: Ranking of the largest flat-plate collector manufacturers 2013 worldwide



Source: (Solrico, 2014)

2 Turkey's framework conditions

2.1 Natural conditions

2.1.1 Wind power

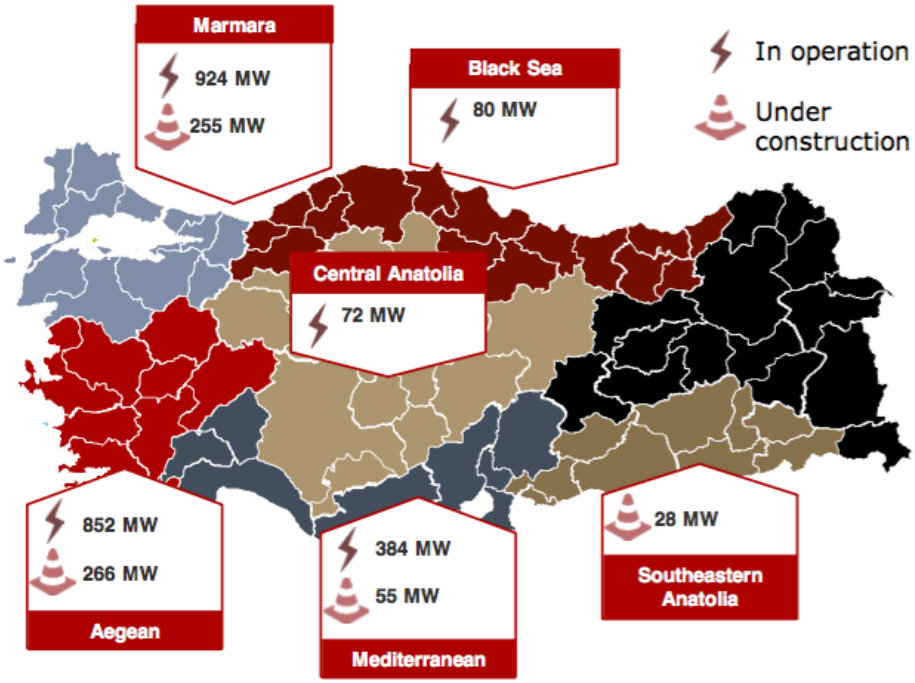
Turkey boasts an exceptionally wide variety of renewable resources for a country of its size. In principle, all major renewable resources – sun, wind, hydropower, biomass and geothermal energy - are available in quantities and qualities far above the average.

For instance, the natural conditions for wind power are generally very good. Estimates on the technical wind power potential and on what share of it is economically viable vary widely from 48 GW up to 132 GW.[3]

Turkey generally benefits from favourable geographic conditions as it is surrounded by sea on three sides and has a coastline of more than 8300 kilometres (İlkiliç, 2012, p. 1169). The best natural conditions for wind farms are along the north-western and southern coastlines of Turkey in the Marmara, Aegean and South-East Anatolia regions (see figure).

[3] The Turkish wind energy industry sees a "techno-economical wind power potential" of 48 GW for Turkey (Atavesen, 2013). Other estimates report an even higher technical potential of 88 GW, but assume that only 10 GW are economical (Basaran, Dogru, Balcik, & Ulugtekin, 2015, p. 83). Other sources predict 132 GW for onshore wind and another 17 GW in offshore wind power (İlkiliç, 2012, p. 1169).

Figure 13: Map of Turkish wind power capacities in operation and under construction



Source: (Turkish Investment Support and Promotion Agency, 2013, p. 26)

2.1.2 Solar energy

Turkey has favourable conditions for solar technologies as irradiation levels reach between 1,600 and 2,000 kWh/m^2 per year in most of the country, except for the northern coastal regions. This value is about 50% higher than the European average. A solar map of Turkey can be found in the annex in section 8.1.

2.1.3 Geothermal energy

The technical potential of geothermal power generation is estimated at 710 MW (Parlaktuna, Mertoglu, Simsek, Paksoy, & Basarir, 2013). The government's target for geothermal power capacity is to reach 600 MW by 2023. The actually installed capacity reached 405 MW in 2014. The geothermal power plants that were licensed by the Energy Market Regulatory Authority (EMRA) in 2013 alone are expected to increase that power generation capacity to 643 MW (Parlaktuna et al., 2013). Because of such developments, the REAP expects geothermal power capacity to in fact reach 1,000 MW in 2023 (MENR, 2014).

The geothermal heat potential by far surpasses the geothermal power potential. Some official estimates (the government's 10th Development Plan) have reported up to 60 GW$_{th}$ of technical capacity for thermal usage. Another study by the Turkish General Directorate of Mineral Research and Exploration estimates the actually existing technical potential for geothermal heat production to be only a fraction of that at a capacity of about 5 GW$_{th}$ (see Parlaktuna et al., 2013, p. 3). The RE Action Plan of the Ministry of Energy and Natural Resources provides an estimate of 31.5 GW$_{th}$ (MENR, 2014, p. 48).

2.2 Demographic information

The Turkish population of currently 76 million (2014) is still growing significantly at around 1.3% annually (2013) (World Bank, 2015). The increasing urbanisation of the country (from 52.9% of the population living in urban areas in 1990 to 77.3% by 2012) is also contributing to higher energy demand and the need to improve the energy efficiency of buildings (MENR & UNDP, 2013). Together with the expected continuation of the economic development of the country, these demographic trends will continue to increase both per capita electricity consumption and demand for new investment in energy supply.

2.3 Energy System

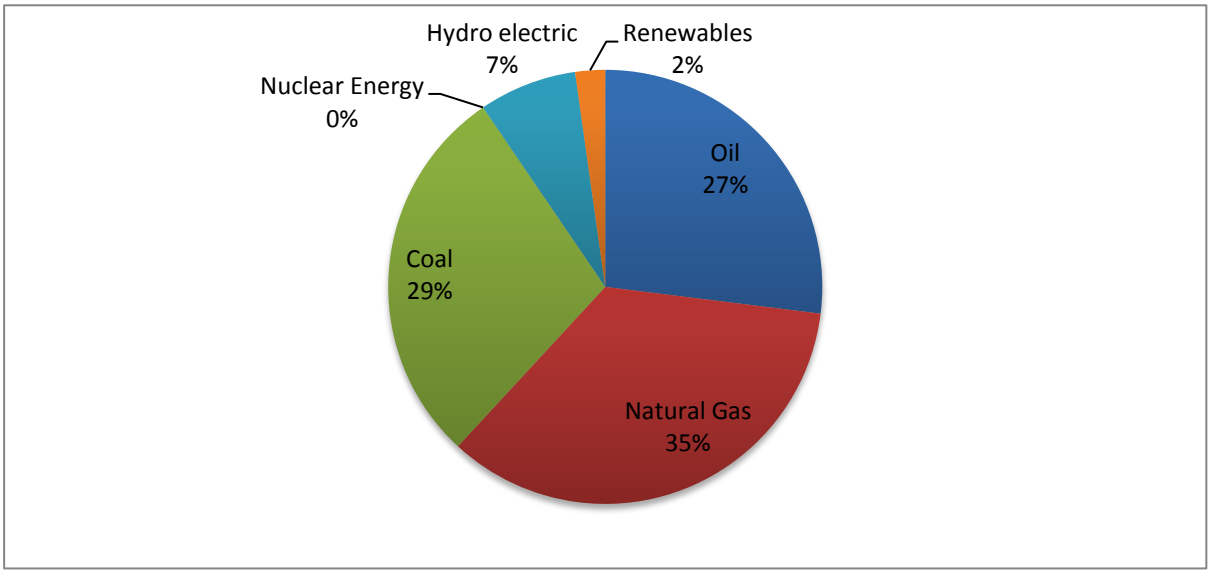
2.3.1 Structure and key properties

More than 90% of primary energy consumption in Turkey is covered by three types of fossil fuels, each with similar shares: Of the total consumption of 125 million toe in 2014, the largest share of 35% (43.7 million toe) was supplied by natural gas, 29% (35.9 million toe) by coal, 27% (33.8 million toe) by oil. According to the IEA, Turkey depends on energy imports for 74% of its energy consumption: in 2013, more than half of its coal, 90% of its oil and its entire natural gas was imported.[4] Hydropower contributed 7% (9.1 million toe) and other renewable sources of energy accounted for 2% (2.8 million toe) (BP, 2015). For the time being, there is no energy being produced from nuclear energy in Turkey.[5]

[4] See Energy Balances (2013) provided by the International Energy Agency: http://www.iea.org/statistics/statisticssearch/report/?year=2013&country=TURKEY&product=Balances

[5] There is one project to build four 1.2GW reactors near Istanbul. However, the Russian State Atomic Energy Corporation is building the power plant. It has been delayed several times in the past, and given the current state of Russian-Turkish relations, it is very uncertain when it will be completed.

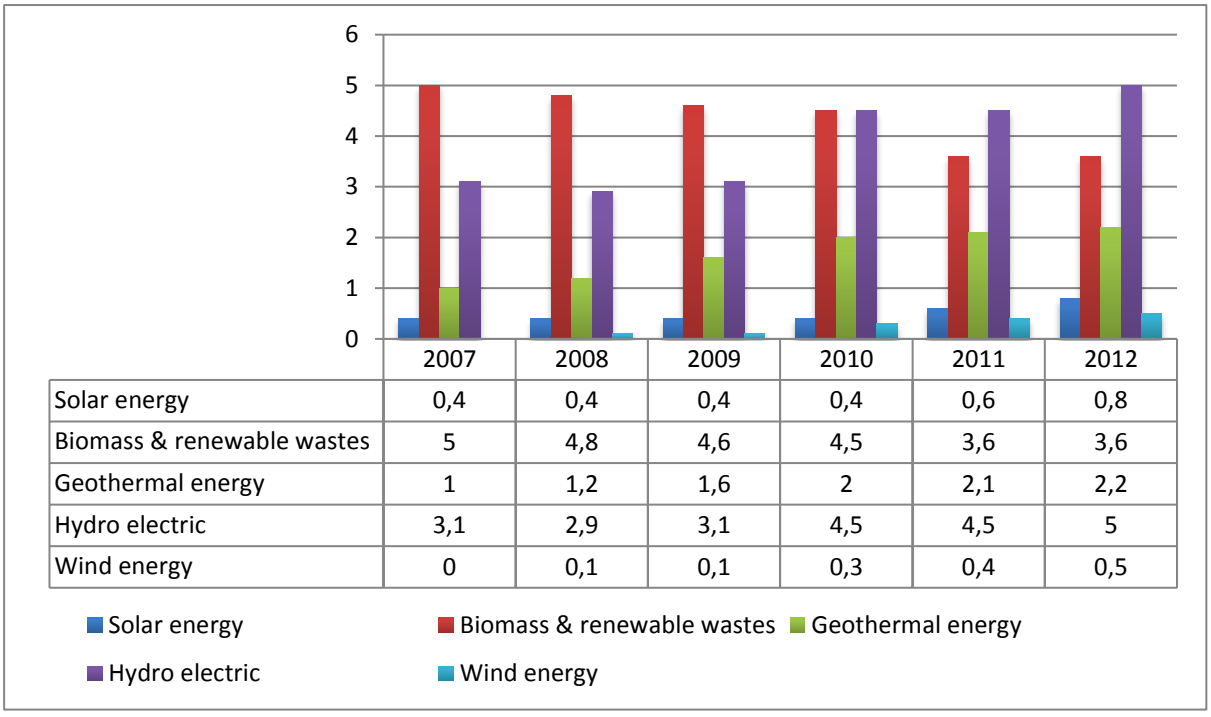
Figure 14: Primary energy consumption in Turkey, by fuel, in 2014



Source: (BP, 2015)

The development of energy from renewables in Turkey can be seen in the figure below. It underscores the importance of biomass and the contribution from hydroelectric sources. The contribution from solar energy surpasses wind power as it includes both power generation (still small) and thermal uses (much larger).

Figure 15: Renewable energy production structure, 2007-2012, in million toe

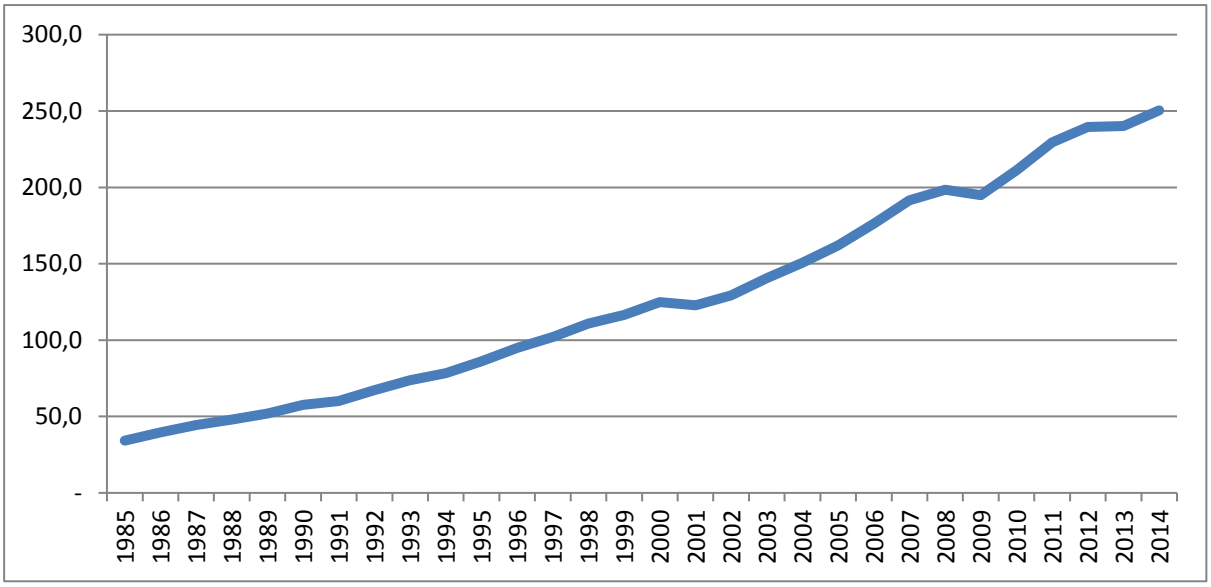


	2007	2008	2009	2010	2011	2012
Solar energy	0,4	0,4	0,4	0,4	0,6	0,8
Biomass & renewable wastes	5	4,8	4,6	4,5	3,6	3,6
Geothermal energy	1	1,2	1,6	2	2,1	2,2
Hydro electric	3,1	2,9	3,1	4,5	4,5	5
Wind energy	0	0,1	0,1	0,3	0,4	0,5

Source: (MENR, 2014)

Electricity generation in Turkey has increased more than seven-fold between 1985 (34 TWh) and 2013 (250 TWh) (BP, 2015). The growth in electricity demand has been so high that it surpassed the rate of growth in power generation from RE, so that the relative share of RE sources in electricity generation in Turkey decreased from more than 40% in 2000 to 29% in 2013 (MENR, 2014, p. 9; Saygin & Cetin, 2011, p. 29).

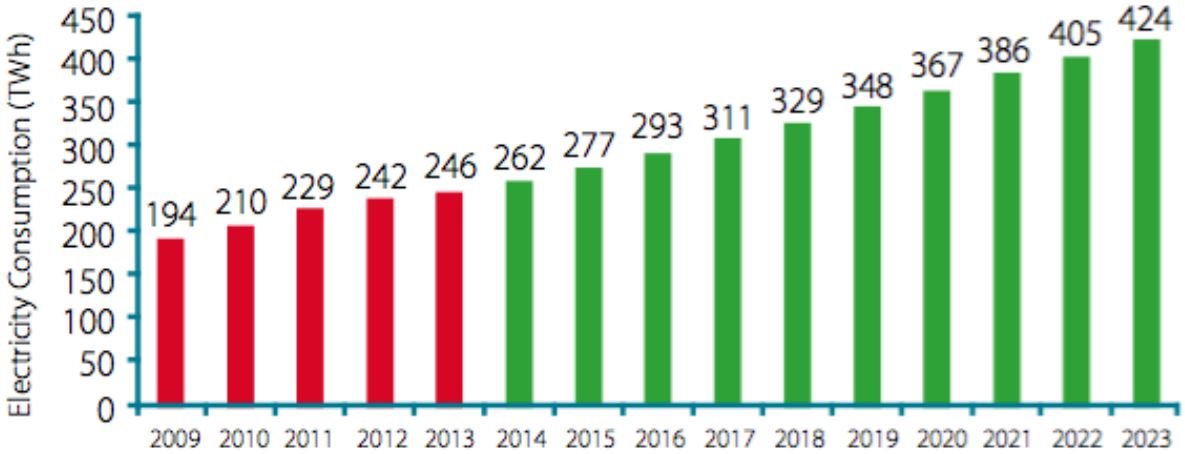
Figure 16: Annual electricity generation in Turkey, in TWh, 1985-2013



Source: (BP, 2015)

Forecasts by TEİAŞ shows that electricity consumption will keep growing strongly and reach 424 TWh in 2023 (MENR, 2014). This growth in demand will therefore drive the demand for additional power generation capacities – both from fossil as well as renewable sources.

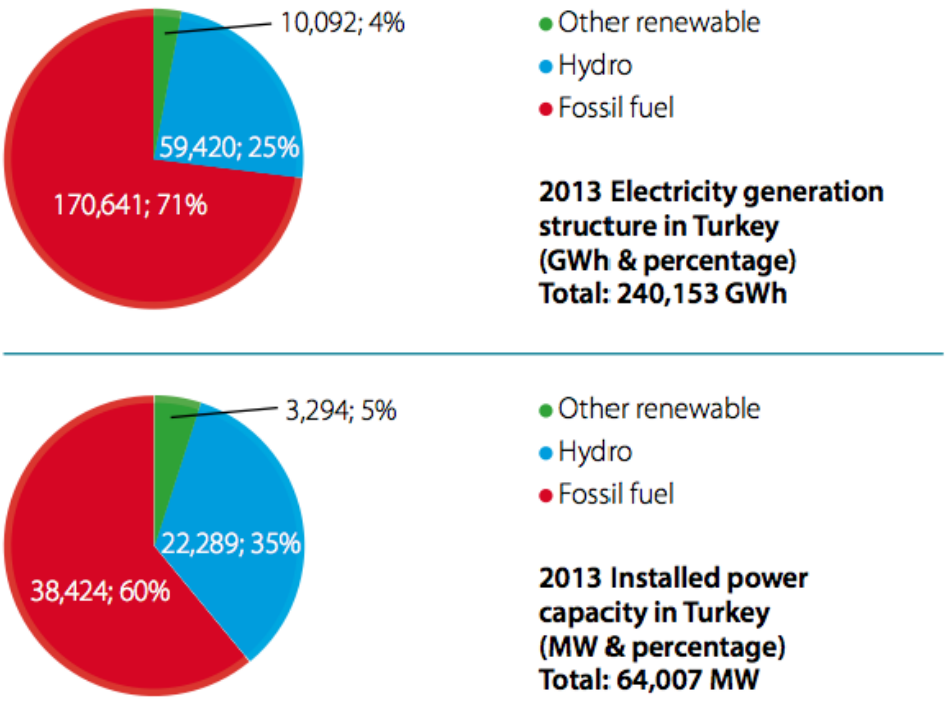
Figure 17: Annual electricity consumption in Turkey, in TWh, forecasts until 2023



Source: (MENR, 2014, p. 17)

The structure of power generation is still dominated by fossil fuels, which produced 71% of power in 2013 with 60% of installed capacity for power generation. Hydroelectric power accounts for 35% of installed capacity and 25% of generation, and other renewable sources of electricity accounted for 5% of installed capacity and 4% of power generation.

Figure 18: Structure of electricity generation in Turkey in 2013



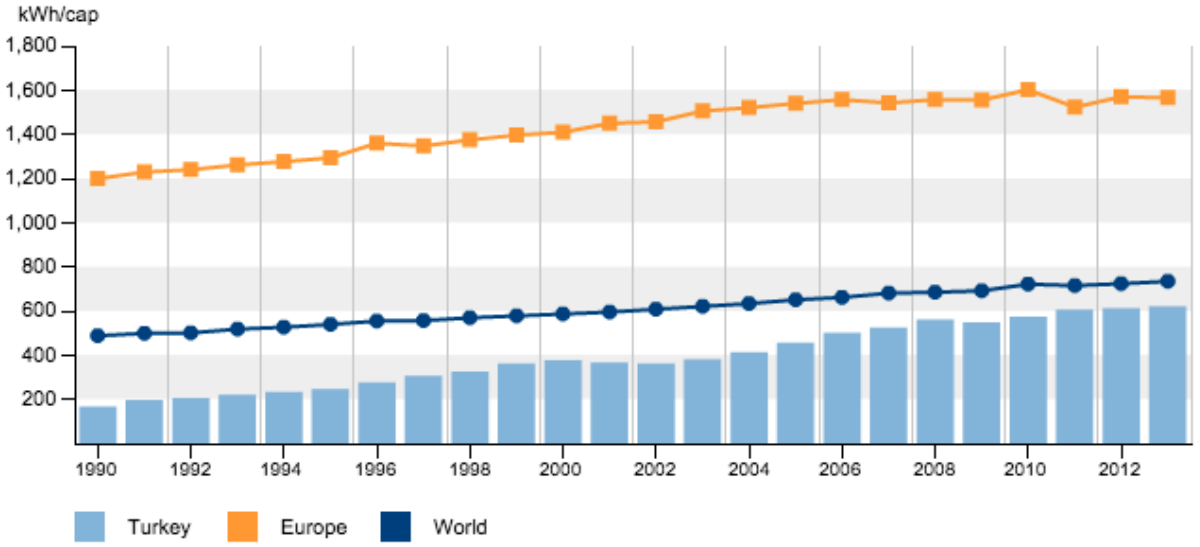
Source: (MENR, 2014, p. 9)

More recent data on electricity production in Turkey up to October 2014 is available from the IEA. The data for 2014 shows not only the relative dominance of fossil fuels in the supply mix, but also that their share (78%; +17.1%) and the share of renewables (4%; +17.9%) in actual generation have increased, at the expense of hydroelectric power (17%; -29.7%).

2.3.2 Electricity consumption of households

Electricity consumption per capita in Turkey has grown very rapidly at nearly 6% annually since 1990, but it is still significantly below the world and European average – limited by the relatively high electricity prices in Turkey.

Figure 19: Electricity consumption per capita in Turkey, compared to Europe and the global average, 1990–2013



Source: (World Energy Council, 2015)

2.3.3 Electricity Infrastructure

The national electricity transmission grid is operated exclusively by the state-owned Turkish Electricity Transmission Company (TEİAŞ) under a license granted by the Electricity Market Regulatory Authority (EMRA).[6] Other municipal electricity companies operate local distribution networks, but TEİAŞ is in charge of planning the development of the national grid based on five-year grid expansion plans.

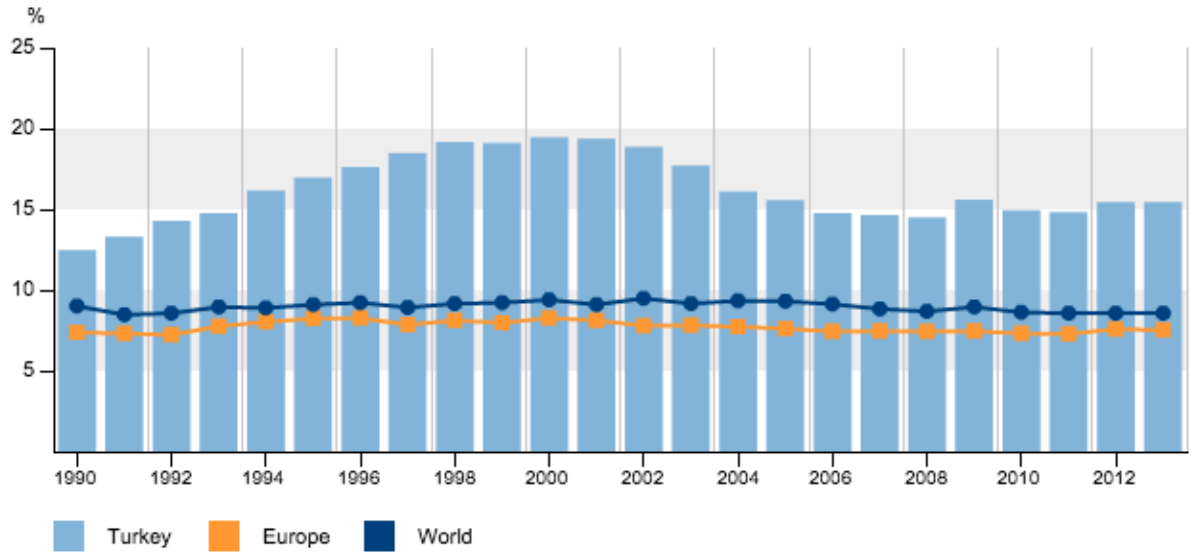
There are several key challenges in grid development: to enhance the capacity of the grid, to ensure its stability and to improve its quality in order to reduce technical losses of generated electricity in the transmission and distribution processes. In March 2015, a major blackout hit the entire country and affected all 81 provinces. The incident underscored technical problems and high risk-taking of TEİAŞ, whose president resigned a few weeks after the event (Deutsche Welle, 2015). One approach by the government to addressing the instability of the electricity grid is to strengthen the capacity of international interconnections to the electricity grids of other countries. There are such connections with Georgia, Azerbaijan, Armenia, Iran, Iraq Syria, Bulgaria and Greece (MENR, 2014, p. 44 f.).[7]

[6] A detailed map of the transmission grid including the capacities of lines can be accessed under http://www.geni.org/globalenergy/library/national_energy_grid/turkey/turkishnationalelectricitygrid.shtml

[7] It should be noted that the connections to the ENTSO-E area (European Network of Transmission System Operators for Electricity) are significantly better-developed than the relatively weak connections to the country's eastern and southern neighbors.

Reducing the losses from transmission and distribution also improves grid stability and reduces the pressure to increase power generation capacities. In 2013, 15.5% of the generated electricity was lost as a result of the quality of the grid – a value that is significantly above the average for Europe and the world (see below).

Figure 20: Rate of electricity losses from transmission and distribution, 1990-2013, in %



Source: (World Energy Council, 2015)

Beyond the losses in generated electricity, the insufficient development of the grid has been identified as a key obstacle to wind power development. Both its quality and its capacity has been rated insufficient by the European Wind Energy Association – especially with regard to the 11 GW of wind power to be installed in the near future (EWEA, 2013, p. 7& 68). As a makeshift solution to the problem, wind developers are able to upgrade the local grid infrastructure themselves and get reimbursed for these investments over ten years through deductions on the fees that they would otherwise pay to the grid operator. But few companies do that because of the risks and costs involved (EWEA, 2013, p. 73).

2.3.4 Electricity prices

The high and growing demand for electricity in Turkey has driven up prices for industrial and household consumption of electricity to levels that are high in comparison to other OECD countries – especially when purchasing power is taken into account (see the table below). Between 1990 and 2012, electricity prices for industry have increased by more than 80% and household prices have grown by 363% (IEA, 2014b Part III.57).

Table 1: Electricity prices for industry & households in US$ per MWh, comparison between Turkey and the OECD average[8]

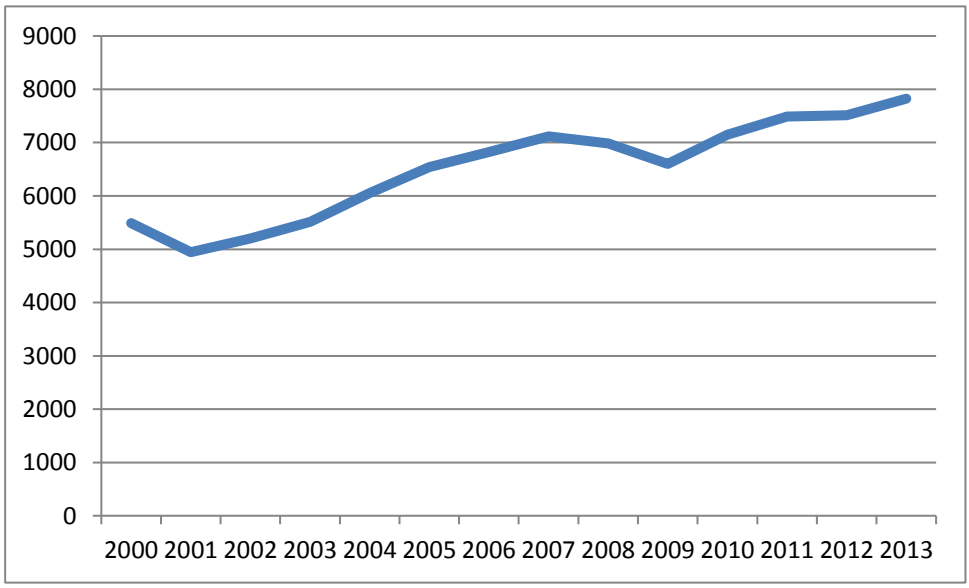
	2011	2012
Turkey – industry	138.414	148.222
OECD – industry	119.516	118.603
Turkey – households	169.072	184.749
OECD – households	169.306	167.306
Turkey – households (PPP)	286.376	320.702
OECD – households (PPP)	159.864	163.178

Source: (IEA, 2014b Part III.57)

2.4 Economic development

The average adjusted net income per capita in Turkey has increased by more than 42% between 2000 and 2013, along with the economic growth of the country in that time. This significant growth in personal income will further boost the demand for electricity in the country and solidify the need to expand the power generation capacities.

Figure 21: Adjusted net income per capita in Turkey, in constant 2005 US$, 2000-2013

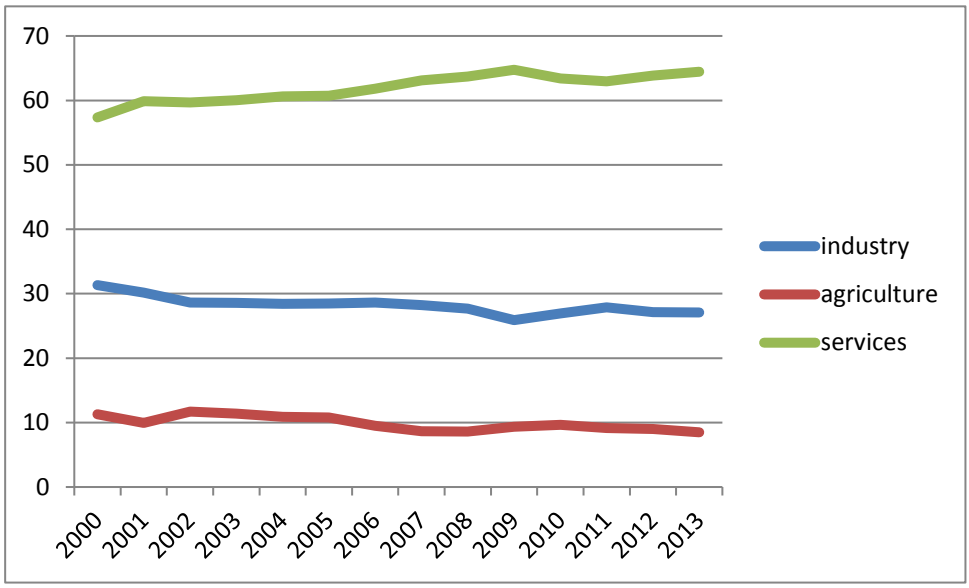


Source: (World Bank, 2015)

[8] Data on 2012 is the newest available from the International Energy Agency.

The share of the services sector in the Turkish GDP has constantly grown over time and accounted for 64% in 2013. The agricultural sector stands at 8.5%, while the industrial sector accounts for 27%.

Figure 22: Structure of the Turkish economy, by sector, in % of GDP



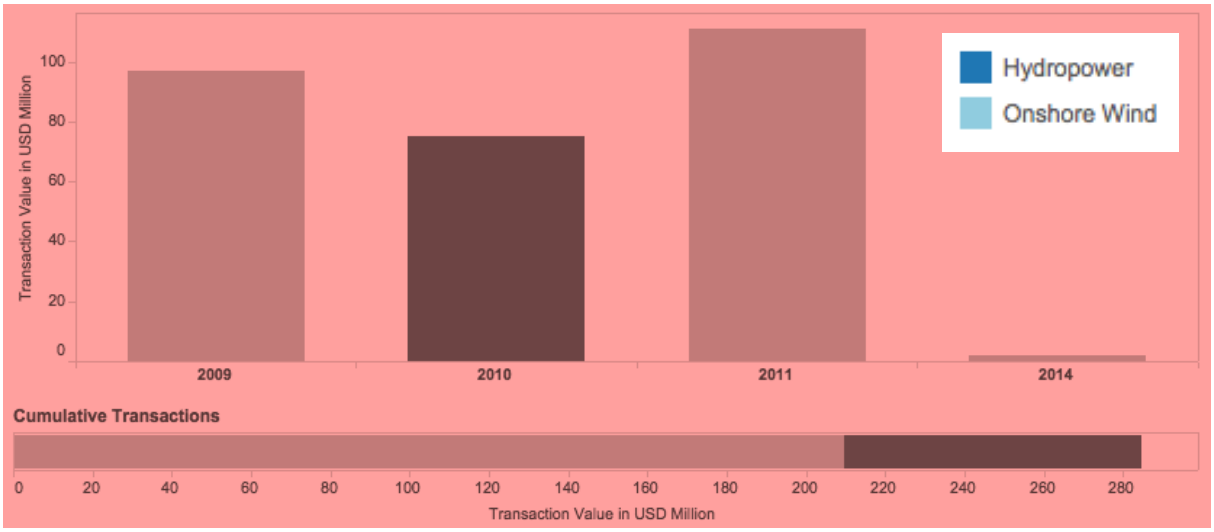
Source: (World Bank, 2015)

2.5 Financial system

The domestic financial system is playing a key role in enabling the fast expansion and diversification of the energy production in Turkey. Private banks are involved in financing RE projects, but ask for greater securities compared to the government's development banks or international development financing institutions (EWEA, 2013, p. 72). The government's feed-in tariff for wind power, for instance, was instrumental in leveraging private capital for RE investments, as it indicated a floor price on which all calculations could be based. Actual market prices for end consumers determined through the Turkish power pool have been continuously higher than the decreed feed-in tariff.

In addition to private banks that provide capital to RE projects, the government's development bank Turkiye Kalkinma Bankasi (TKB) as well as the (private) Turkish Industrial Development Bank (Turkiye Sinai Kalkinma Bankasi – TSKB) are active in creating financing mechanisms in collaboration with international partners. International development financing institutions also play an important role in financing RE and EE projects in Turkey. The figure below illustrates the finance they provided to RE projects in the country. Key actors in this respect are the World Bank, the European Investment Bank, the European Bank for Reconstruction and Development and the Dutch Development Finance Company.

Figure 23: Renewable energy finance flows to Turkey from international development financial institutions, in million US$, 2009-2014



Source: (IRENA, 2015)

3 Political strategies, actors and processes

Turkey is a representative democracy with a prime minister as the head of government and a president as the head of the armed forces. Turkey is a unitary state with a one-chamber parliament representing the country's 81 provinces. Energy-related policies are exclusively determined by the national government – with a few exceptions for land use and expropriation rights (cf. MENR, 2014, p. 35). Therefore, the analysis will focus on this level. While the near-exclusive competence of the national level makes it necessary to coordinate the large number of institutions involved, Turkey's unitary structure also reduces complexity to a certain degree and facilitates the actual implementation of political decisions.

3.1 General strategy framework for RE and EE

3.1.1 Historical overview

Turkey's strategy towards renewable energies and energy efficiency is not contained in a single unified strategy document or policy process. A variety of strategy documents has shaped the development over time and in specific areas. In order to understand this development and the strengths and weaknesses of RE & EE in Turkey, they must be considered in relation to each other. The central strategy documents are:

Table 2: Main strategy documents regarding renewable energies and energy efficiency in Turkey by author, year and title

Higher Board of Planning	**2004**	**Electricity Sector Reform and Privatisation Strategy**
Higher Board of Planning	2009	Turkey's Electric Energy Market and Supply Security Strategy Paper
Ministry for Energy and Natural Resources	2010	Strategy Plan 2010-2014
Ministry of Environment and Forestry & of Environment and Urbanisation	2010/2011	National Climate Change Strategy & National Climate Change Action Plan
Ministry for Energy and Natural Resources	2012	Energy Efficiency Strategy Paper

3.1.2 Electricity Sector Reform and Privatisation Strategy Paper

The liberalisation of the Turkish energy market is a process that started with the structural changes of the last decade, which created today's energy market structure. However, the process is still ongoing to this day. The liberalisation strategy of the *Electricity Sector Reform and Privatisation Strategy Paper* was guided by the objective of adopting the EU Acquis to ensure a more inexpensive and secure supply of electricity and a greater participation of private investors in the expansion of the country's electricity system (Higher Board of Planning, 2004). The strategy of the Higher Board of Planning established a timeline and a sequencing of the privatisation of state assets – starting with distribution, followed by generation – in order to create a functioning and competitive market for electricity.

3.1.3 Electricity Market and Supply Security Strategy Paper (2009)

The *Electric Energy Market and Supply Security Strategy Paper* of the Higher Board of Planning and the MENR's *Strategic Plan 2010-2014* complement each other. While the former considers the longer term until 2023[9], the latter focuses on the initial four-year timeframe. Both strategy documents reaffirm the goal to ensure an "adequate, high-quality, uninterrupted, low-cost, and environment-friendly" electricity supply (Higher Board of Planning, 2009, p. 4). Besides supply security and environmental protection, the strategy also states the goal to make Turkey a "regional and global influence in energy matters". The goal of ensuring supply security

[9] The year 2023 was chosen because it marks the 100th anniversary of the Turkish Republic.

and reducing import dependence is of paramount importance given Turkey's dependence on imports of fossil fuels. Given that Turkey is poor in local sources of hydrocarbons, the fast growth in energy demand over the last decades has fostered this dependency. The consequence is that over 70% of total primary energy consumption are met by imports of fossil fuels (Saygin & Cetin, 2011). In this context, the development of domestic sources of renewable energy generation is both a strategic tool to reduce this dependency and to limit the rise in greenhouse gas emissions. Therefore, the strategy encourages the "maximum use of domestic and renewable resources" to limit energy import dependence, and therefore establishes the following goals for renewable electricity generation until 2023:

- to reach 30% of total electricity generation from renewable sources;
- to fully use all technically and economically viable hydroelectric potentials (large- and small-scale);
- to increase the installed wind energy capacity to 20.000 MW;
- to increase the installed geothermal capacity to 600 MW[10] and;
- to reduce primary energy intensity by 20% (compared to 2008) by increasing the energy efficiency in production and consumption of energy, to reduce the energy intensity of industry, to minimise technical losses in generation and transmission and to prevent illegal distribution (Higher Board of Planning, 2009).

3.1.4 MENR's Strategic Plan 2010-2014

The *Strategic Plan 2010-2014* of the MENR complements this longer-term roadmap with a short-term focus. It also highlights the necessity of diversifying oil and gas imports; improving the framework for investments; increasing energy efficiency; expanding the share of renewables and strengthening energy generation from domestic fossil fuels and nuclear energy (Saygin & Cetin, 2011). For wind power, specifically, the goal is to install 10 GW by 2015, and for geothermal power, the goal is to install 300 MW (Ministry of Energy, 2010). The plan also points out Turkey's high potential for increasing energy efficiency, mostly through improvements in electricity generation, transmission and distribution. The goal of the plan is to reduce primary energy intensity by 10% by 2015 and by 20% by 2023, both compared to 2008 (Ministry of Energy, 2010).

[10] The documents focus on this goal for geothermal for electricity production. The expansion of geothermal energy for heating and cooling – despite having a greater total potential – has no specific target.

3.1.5 National Climate Change Strategy (2010)

The *National Climate Change Strategy* (2010) reaffirms these long-term goals and complements them with more specific short-to-medium- and long-term measures. Examples are the introduction of energy certificates, the mandatory installation of renewable energy systems in new buildings, fostering the voluntary use of energy management and the adoption of incentive measures to promote cleaner production and climate-friendly technologies (see Ministry of Environment and Urbanisation, 2010, p. 16 and the following).

The Strategy also establishes the goal of reducing energy intensity to 2004 levels by 2020 and of reducing greenhouse gas emissions to 7% below a business-as-usual scenario by 2020. (Ministry of Environment and Urbanisation, 2010, p. 17). The National Climate Change Action Plan was adopted a year after the Strategy. It spells out specific measures to reach the 2023 goals and to allow the Climate Change Coordination Board to track the success in implementing these measures (Ministry of Environment and Urbanisation, 2011).

3.1.6 Energy Efficiency Strategy Paper (2012)

The 2012 *Energy Efficiency Strategy Paper* sets a general energy efficiency goal for the entire economy. Its measures aim to decrease the energy intensity of the economy (per unit of GDP) by 10% by 2015 and by 20% by 2023 (Ministry of Energy, 2012). The paper includes specific measures in seven areas for action: to reduce energy intensity and energy losses in industry and services; to decrease energy demand and carbon emissions of buildings; to promote sustainable environmentally friendly buildings using renewable energy sources; to promote markets for energy-efficient products and to increase the efficiency in the production, transmission and distribution of electricity (Ministry of Energy, 2012). While some of these measures come within the exclusive scope of the public sector, most will actually require public-private cooperation.

The topic of employment in RE or EE has not been a priority in these strategy documents which have been dominated by energy policy imperatives. Domestic employment effects have been specifically mentioned as ‘co-benefits’ only in the latest strategies – the National Climate Change Action Plan and the Energy Efficiency Strategy Paper.

3.2 Key actors and the involvement of stakeholders in strategy processes

Energy policy in Turkey is still entirely controlled by the executive branch, although non-government actors – especially from the private sector – are increasingly being given the opportunity to voice their concerns. The key actors for strategic planning within government are the leading ministries that draft a policy strategy alongside the Prime Minister’s Office which also included – in the past – the Higher Board of Planning within the State Planning Organisation. The State Planning Organisation was actually attached to the Prime Minister’s Office and for many decades played a decisive role in developing Turkey’s five-year development plans.

However, in 2011 it was integrated into the new Ministry for Development, reflecting the increasing liberalisation of the Turkish economy. Still, the element of planning and horizontal coordination among government ministries can also be found in the most recent National Climate Change and Energy Efficiency Strategies.

Higher Board of Planning. The Higher Board of Planning is instrumental in fostering horizontal integration among government departments. It adopted several major energy strategy documents, such as the Electricity Sector Strategy Reform and Privatisation Strategy Paper as well as the Electric Energy Market and Supply Security Strategy Paper. It was also instrumental in the adoption of the National Climate Change Strategy and the National Climate Change Action Plan. The table below shows its composition prior to being incorporated into the Ministry of Development (Higher Board of Planning, 2009, p. 2).

Table 3: Membership in the Higher Board of Planning

Prime Minister (Chairman)		
Deputy Prime Minister	Minister of Development	Minister of Finance
Minister of Environment and Urban Planning	Minister of Public Works and Settlement	Minister of Transportation, Maritime Affairs and Communication
Minister of Science, Industry and Technology	Minister of Energy and Natural Resources	Minister of Forestry and Water

Source: Website of the Ministry of Development[11]

State-owned enterprises. Another group of key actors whose role must be considered are the successor companies of the formerly state-owned energy company (Turkish Electricity Authority) that controlled the entire energy system in its time. In 1993, the company was first split into a generation division and a distribution company. The liberalisation of the Turkish electricity market was started in 1998, but is a still on-going process. As part of the liberalisation four companies were set up as joint stock companies in public ownership that each took over one aspect of the work of the former state monopolist: the Turkish Electricity Distribution Co. (TEDAŞ), the Turkish Electricity Generation Co. (EÜAŞ), the Turkish Electricity Transmission Co. (TEİAŞ) and the Turkish Electricity Contracting and Trading Co. (TETAŞ).

[11] See http://www.kalkinma.gov.tr/Pages/Yuksek-Planlama-Kurulu.aspx

Privatisation has seen the greatest progress in power generation[12] and power distribution (Ministry of Energy, 2010, p. 23). Power transmission and trading (TEİAŞ and TETAŞ) will remain in public control, the reason being that they play an important role for the government's energy policy as they manage the national electricity grid and buy up the power produced by private companies. The companies are still affiliated with the Ministry for Energy and Natural Resources (Ministry of Energy, 2010, p. 7).

3.3 The process of strategy development and implementation

3.3.1 Processes and capacities for strategy development within the government

Since 2005, all ministries have established strategic development units in order to support the strategy development capacities within the government. In the case of the MENR, these units organise the involvement and participation of members of "all units of our ministry" and structure the planning process within the ministry (Ministry of Energy, 2010, p. 5).[13]

The approach to strategic planning throughout government was shaped for many decades by the country's five-year programmes. After 2002, a transition away from central planning and towards greater independence and performance measurement in public institutions in the spirit of new public management was started. With that came pilot studies in strategic planning for public institutions that resulted in the development of a Strategic Planning Guide for Public Administrations and a Regulation on Procedures and Principles Regarding to Strategic Planning in Public Administration issued by the Under-Secretariat of the State Planning Organisation (Gorun & Tufan, 2011, p. 223; Ministry of Energy, 2010, p. 43). This new framework for strategy development has served as the model for the 140 strategy plans of public administrations that have since been developed.

3.3.2 (Vertical/horizontal) integration of interests in strategy development

Strategy development in Turkey was for a long time guided by the tradition of state planning with little to no formal involvement of non-state stakeholders. Rather, the integration of different interests and viewpoints was pursued through a central planning agency (the State Planning Organisation) and horizontal coordination between various ministries. The former was dissolved in 2011 and integrated into the Ministry of Development, and new processes for the coordination of interests have been established since then.

[12] For example, in energy generation, the share of private companies is now above 70%. See http://www.mondaq.com/turkey/x/395770/Oil+Gas+Electricity/Turkish+Energy+Market+2015

[13] The annex contains the organisational chart of the MENR with its strategy development unit.

The Higher Board of Planning that plays a key role for the coordination of interests between different government agencies has already been addressed (see above). Other institutions that coordinate policies related to RE/EE are the Coordination Board on Climate Change within the National Climate Change Strategy and the Coordination Board on Energy Efficiency. Most of their members are ministries, but they also include regulatory agencies, business associations, academia and local governments. It is noteworthy that the most recent strategies shave also seen some degree of participation from non-government actors.

Specifically, the Coordination Board on Climate Change includes two non-government actors: the Union of Chambers and Commodity Exchanges of Turkey (the national umbrella organisation of the Chambers of Commerce) and the Turkish Industry and Business Association.

Figure 24: Membership of the Coordination Board on Climate Change (2012)

Ministry of Environment and Urbanisation (Chair)
Ministry of Development
Ministry of Foreign Affairs
Ministry of Energy and Natural Resources
Ministry of Finance
Undersecretariat of the Treasury
Ministry of Science, Technology and Commerce
Ministry of Health
Ministry of Transport, Maritime Affairs and Communications
Ministry of Food, Agriculture and Livestock
Ministry of Forest and Water Management
Turkish Union of Chambers and Commodity Exchanges
Turkish Industry and Business Association

Source: (Ministry of Environment and Urbanisation, 2012)

The Coordination Board on Energy Efficiency goes one step further and includes five members that are not part of the national government.

Figure 25: Membership of the Coordination Board on Energy Efficiency

Ministry of Energy and Natural Resources
Ministry of Interior Affairs
Ministry of Finance
Ministry of National Education
Ministry of Environment and Urbanisation
Ministry of Transport, Maritime Affairs and Communications
Ministry of Science, Industry and Technology
Ministry of Energy and Natural Resources
Ministry of Forest and Water Management
Ministry of Development
Undersecretariat of the Treasury
Energy Market Regulatory Authority
Turkish Standards Institute
The Scientific and Technological Research Council
The Union of Chambers and Commodity Exchanges
Union of Chambers of Turkish Engineers and Architects
Union of Municipalities of Turkey

Source: (Ministry of Energy, 2012)

3.3.3 Participation of non-governmental stakeholders

The Renewable Energy Action Plan (REAP) was developed with the participation from stakeholders representing industry associations and sector-specific businesses (developers, financiers and manufacturers). The development process for the Action Plan was organised by the Turkish government in collaboration with the European Bank for Reconstruction and Development. A consultation process accompanied the development of the REAP and consisted of a series of meetings bringing together public- and private-sector representatives.

Table 4: Government agencies and non-governmental stakeholders involved in the development of the Renewable Energy Action Plan

Category	Institution / organization
Government/regulatory agencies/publically-owned businesses	Ministry of Energy and Natural Resources, General Directorate of Renewable Energy Ministry of Energy and Natural Resources, Mineral Research & Exploration General Directorate Ministry of Energy and Natural Sources. EU & IFIs Department TEİAŞ, Research, Planning and Coordination Department Energy Market Regulatory Authority, Electricity Market Department
Industry associations	TWEA, the Turkish Wind Energy Association GENSED, the Turkish Photovoltaic Industry Association GÜNDER, the International Solar Energy Association (Turkey Branch) BİYOGAZDER, the Biogas Association LI-DER, the Unlicensed Electricity Generation Association
Businesses and organisations	Pales Engineering & Consultancy Services CO. LTD. MidSEFF, Mid-sized Sustainable Energy Financing Facility Fina Enerji Holding A.Ş Garanti Bank Deniz Bank SAIF, Biomass Business branch of SAIF S.p.A. Group Güriş İnşaat ve Mühendislik A.Ş. Gama Energy TOKİ, Residential Buildings and Urban Transformation GE Wind Energy Enerjisa Zorlu Energy Polat Enerji San. ve Tic. A.Ş.

Source: (MENR, 2014, p. 72 f.)

Similarly, the Energy Efficiency Strategy Paper explicitly mentions that the public and private sector as well as NGOs shall collaborate in monitoring and evaluating the implementation of EE policies (Ministry of Energy, 2012, p. 1).

3.3.4 Institutions and capacities for implementation

Energy Market Regulatory Authority. The national energy markets for electricity, gas and petroleum are all regulated and supervised by the Turkish Energy Market Regulatory Authority (EMRA). Every power installation with a capacity of more than 1 MW is thus subject to licensing by the EMRA under the Electricity Market Law and License Regulation. The EMRA is attached to the Ministry for Energy and Natural Resources (see annex, section 8.2).

MENR's General Directorate of Renewable Energy. The division of the ministry is responsible for the technical assessment of RE projects that are applying for an operation license (i.e. projects with a capacity of more than 1 MW).

Turkish Electricity Transmission Company (TEİAŞ). The state-owned enterprise is the system operator for the high-voltage electricity transmission grid. It is responsible for the evaluation of the grid access for RE installations[14] and conventional power plants and is involved in the wind and solar tendering processes (MENR, 2014, p. 34).

3.3.5 Monitoring and Evaluation

The lead ministries conduct the monitoring of the implementation of a strategy. Thus, for example, monitoring efforts on the National Climate Change Strategy are coordinated by the Ministry of Environment and Urbanisation (Ministry of Environment and Urbanisation, 2010, p. 30). The Coordination Board on Climate Change receives quarterly reports on the strategy's implementation by the MEU. Similarly, the individual monitoring and evaluation reports on the implementation of the 2010-2014 Strategic Plan will be coordinated by the Strategy Development Directorate within the Ministry for Energy and Natural Resources. An annual monitoring and evaluation report ("Administration Operation Report") that summarises the individual evaluation studies is published annually in print and on the website of the MENR (Ministry of Energy, 2010, p. 42). Thus, while the studies are made available to the public, the monitoring and evaluation is largely conducted as well as coordinated directly by the lead ministries for both strategies.

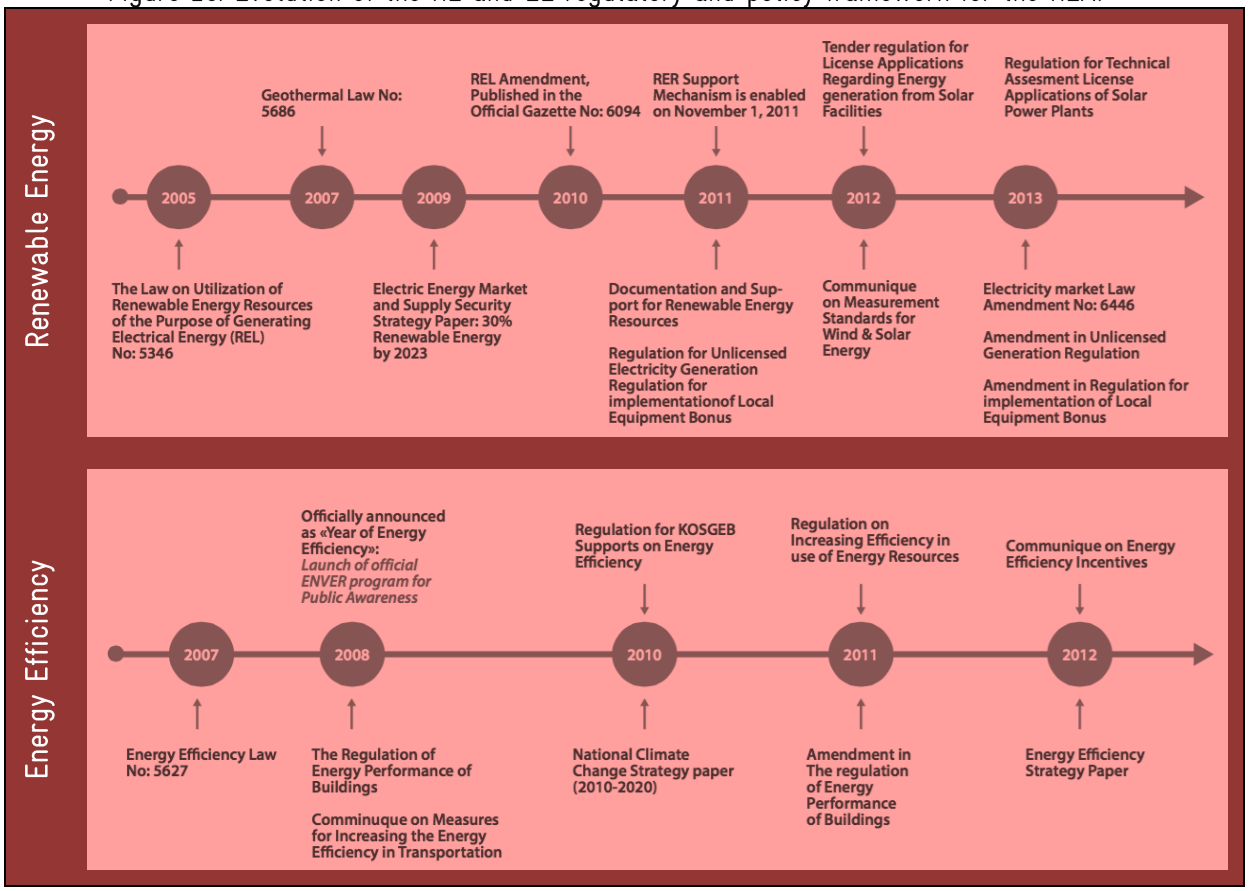
The REAP has not yet adopted a monitoring system, but will develop indicators and processes in the near future (MENR, 2014, p. 73).

[14] For details on the approval process, see (MENR, 2014, p. 45).

3.4 Goals and action programmes

The development of the Turkish approach to RE & EE must be understood as a process over time and in the context of the different strategy documents that guided and underpinned this process. The strategy papers outlined in section 3.1 form the basis for the Renewable Energy Action Plan and other policies on RE and EE. The timeline below shows the development of individual policy instruments for RE and EE over time.

Figure 26: Evolution of the RE and EE regulatory and policy framework for the REAP



Source: (MENR, 2014, p. 11)

3.4.1 National Renewable Energy Action Plan (2015)

The Renewable Energy Action Plan (REAP) is built on the strategy papers outlined in the previous section and a number of framework policies on energy and energy efficiency that have been adopted over time (MENR, 2014, p. 10).

Its objectives are based on the previous strategy documents and the European Union's Renewable Energy Directive. Specifically, the central goals of the REAP are:

- a 30% share of RE in electricity generation by 2023, including hydropower (based on the Electricity Energy Market and Supply Security Strategy Paper)[15]
- a 10% share of RE in the transportation sector (based on the European RE Directive)
- to promote RE development by:
  - providing financial support,
  - removing administrative barriers,
  - developing legal frameworks for RE,
  - ensuring grid access for RE power,
  - optimising the use of the existing electricity infrastructure and
  - developing support mechanisms (MENR, 2014, p. 14).

What the REAP does not address is the employment dimension of RE development or thermal uses of RE energies. The REAP's overall goals, specific targets and support measures are focused on power capacity development and on improving the regulatory framework for market development in this field.

Specific targets for the capacity development of the different types of RE by 2023 are displayed in the table below. The increases are expected to raise the share of non-hydro RE in the country's installed power capacity from 5% (2013) to 22% (2023) and its share in electricity generation from 4% (2013) to 16%. Respectively, the share of hydroelectricity is expected to fall from 35% (2013) to 27% (2023) in installed capacity and from 25% (2013) to 22% (2023) in electricity generation, while the share of fossil sources is expected to fall from 60% (2013) to 51% (2023) in installed capacity and from 71% (2013) to 62% (2023) in electricity generation. A figure illustrating the forecast of the development of the power generation structure can be found in the annex in section 8.4.

Table 5: Targets for RE power in 2023, for capacity (in MW) and generation (in GWh)

RE technology	Installed power capacity (MW)			Electricity generation (GWh)		
	2013	2023	Δ	2013	2023	Δ
Hydro	22,289	34,000	53%	59,420	91,800	54%
Wind	2,759	20,000	625%	7,558	50,000	562%
Geothermal	310	1,000[16]	223%	1,364	5,100	274%
Solar	0	5,000	-	0	8,000	-
Biomass	224	1,000	346%	1,171	4,533	287%

Source: (MENR, 2014, p. 18)

[15] See section 8.4 for a graphical representation of the changes in power capacity and generation.

[16] The original target was set at 600 MW from geothermal power production. The REAP estimates that given the current development of installed capacity, it is possible to reach 1000 MW by 2023.

The action plan also estimated the co-benefits from the expansion of RE and EE. The co-benefits have been quantified in three dimensions: their contribution to energy independence, to the reduction of greenhouse gas emissions and to economic development. An estimate for employment effects was not made.

Table 6: Co-benefits of the RE capacity expansions under the REAP until 2023

Dimension	Co-benefits
Energy dependence	"avoid the importation of more than 19 million toe of natural gas per year"
CO2 emissions	"avoid more than 47 million tons of CO2", equivalent to an economic impact of US$1,262 million17
Economic development	Annual increase in GDP by US$1.73 billion

Source: (MENR, 2014, p. 71)

3.4.2 National Energy Efficiency Action Plan

Similar to the REAP, the government is working with the EBRD on an action plan on energy efficiency as a framework for EE policies and measures. At the time of writing, it has not yet been published.

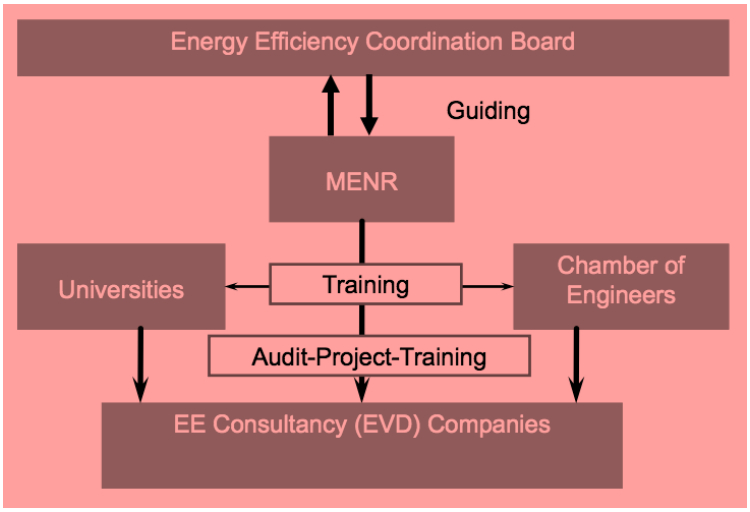
[17] Based on a carbon price of 20 Euro per ton of CO_2.

4 Specific policies and measures in Turkey

4.1 Human qualifications and technological know-how

- *Existing training programmes.* Both public and private institutions (companies, universities and non-governmental organisations) are offering training courses to provide people with the necessary skills (EWEA, 2013, p. 72). According to the Turkish Investment Support and Promotion Agency, in 2012, there were nearly 2,500 openings for training in the energy sector at universities and vocational schools (Turkish Investment Support and Promotion Agency, 2013, p.19).
- *University cooperation networks.* One instrument to foster cooperation and build networks between European and Turkish universities was the RENET project between Turkey and the EU. The project served as a builder of partnerships between the participating institutions of higher education in the fields of renewable energy technology and capacity building as well as scientific research. Generally, however, Turkish universities so far appear to have shown relatively little interest in building human capacities to support the development of the RE sector [more specific data was not available based on the sources analysed].
- *Programmes by businesses and trade bodies.* In the RE field, training needs are covered by the investing businesses themselves as well as in cooperation with (international) trade bodies. For example, the Turkish-German Chamber of Industry and Commerce is involved in the certification of training programmes as well as in the training of energy efficiency managers (the 'European Energy Manager' training) (BMBF, 2011). While larger companies employ specialised and certified energy managers, smaller companies do not have the necessary skills and knowledge. Turkish universities, chambers of engineers and energy consultant companies are authorised to provide training measures in EE (Acikgoz, 2011). For smaller businesses, energy service companies (ESCOs) offer consulting, training, auditing and implementation services for energy efficiency in the building sector as well as in industrial processes (Turkish Investment Support and Promotion Agency, 2013).
- *Coordination of actors.* The figure below illustrates how the actors involved in training measures for EE are interconnected. Energy efficiency consulting companies cooperate with universities and chambers and are audited by MENR in coordination with the EE Strategy Coordination Board. Beyond the national actors mentioned, these training services are further supported by international cooperation programmes, such as the MENR-UNDP Project for Promoting Energy Efficiency in Buildings that provides guidance on training curricula, materials and training programmes (MENR & UNDP, 2013).

Figure 27: Actors involved in providing training and skill development for energy efficiency in Turkey



Source: (MENR, 2012)

4.2 Access to capital

- *International sources of finance.* Initially, the roll-out of wind power in Turkey was mainly driven by capital from domestic private banks. Access to capital through Turkish private banks has, however, become more restricted after the financial crisis. As a consequence, international financing schemes play a larger role in financing Turkish RE & EE investments today – such as the World Bank, the European Bank for Reconstruction and Development (EBRD), the European Investment Bank (EIB) as well as foreign export credit agencies (Azau, 2013, p. 32). The currently largest multilateral financing instrument is the World Bank's Private Sector Renewable Energy and Energy Efficiency Project in Turkey. It is financed by the IBRD (US$500 million), two of Turkey's own development banks (US$550 million) as well as the World Bank's Clean Technology Fund (US$100 million).
- *TurSEFF and MidSEFF RE financing schemes.* Two European instruments for providing finance are TurSEFF and MidSEFF, which are both financed by the EBRD and EIB and administered in Turkey by local private banks. TurSEFF provides €265 million of financing for small-scale projects in the field of both renewables and energy efficiency. MidSEFF provides €975 million for mid-sized projects in the field of renewable energy generation. The robustness of the Turkish banking sector has been a key condition for this approach to be implemented.

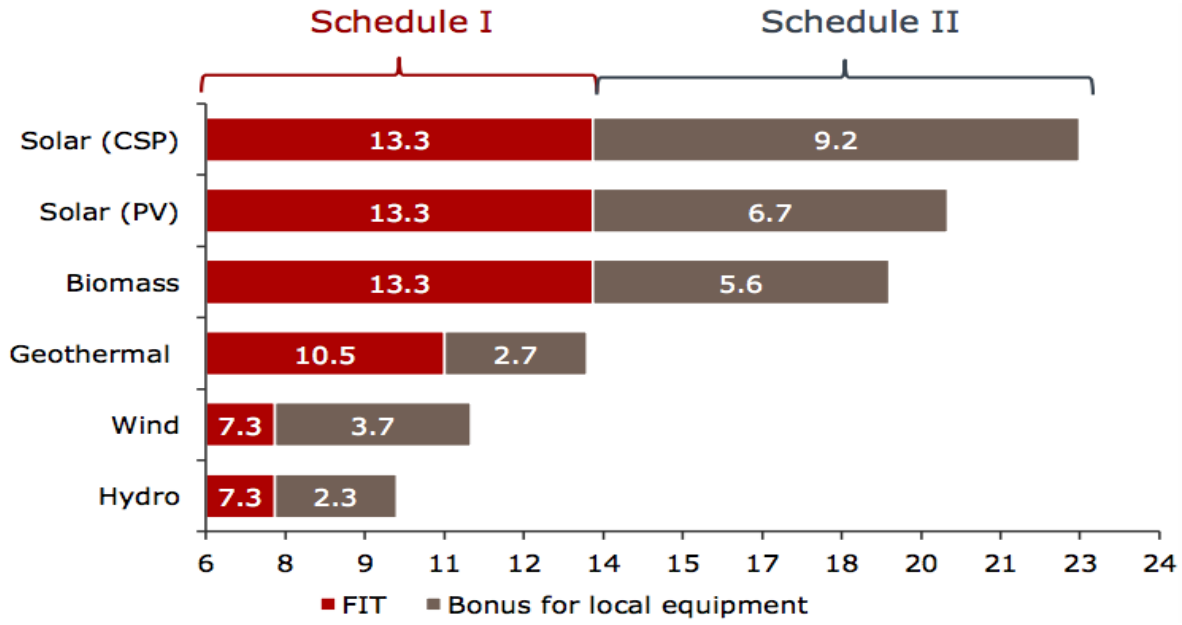
4.3 Support measures to foster demand

4.3.1 Support measures for renewable energies

4.3.1.1. Feed-in tariffs and local content premiums

- *Feed-in tariff for RE power.* The primary incentive instruments in Turkey for RE power are feed-in tariffs (FITs). The current Turkish FIT has two major components: the FIT itself which differs according to the source of renewable electricity and a premium on top of the FIT depending on if the components are manufactured locally. The FIT is paid for up to ten years of operation for facilities holding an RE certificate (license) that are in operation or go into operation until 2020. The Turkish FIT primarily serves as a security for investors against falling market prices. It does not work like a subsidy that guarantees higher than market prices to attract investments, as the FIT and the market price for electricity are at similar levels. At times, the market price for power on the spot market has actually been higher than the FIT. An important feature of the Turkish FIT scheme is that the producer of RE power can choose between selling the electricity through the market or selling it to the market operator (TEİAŞ)18 (MENR, 2014, p. 51).

Figure 28: Feed-in tariffs for different types of renewable electricity (schedule I) and maximum premium for local content (schedule II), in US$ cent per kWh19



Source: (Turkish Investment Support and Promotion Agency, 2013, p. 15); based on Law No. 6094 (law amending the Law on Utilisation of Renewable Energy Resources for the Purpose of Generating Electrical Energy, 2011).

[18] RE power producers can once per year choose between the two options (selling power on the market at fluctuating prices or selling it for the fixed feed-in tariff).

[19] The FITs are denominated in US$ in order to create greater stability against exchange rate fluctuations.

- *Local Content Premiums.* In addition to the feed-in tariff, Turkish law provides additional premium payments depending on how many components of a wind turbine or a geothermal installation have been manufactured in Turkey.[20] These local content premiums are paid for five years. They were introduced with the reform of the Renewable Energy Law. The goal of the FIT to spur on market development was explicitly linked to the promotion of domestic manufacturing and domestic employment. Decree 2013/5625 by the Council of Ministers determined the premiums for each mechanical or electromechanical component type (EWEA, 2013; Gedik & Eraksoy, 2013; O'Brian, 2013). The premiums for wind power, depending on the type of component, are provided below. The premiums for geothermal, concentrated solar power and PV, respectively, can be found in the annex.

Table 7: FIT premium for local content by component for wind power

	Blades	Generator and power electronics	Turbine tower	Mechanical components in rotor/nacelle
Premium (US$ cent/kW)	0,8	1,0	0,6	1,3

- *Calls for tenders to manage capacity additions via tenders.* In order to manage the expansion of RE while ensuring grid stability, the government is structuring capacity additions through calls for tenders. For example, the RE Law stipulated a cap on solar PV capacity of 600 MW in order to ensure grid stability. In line with this restriction, in 2013, a first call was issued by TEİAŞ for 600 MW of solar PV capacity, which attracted project proposals to a total amount of 9 GW (MENR, 2014, p. 46; Tsagas, 2015). 228 MW of solar power were pre-licensed in January 2015 by TEİAŞ, waiting for final approval by the EMRA before construction can commence. Another call for 302 MW of solar PV capacity was issued in April 2015.

[20] Please note that Turkey's local content premiums are potentially in violation of WTO rules. In a similar case, Ontario's feed-in tariff scheme that was similarly designed to foster local manufacturing, was found to be illegal under WTO rules (WTO, 2012). A case against the provision has not yet been filed, though, and the government is – so far – determined to keep the successful local content policies.

4.3.1.2. RE-related investment incentives

- *Investment incentives.* There are four types of investment incentives for RE power: 'general investment incentives' that include tax exemptions for RE generation, 'regional investment incentives' that encourage investments in less-developed regions of the country, 'large-scale investment incentives' that support research & development and 'strategic investment incentives' that promote the development of strategic technologies which Turkey has to import (import share >50%). The figure below summarises the different types of incentives. For more details, see (MENR, 2014, p. 30).

Figure 29: Types of support measures under the Investment Incentives Programme[21]

Support Measures	General Investment	Regional Investment	Large Scale Investment	Strategic Investment
Vat Exception	✓	✓	✓	✓
Customs Duty Exemption	✓	✓	✓	✓
Tax Deduction	⊘	✓	✓	✓
Land Allocation	⊘	✓	✓	✓
Interest Support	⊘	✓	⊘	✓
Vat Refund	⊘	⊘	⊘	✓
Employer's Social Security Premium Support	⊘	✓	✓	✓
Only For Region 6				
Income Tax Withholding Support	✓	✓	✓	✓
Employee's Social Security Premium Support	⊘	✓	✓	✓

Source: (MENR, 2014, p. 30)

4.3.1.3. Incentives related to grid access, licensing procedures and fees

- *Priority grid access for RE over fossil electricity.* The 2010 amendment to the Renewable Energy Law also stipulated that renewable energies receive priority over fossil fuels by EMRA and TEİAŞ when applying for new generation licenses and grid access, in addition to the guarantee that the energy produced is purchased by the local distribution companies (Saygin & Cetin, 2011, p. 35). In practice, however, there are questions about the implementation of this principle, and the technical specifications of TEİAŞ allow the company to curtail access to the grid in order to ensure its stability – particularly given the rising shares of electricity being produced from fluctuating power sources (see MENR, 2014, p. 48).

[21] Region 6 refers to the east of the country.

- *Transmission fee reduction*. The 2013 revision of the Electricity Market Law provides for a 50% reduction in transmission fees for five years for all RE sites starting operation by the end of 2015. In addition to that, other fees (stamp tax) and duties related to the application for a license for new RE power sites have been exempted (KPMG International, 2014).[22]
- *Suspended operation fees. As* an incentive to RE developers, the annual operation fees are applied only after the first eight years of operation (Saygin & Cetin, 2011 p.35).
- *Reduced land usage fees*. The government provides discounts for RE power sites on leases of state-owned lands. The discount amounts to 85% for the first ten years if the site is RER certified (MENR, 2014, p. 12/ 27).
- *Favourable conditions for siting and land leases*. Government policy allows siting RE facilities in "natural parks, conservation areas, protected forests and wildlife habitats including those with a special environmental status, with authorisation from the relevant national or regional environmental authorities" (Azau, 2013, p. 32).

4.3.1.4. Demand support for small, distributed solar power

- *Feed-in tariffs.* Any small-scale, "unlicensed" installation with a capacity of less than 1 MW can similarly receive the feed-in tariff for the net electricity generation the installation feeds into the grid. Local power distribution companies are obliged to buy this generated power from small-scale installations.
- *Reduced administrative requirements for small installations (operations without a license).* Small RE sites, which use the electricity produced internally and do not feed it into the grid, can operate without a license. The maximum generation capacity for such installations is set at 1 MW, but can be increased to up to 5 MW (Gedik & Eraksoy, 2013).

4.3.1.5. Support for SWH manufacturing

- *Import tariff on Chinese evacuated tube collectors (ETC).* In order to strengthen the competitiveness of the domestic ETC manufacturers, the government has increased the price of competing Chinese SWH imports by imposing a tariff on vacuum tube systems in 2011 (Epp, 2011; Solrico, 2014, p. 35).

[22] The source is still available through an archive page. See: https://web.archive.org/web/20150126034528/http://www.kpmg.com/global/en/issuesandinsights/articlespublications/taxes-and-incentives-for-renewable-energy/pages/turkey.aspx

4.3.2 Support measures for energy efficiency

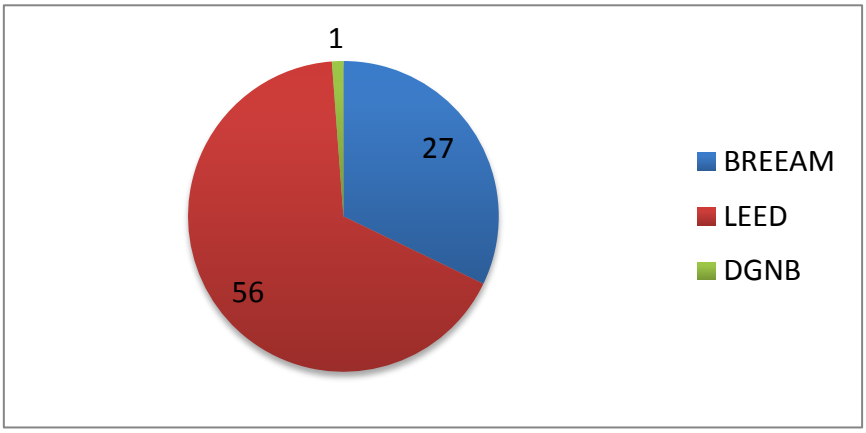
4.3.2.1. Industrial Efficiency

- *The 2008 Support Scheme for Energy Efficiency in Industry.* The scheme provides for up to 30% in public support for EE investments by industrial enterprises. All applications for voluntary investments also require the introduction of an ISO 50001 certified energy management system in order to be eligible for funding (IEA, 2014c) [more specific data was not available based on the sources analysed].

4.3.2.2. Energy Efficiency in Buildings

- *Building energy performance certificates to foster transparency.* To promote transparency about the business case for investing in the energy efficiency of buildings, the 2009 Regulation on Energy Performance in Buildings requires that new buildings and existing buildings that are purchased or rented must have an energy performance certificate that provides information on energy expenses and greenhouse gas emissions (IEA, 2014c).
- *Performance standards and EE label for buildings*. The regulation on the energy performance of buildings has first been introduced in 2008 and has been reviewed and expanded several times since then. The Turkish standards developed are generally similar to or directly refer to European norms. The regulation defines performance criteria for existing and new residential buildings, covering heating, insulation, ventilation, hot water generation and lighting (see IEA, 2014a). The 2009 revision added that buildings that do not reach a D grade in their Energy Performance Certificate would not be given a license to operate. The government has started to require green building certifications in public procurement. A specific example is the procurement of hospitals through the Ministry of Health. For that, Turkey recognises various international Green Building labels while the Turkish Standards Organisation is developing its own Turkish green building label. However, so far the demand created by public procurement is insufficient to energise market development enough for energy services companies to flourish. The further development of the policy instruments to increase performance standards, to develop indicators and benchmarks and to include the retrofitting of buildings is currently under way in the MENR and is supported by international expertise through the MENR-UNDP cooperation project Promoting Energy Efficiency in Buildings (MENR & UNDP, 2013).

Figure 30: Green certified buildings in Turkey, by certification label[23]



Source: Green Building Association of Turkey
(Turkish Investment Support and Promotion Agency, 2013)

- *Solar heating regulation and import restrictions on equipment.* A separate regulation (2008) governs the use of solar thermal water heating in residential buildings, such as the sharing of costs of solar heating systems or their certification. As the regulation fostered demand, a 2011 import duty on vacuum tubes led to the creation of three manufacturing plants using Chinese technology, that supply the Turkish as well as other regional markets (Solrico, 2014). It is noteworthy that the demand for SWH in Turkey has developed largely without specific support measures (such as subsidies) – primarily due to the favourable natural conditions of the country and to the high prices of fossil alternatives, mainly gas imported from Russia.

[23] BREEAM: Building Research Establishment Environmental Assessment Methodology; LEED: Leadership in Energy and Environmental Design; DGBN: German Sustainable Building Council

5 Outlook on Turkey's market development and employment potentials in RE and EE

5.1 Market development

5.1.1 Anticipated market development for RE

There has been a very significant growth in demand for energy in Turkey over the last decades that amounted to 7% per year on average (Azau, 2013; EWEA, 2013). This demand has spurred the diversification and expansion of energy generation from both fossil and renewable sources. This trend is very likely to continue in the next years due to the official RE expansion goals as well as thanks to a favourable market environment (Apricum, 2014).

The costs of natural gas imports have reached a high level in Turkey and are exacerbating the current budget deficit. The expansion of RE generation creates the co-benefit of reducing the country's dependence on imports of natural gas, which is likely to fuel the demand for RE investments in the coming years (Ernst and Young, 2015). The more consistent framework provided by the REAP and the additional policy measures outlined by it are likely to facilitate higher private investments in the expansion of RE generation capacities. The current geopolitical conflict with Russia will further fuel this trend.

Given the ambitious RE targets and the expected unmitigated growth in demand, it is likely that market prices will not drop but continue to rise. Some companies have therefore called for a higher FIT as a necessary incentive for the future expansion of wind energy, in order to cover the risk of investment (see Enerjisa in O'Brian, 2013).

The strong development of wind power can be expected to continue given the overall demand growth and its own cost-competitiveness: The IEA recently ranked Turkey among those countries where newly installed on-shore wind turbines are "competing or close to competing with new coal or gas-fired plants" (IEA, 2013, p. 14). While the installed and grid-connected capacity for wind power is still below 4 GW, the project pipeline of licensed wind power sites in 2013 already amounted to over 9 GW (compare Sabadus, 2013).

Similarly, the 2023 goal to install 600 MW of geothermal capacity for electricity production is likely to be reached, as the European Geothermal Energy Council already projects installations to reach 976 MW by the end of 2016 (Turkish Investment Support and Promotion Agency, 2013, p. 33). Projections by the Geothermal Industry Association in Turkey assume that by 2018 a total capacity of more than 8 GW for electricity and thermal uses combined can be reached, stimulating the creation of 300,000 direct and indirect jobs in this technology field (Parlaktuna et al., 2013, p. 5).

The REAP has outlined a number of policy measures that currently are either planned or under consideration, but not yet implemented, and that would further accelerate investments in RE and EE, such as subsidised loans for RE, technical support for developers, updated licensing

procedures[24], improved grid access and targeted training measures (MENR, 2014, pp. 26-29). An overview of existing RE support measures, planned measures and measures under consideration can be found in the annex in section 8.4.

5.1.2 Anticipated market development for EE in buildings and industry

Due to the strong growth of the Turkish economy, the demand for primary energy is also expected to increase by about 5% annually until 2023 (MENR & UNDP, 2013). In spite of the marked efforts by the Turkish government to encourage a responsible use of energy, much of the EE potential has been left unused so far. The EE potential in buildings alone is estimated to be at 30% - largely in electricity usage and heat generation, as green buildings codes are only now becoming a standard and many older buildings lack proper insulation. Similarly, the potential savings in the industrial sectors are very high – estimated at nearly US$3 billion (Turkish Investment Support and Promotion Agency, 2013, pp. 55-57).

There are no estimates of future employment effects of the Turkish EE policies. A broader study on the economic and employment effects of the various scenarios for Turkish climate policy suggested that initial employment effects of investments in CO_2 savings might negatively impact employment in Turkey, unless they are financed through third parties (Telli, Voyvoda, & Yeldan, 2008). Given the technological changes that have occurred since then, and the experience of a multitude of countries with similar conditions as Turkey, these findings can be regarded as unrealistic and hence irrelevant.

5.2 Estimated employment effects

It has already been pointed out that there is hardly any data available for the employment effects of RE and EE in Turkey. The Green Jobs assessment by the ILO is likely to provide sound data on that, but has not been published yet. One study has been published that estimates the employment effects of solar power development in Turkey. Its results are modelled on a roadmap, developed by academics and industry representatives in 2010, which assumes relatively high shares of domestic businesses in parts for solar PV (a 30% share by 2020, reaching 60% by 2030) and even higher shares in concentrated solar power (a 70% share in 2020, reaching 100% in 2030) (Çetin & Eğrican, 2011, p. 7186). The study makes a number of assumptions on the share of domestic businesses in the investments and estimates direct employment effects of between 177,000 and 221,000 jobs in solar PV and around 2,000 in CSP (Çetin & Eğrican, 2011, p. 7187).

[24] The licensing procedure for RE installations is extensive and an overview on the different steps can be found in the annex in section 8.3.

6 Conclusion: key features of the Turkish approach, explanatory limitations of the study and open questions for future research

This section aims to distil some key features of the RE and EE-related strategies and policies employed by the Turkish government, to highlight the remaining explanatory limitations of the study and to point out some key questions for future research.

6.1 Key features of the Turkish strategies and policies on RE and EE

A number of key aspects of the Turkish approach will be highlighted in this section.

6.1.1 Strategic approach to RE and EE

- While the State Planning Organisation no longer exists, a centralised approach to planning (through the Prime Minister's Office) is still a key feature of Turkish energy policy. The prime minister also plays a key role in coordinating different ministries (through the Higher Board of Planning as well as the Coordination Boards). Due to the dominance of the national government with regard to energy policy, coordination with provincial governments plays a minor role. The more recent strategy documents acknowledge a greater need for coordination with and participation of non-government stakeholders. So far, such participation has, however, been mostly limited to the business community. Civil society is practically absent in this respect.
- The various Turkish strategies have been developed over time in a specific, non-arbitrary order: the liberalisation of the energy/electricity market in the early 2000s provided the possibility for the first private investors to engage in the sector, followed by the adoption of the first goals for renewable energy generation. An industrial policy component was added with local content premiums to foster domestic value added from renewable energy investments. The wind FIT premium focuses exactly on those parts of the value chain where, so far, Turkish companies have not been able to compete on an equal footing with international industry leaders.
- The RE Action Plan addresses a number of shortcomings, e.g. by providing technology-specific expansion goals, by covering not just the power sector, but also including transportation as a field of action and by pointing out not just the costs, but also the benefits of RE (in terms of energy independence, climate change and economic development). However, one aspect that is hardly addressed by the REAP is the employment dimension: There are actually no employment-specific estimates or goals or measures attached to the development of RE capacities. Another remaining shortcoming is the REAP's neglect of the heating sector: In fact, the REAP sets clear goals for power generation from RE, but there are no goals regarding the use of solar energy for water heating.

6.1.2 Policy instruments for RE and EE

- The process of 'getting RE power into the grid' is different in Turkey compared to other countries that use capacity auctions with integrated operation licenses. The overall administrative process is bureaucratic and takes a lot of time until construction can start – a weakness the REAP aims to improve upon (MENR, 2014; Tsagas, 2015). Capacity additions to the grid are structured through calls for tenders by which project developers are granted operation licenses and provided with grid access. Once these projects are licensed and grid-connected, they receive feed-in tariffs and local content premiums depending on the type of RE power produced and the share of domestically manufactured components used. This complicated and time-consuming licensing process is actually a major reason for the still slow development of the solar PV market.
- The FIT policy design has strengths and weaknesses. The relatively low tariff paid for wind power means that the costs of deployment are also low. The option to switch annually between FIT payments and market prices is attractive from a short-term perspective. From a long-term perspective, however, insecurity about the development of the market price and the low (albeit guaranteed) returns on RE power from FITs makes wind power a less attractive investment option.
- Policy incentives for renewables have developed over time to combine energy policy with industrial policy goals (from expanding and diversifying energy sources to increasing the share of domestic value added and employment through the local content premiums and import tariffs). Education and training measures support the development of local skills needed by Turkish companies to become competitive with international companies in more and more segments of the supply chain. However, education and training needs are not yet systematically addressed. There are a number of initiatives and programmes by individual companies, chambers, universities etc., but there is little to no coordination between them so far.

6.2 Explanatory limitations of the study

The study is particularly limited by the lack of reliable data on many aspects of RE and EE. The lack of employment data stands out, but there is also only anecdotal information on the share of domestic companies in value creation from RE or on the market size of EE investments.

- *Lack of data on smaller installations.* As pointed out above, a significant number of RE installations are allowed to 'operate without a license' due to their size in order to limit the administrative burdens for small generators. That also means that it is not clear how significant the share of such unofficial installations is.
- *Quality and reliability of (employment) data.* The data available on the development of RE and EE in Turkey has, in comparison to the other case studies, some particular weaknesses. There are no official sources on employment in RE and EE and the few

figures that are available show a wide range of actual or assumed effects[25] or are based on questionable (often very optimistic) assumptions. In a number of cases, the employment estimates are developed by industry associations and might therefore be interpreted as 'political publicity' or 'wishful thinking'.

- *Lack of evidence on the effectiveness of policy measures*. Another gap in the study is the lack of evidence on the question, whether the premiums that are granted on top of the FITs are really effective in promoting the share of Turkish companies in RE investments. Similarly, there is, for example, little evidence on employment effects generated by EE standards for the retrofitting of buildings.

6.3 Open questions for future research

Open questions for future research mainly concern those remaining, not yet determined aspects of the Renewable Energy Action Plan as well as the overall design of the (yet unpublished) Energy Efficiency Action Plan. Moreover, given the lack of data (particularly on employment) it is so far unclear how effective Turkey has been in combining RE market development with employment creation.

The following key questions should therefore be considered in future studies:

- A number of areas that ought to be addressed by the REAP still under consideration (see Table 10 in the annex). Future studies should follow-up and analyse how, for example, the training and qualification needs for local value creation and employment in the RE (or EE) sectors are addressed by the Action Plan.
- Another focus of attention should be on the unofficial part of the RE market. What is the exact capacity installed in small, off-grid RE appliances that operate without a license? What factors drive market development in this particular niche? What are the employment effects by these installations?
- Market data on solar thermal water heating capacity in Turkey shows that the country is one of the largest markets worldwide and that Turkish companies also play an important role as manufacturers (particularly for flat plate technology). Yet, the (energy and employment) potential of SWH is hardly addressed by the REAP or by other policy documents. Future studies should discuss how to more effectively foster the competitiveness of Turkish manufacturers and their ability to export SWH technology as another approach to creating employment and value added.
- Given the significant influence of the European Union's energy policies on Turkey: What role do European RE companies play in Turkey, for example with regard to the

[25] The same can be said for the widely varying estimates on the natural potential for wind, solar and geothermal energy.

development of local manufacturing? Does the close relationship with the European energy and electricity market foster mutual learning and spill-over effects?

- Looking beyond the domestic energy market: Are Turkish RE manufacturers also looking beyond the domestic markets to neighbouring countries as export markets to further increase employment in the Turkish RE industry?

7 Sources

Acikgoz, C. (2011). Renewable energy education in Turkey. Renewable Energy, 36(2), 608–611. http://doi.org/10.1016/j.renene.2010.08.015

Apricum. (2014). Turkey: Renewable energies thriving at the Bosphorus. Berlin: Apricum Group.

Atavesen, M. S. (2013). Turkish Wind Energy Association. Presented at the 8th Wind Energy and Development Dialogue, Berlin.

Azau, S. (2013, September). The powerhouse bridging east and west. Wind Directions, 30–36.

Basaran, S. T., Dogru, A. O., Balcik, F. B., & Ulugtekin, N. N. (2015). Assessment of renewable energy potential and policy in Turkey–Toward the acquisition period in European Union. … Science & Policy.

BMBF. (2011). Marktstudie Türkei für den Export beruflicher Aus- und Weiterbildung. imove-germany.de. Berlin: Bundesministerium für Bildung und Forschung.

BP. (2015). BP Statistical Review of World Energy June 2015. BP Statistical Reviw of the World. BP.

Çetin, M., & Eğrican, N. (2011). Employment impacts of solar energy in Turkey. Energy Policy, 39(11), 7184–7190. http://doi.org/doi:10.1016/j.enpol.2011.08.039

Deutsche Welle. (2015, April 6). Head of Turkish grid operator resigns after blackout. Retrieved October 2, 2015, from http://www.dw.com/en/head-of-turkish-grid-operator-resigns-after-blackout/a-18363453

Epp, B. (2011, July 29). Turkey: New Import and VAT Taxation for Vacuum Tubes | Solarthermalworld. Retrieved October 3, 2015, from http://www.solarthermalworld.org/content/turkey-new-import-and-vat-taxation-vacuum-tubes

Ernst and Young. (2015). Renewable energy attractiveness index - September 2015 (No. 45). ey.com. Ernst & Young.

European Geothermal Energy Association. (2014). EGEC Market Report 2013/1014 Update. egec.info.

EWEA. (2013). Eastern Winds: Emerging European wind power market. ewea.org. European Wind Energy Association.

FS-UNEP Collaborating Centre. (2015). Global Trends in Renewable Energy Investment 2015. fs-unep-centre.org. Frankfurt: Frankfurt School-UNEP Centre.

Gedik, H., & Eraksoy, G. (2013). Renewable Energy: A Quick Guide to Turkish Regulatory Framework. gedikeraksoy.com. Gedik & Eraksoy Avukatlık Ortaklığı.

Gorun, M., & Tufan, F. (2011). The Legal Framework of Strategic Management Implementations in Public Institutions in Turkey. British Journal of Arts and Social Sciences, 3(2), 220–228.

Higher Board of Planning. (2004). Electricity Sector Reform and Privatization Strategy Paper. web.archive.org. Ankara: Government of Turkey.

Higher Board of Planning. (2009). Electricity Energy Market and Supply Security Strategy Paper. web.archive.org.

IEA. (2013). Technology Roadmap: Wind Energy. iea.org. Paris: International Energy Agency.

IEA. (2014a). BEP-TR: Regulation of energy performance of buildings. Retrieved April 7, 2015, from http://www.iea.org/beep/turkey/codes/bep-tr-regulation-of-energy-performance-of-buildings.html

IEA. (2014b). IEA Statistics: Electricity Information 2014 (with 2013 data). oecd-ilibrary.org. Paris: International Energy Agency.

IEA. (2014c). Policies and Measures Databases. iea.org. Paris: International Energy Agency.

IEA. (2014d). PVPS Report: Snapshot of Global PV 1992-2013. iea-pvps.org. Paris: International Energy Agency.

ILO. (2015). Decent work in the Green Economy: Business cases from Turkey. ilo.org. Ankara: ILO Office for Turkey.

Inal, E. (2015, May). Turkish Solar Power: Better Late Than Never. Retrieved October 1, 2015, from http://www.chadbourne.com/Turkish-Solar-Power-Better-Late-Than-Never_projectfinance/

International Labour Office. (2013). Green jobs becoming a reality Progress and outlook 2013. cliclavoro.gov.it. Geneva: International Labour Organization.

IRENA. (2015). IRENA REsource Gateway. Retrieved March 5, 2015, from http://resourceirena.irena.org/gateway/index

İlkiliç, C. (2012). Wind energy and assessment of wind energy potential in Turkey. Renewable and Sustainable Energy Reviews, 16(2), 1165–1173.

KPMG International. (2014). Turkey - Taxes and Incentives for renewable energy. Kpmg.

Mauthner, F., & Weiss, W. (2014). Solar heat worldwide: Markets and contributions to the energy supply 2012. iea-shc.org.

MENR. (2012). Energy Efficiency Policies and Strategies in Turkey. iet.jrc.ec.europa.eu. Ankara: Government of Turkey.

MENR. (2014). National Renewable Energy Action Plan for Turkey. Ankara: Government of Turkey. Retrieved from http://www.ebrd.com/documents/comms-and-bis/turkey-national-renewable-energy-action-plan.pdf

MENR, UNDP. (2013). Promoting Energy Efficiency in Buildings. tr.undp.org. Ankara: MENR & UNDP Turkey.

Ministry of Energy. (2010). Strategic Plan 2010 - 2014. web.archive.org. Government of Turkey.

Ministry of Energy. (2012). Energy Efficiency Strategy Paper 2012 - 2023. Government of Turkey. Government of Turkey.

Ministry of Environment and Urbanization. (2010). Climate Change Strategy of Turkey 2010 - 2020. dsi.gov.tr. Ankara: Government of Turkey.

Ministry of Environment and Urbanization. (2011). National Climate Change Action Plan 2011 - 2023. dsi.gov.tr. Ankara: Republic of Turkey.

Ministry of Environment and Urbanization. (2012). Climate Change Policies in Turkey. cgseurope.net. Republic of Turkey.

O'Brian, H. (2013, February 25). Turkish minister praises local content | Windpower Monthly. Windpower Monthly.

Parlaktuna, M., Mertoglu, O., Simsek, S., Paksoy, H., & Basarir, N. (2013). Geothermal Country Update Report of Turkey (2010-2013). geothermal-energy.org. Pisa: European Geothermal Congress 2013.

REN21. (2014). Renewables 2014 Global Status Report. ren21.net. Paris: REN21 Secretariat.

REN21. (2015). Renewables 2015: Global Status Report. ren21.net. Paris: REN21 Secretariat.

Sabadus, A. (2013, January 28). Turkey to hold more wind and solar electricity tenders. Retrieved October 3, 2015, from http://www.icis.com/resources/news/2013/01/28/9635448/turkey-to-hold-more-wind-and-solar-electricity-tenders/

Saygin, H., & Cetin, F. (2011). Recent Developments in Renewable Energy Policies of Turkey. In M. Nayeripour & M. Kheshti (Eds.), Renewable Energy - Trends and Applications (pp. 25–40). InTech.

Solargis. (2011). Global horizontal irradiation: Turkey. Retrieved March 26, 2015, from http://solargis.info/doc/_pics/freemaps/1000px/ghi/SolarGIS-Solar-map-Turkey-en.png

Solrico. (2014). World map of the Solar Thermal Industry. Retrieved October 3, 2015, from http://www.solrico.com/fileadmin/medien/pdf/article_SWE_solar_thermal_world_map_2014.pdf

Telli, Ç., Voyvoda, E., & Yeldan, E. (2008). Economics of environmental policy in Turkey: A general equilibrium investigation of the economic evaluation of sectoral emission reduction policies for climate change. Journal of Policy Modeling, 30(2), 321–340. http://doi.org/10.1016/j.jpolmod.2007.03.001

Tsagas, I. (2015, March 25). Turkey to tender 302 MW of PV in April: pv-magazine. Retrieved October 3, 2015, from http://www.pv-magazine.com/news/details/beitrag/turkey-to-tender-302-mw-of-pv-in-april_100018767/#axzz3nUQ4uEq0

Turkish Investment Support and Promotion Agency. (2013). Renewable Energy & Environmental Technologies. invest.gov.tr. Ankara: Republic of Turkey.

World Bank. (2015). World Development Indicators. data.worldbank.org. Washington, D.C.: The World Bank.

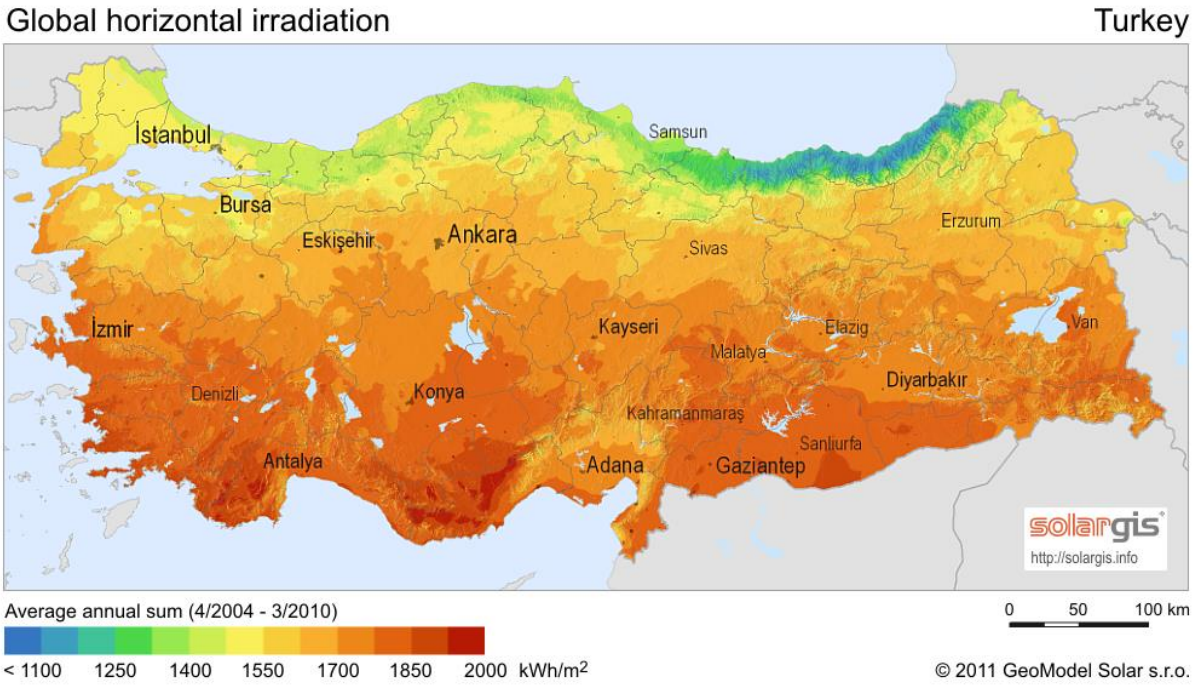
World Energy Council. (2015). Energy Efficiency Indicatiors database. wec-indicators.enerdata.eu. World Energy Council & Enerdata.

WTO. (2012, December 19). Dispute Settlement: WTO issues panel reports on Canada's renewable energy measures. Retrieved January 22, 2015, from http://www.wto.org/english/news_e/news12_e/412_426r_e.htm

8 Annex

8.1 Solar map of Turkey

Figure 31: Global horizontal irradiation in Turkey

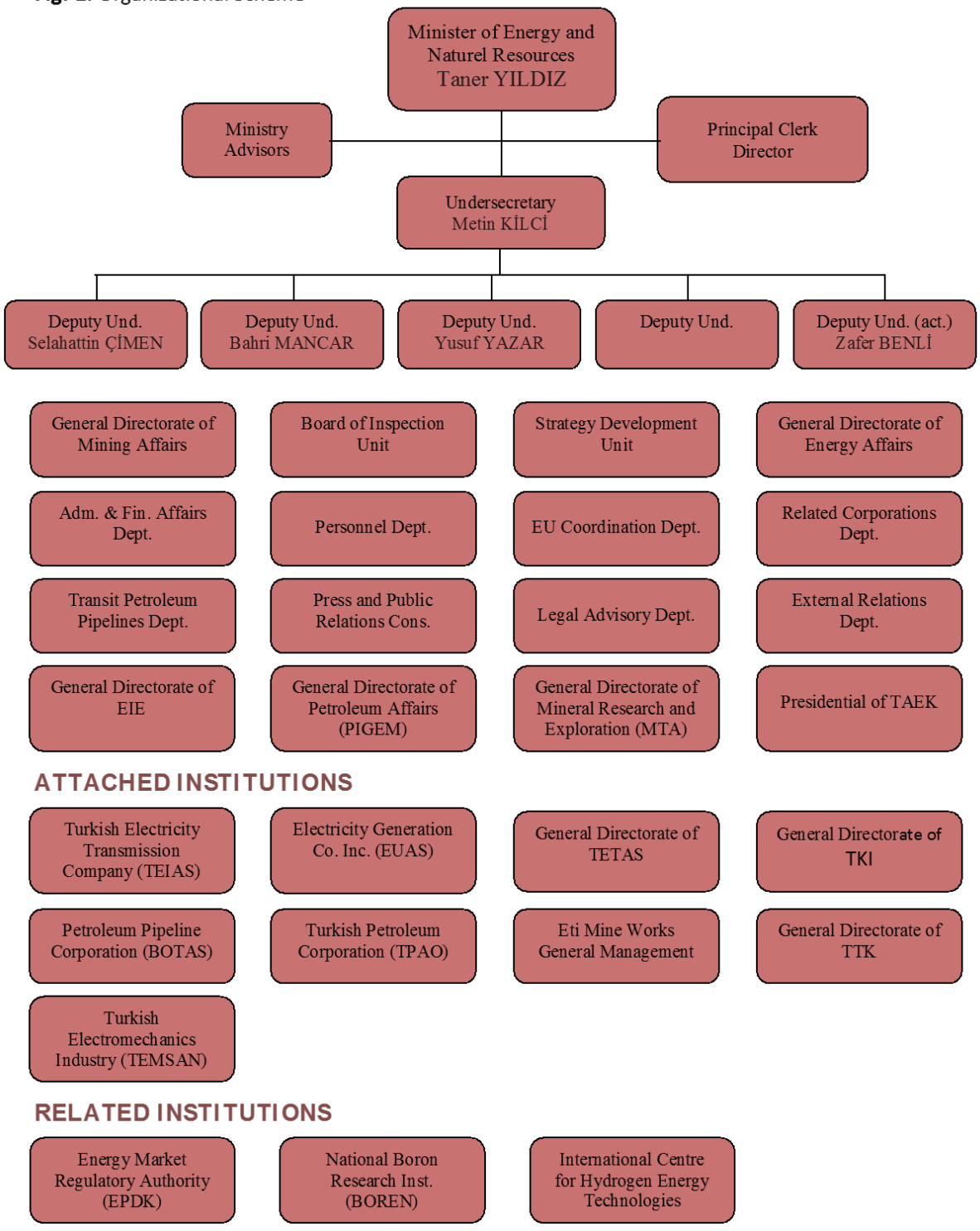


Source: (Solargis, 2011)

8.2 MENR Organisational Chart

Figure 32: Organisational chart of the MENR

Fig. 1: Organizational Scheme



8.3 Policy instruments

Table 8: FIT premium for local content based on component for geothermal energy

Geothermal energy			
	Steam or gas turbine	Generator and power electronics	Steam injector or vacuum compressor
($-Cent/kW)	1,3	0,7	0,7

Concentrated solar power							
	Radiation collector tube	Reflective surface	Sun tracking system	Mechanical components of heat energy storage system	Mechanical components of the steam generation system	Stirling engine	Panel integration and production of structural solar mechanics
($-Cent/kW)	2,4	0,6	0,6	1,3	2,4	1,3	0,6

Photovoltaic solar power					
	PV panel integration and production	PV Modules	PV Module Cells	Inverter	Material for focussing radiation on PV Module
($-Cent/kW)	0,8	1,3	3,5	0,6	0,5

Source: (Turkish Investment Support and Promotion Agency, 2013, p. 33)

Table 9: List of administrative procedures to install new renewable power capacity

Step 1	Step 2	Step 3
• For solar and wind: completion of the necessary land use permits and applications to the General Directorate of Meteorological Works to start measuring. • For geothermal energy, applications should be made to the Secretary General of Special Provincial Administration for access to the geothermal source. Then, all the applications are overseen by the General Directorate of Mining Affairs. • For hydro energy, water usage rights agreement should be signed with the General Directorate of State Hydraulic Works. • For biomass power plants, a tender is applicable for those companies that want to build a power plant that uses landfill as fuel. In that case, usage rights for the city landfill is granted through a tender by the municipality.	• For solar and wind energy, gaining grid connection rights through bidding on the tender. • Biomass, geothermal and hydro investors submit their technical specifications to TEİAŞ to enable access to the system.	• Completion of the environmental impact assessment and other related permissions. • Technical and financial feasibility studies and completion of the project's development.

Step 4	Step 5
• Pre-license application.	• Obtaining the license after completing the necessary documentation. • Review with the grid operator connection requirements.

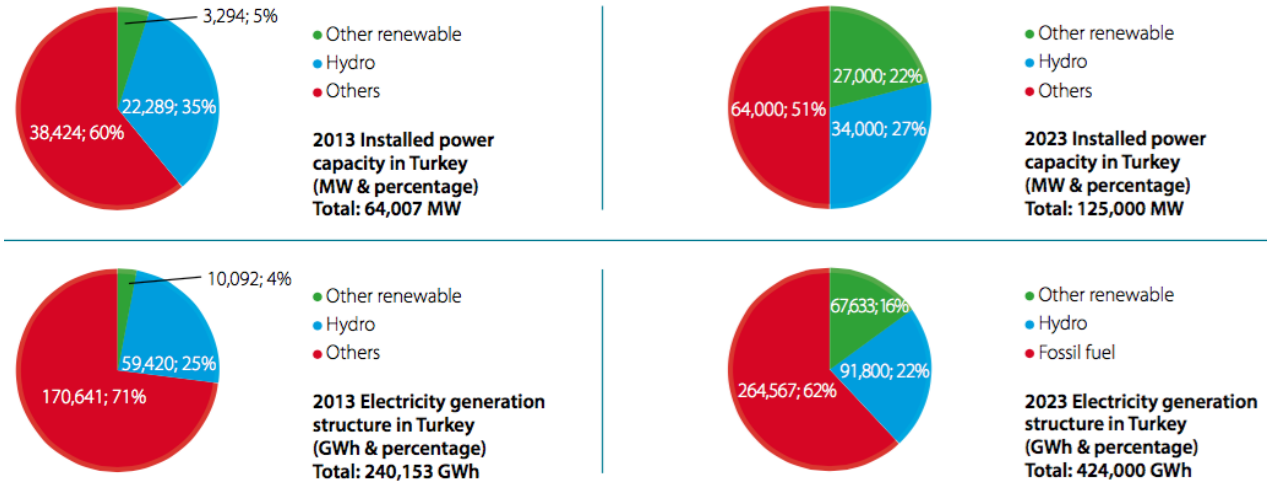
Required documents for all resources

• Letter of Application (from EPDK) • Authorisation Certificate (from EPDK) • Principal Agreement or Commercial Registry Gazette (also for partners of legal entities) • Production Plant Information Form (from the Applicant) • Single-line Diagram (from the Applicant) • Map and Settlement Plan (1/25,000 scale) (from the Ministry of Environment and Urbanisation) • Document concerning the right of resource utilisation • No-Lien Affidavit with the Ministry of Energy and Natural Resources • Statement of Partnership Structure (from Commercial Registry Gazette) • Declaration of Financial Status (from the Applicant) • Letter of Guarantee from the Bank

Source: (MENR, 2014, p. 33)

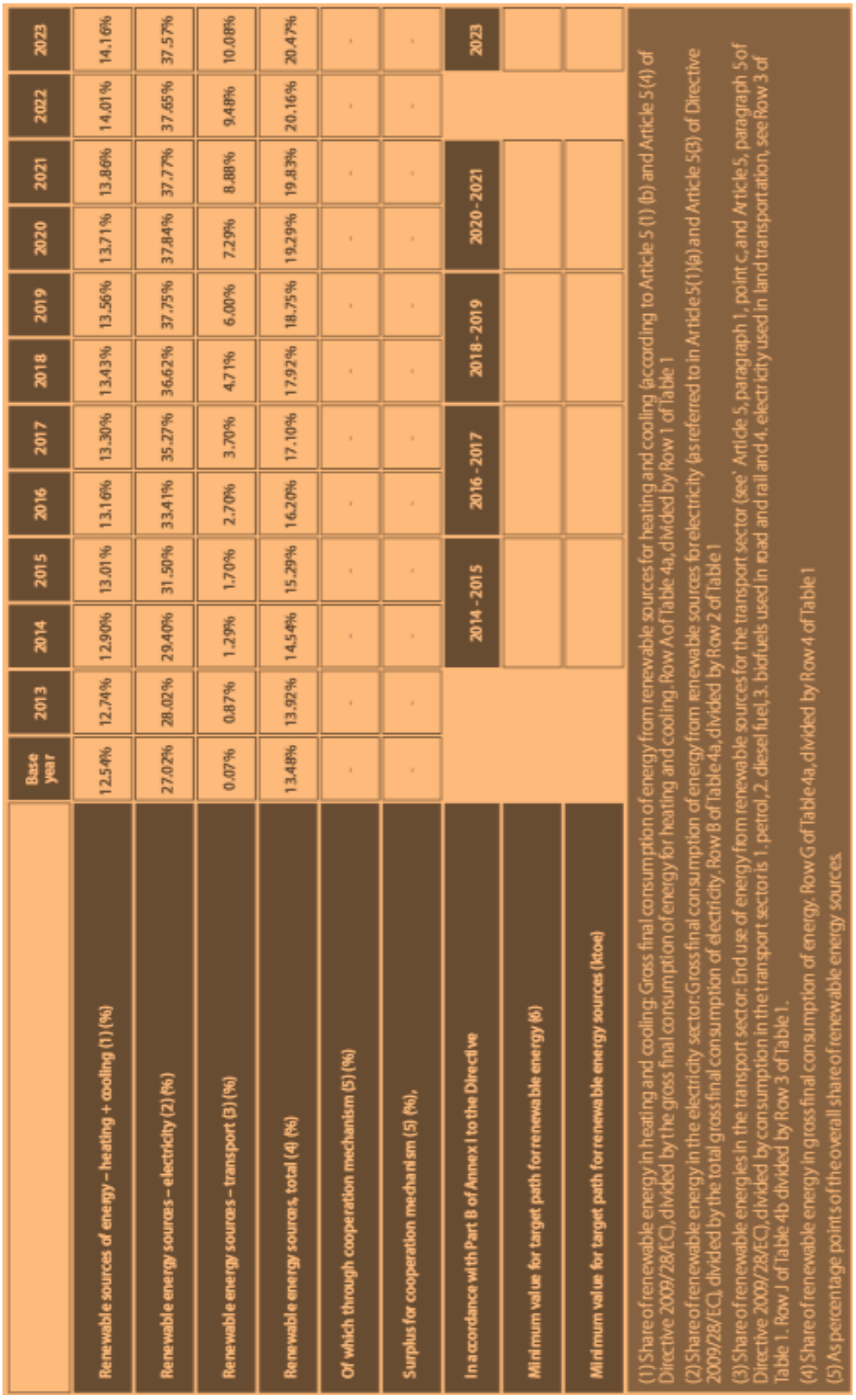
8.4 Renewable Energy Action Plan

Figure 33: Installed capacity (first row) and electricity generation (second row): 2013 data and 2023 forecast



Source: (MENR, 2014, p. 19)

Figure 34: RE targets and trajectories by 2023 in the sectors of electricity, heating and cooling as well as transportation



	Base year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Renewable sources of energy – heating + cooling (1) (%)	12.54%	12.74%	12.90%	13.01%	13.16%	13.30%	13.43%	13.56%	13.71%	13.86%	14.01%	14.16%
Renewable energy sources – electricity (2) (%)	27.02%	28.02%	29.40%	31.50%	33.41%	35.27%	36.62%	37.75%	37.84%	37.77%	37.65%	37.57%
Renewable energy sources – transport (3) (%)	0.07%	0.87%	1.29%	1.70%	2.70%	3.70%	4.71%	6.00%	7.29%	8.88%	9.48%	10.08%
Renewable energy sources, total (4) (%)	13.48%	13.92%	14.54%	15.29%	16.20%	17.10%	17.92%	18.75%	19.29%	19.83%	20.16%	20.47%
Of which through cooperation mechanism (5) (%)	-	-	-	-	-	-	-	-	-	-	-	-
Surplus for cooperation mechanism (5) (%),	-	-	-	-	-	-	-	-	-	-	-	-
In accordance with Part B of Annex I to the Directive			2014 - 2015		2016 - 2017		2018 - 2019		2020 - 2021			2023
Minimum value for target path for renewable energy (6)												
Minimum value for target path for renewable energy sources (ktoe)												

(1) Share of renewable energy in heating and cooling: Gross final consumption of energy from renewable sources for heating and cooling (according to Article 5 (1) (b) and Article 5 (4) of Directive 2009/28/EC), divided by the gross final consumption of energy for heating and cooling. Row A of Table 4a, divided by Row 1 of Table 1

(2) Share of renewable energy in the electricity sector: Gross final consumption of energy from renewable sources for electricity (as referred to in Article 5(1)(a) and Article 5(3) of Directive 2009/28/EC), divided by the total gross final consumption of electricity. Row B of Table 4a, divided by Row 2 of Table 1

(3) Share of renewable energies in the transport sector: End use of energy from renewable sources for the transport sector (see 'Article 5, paragraph 1, point c, and Article 5, paragraph 5 of Directive 2009/28/EC), divided by consumption in the transport sector is 1. petrol, 2. diesel fuel, 3. biofuels used in road and rail and 4. electricity used in land transportation, see Row 3 of Table 1. Row J of Table 4b divided by Row 3 of Table 1.

(4) Share of renewable energy in gross final consumption of energy. Row G of Table 4a, divided by Row 4 of Table 1

(5) As percentage points of the overall share of renewable energy sources.

Source: (MENR, 2014, p. 23)

Table 10: Overview of all policies and measures to promote the use of energy from renewable resources in the REAP

Name and reference of the measure	Type of measure[12]	Expected result[13]	Target group and/or activity[14]	Exists/is planned	Duration of the measure
Feed-in tariff scheme. ***The Law on the Utilisation of Renewable Energy Resources for the Purpose of Genera- ting Electrical Energy (Law No: 5346) and its amendment (Law No: 6094) (8).*** *The end date of the feed-in tariff scheme was extended to December 31, 2020 according to the Board Decision published in the Official Gazette on December 5, 2013 (No: 28842, Decision No: 2013/5625)*	Financial	Investments in renewable energy. New power capacity.	Investors, Private households	Exists	2005-2020
Incentive to promote the use of local equipment. ***Local incentives for renewable energy technologies stated in Renewable Energy Law (No:5346)***	Financial	Investments in renewable energy. New power capacity and energy generation for heating.	Industrial players, investors Energy investors, industrial players	Exists	2010-2030
Investment Incentives Programme. ***The New Investment Incentives Programme in Turkey has been in effect since the January 1, 2012*** **(12).**	Financial	New power capacity and energy generation for heating	Energy investors, industrial players	Exists	From 2012 ongoing
Support from major international financial institutions. ***Promoting support from major institutions, such as TurSEFF and MidSEFF provided by EBRD, the World Bank, the Industrial Development Bank of Turkey (TSKB), the International Finance Corporation (IFC) and the Technology Development Foundation of Turkey (TTGV).***	Financial	Investments in renewable energy. New power capacity and energy generation for heating.	Industrial players, investors	Exists	2012-2023
Subsidised long-term loans for renewable energy projects. ***In the short term, the Turkish Government, in collaboration with the Turkish financial sector and international financial institutions focused on economic development, will analyse the possibility of***	Financial	Investments in renewable energy. New power capacity and energy generation for heating.	Energy promoters, Investors.	Under consideration	Under consideration

enabling mechanisms to provide long-term loans for renewable energy project construction and implementation.					
Advisory services, provided by government agency under the General Directorate of Mineral Research and Exploration (MTA), on engineering and best practices in resource development	Technical	Use of geothermal potential, more targeted development effort	Geothermal promoters/ investors	Under consideration	Under consideration
Financial support to private sector for geothermal exploration activities. ***In the short term, the Turkish government, in collaboration with the Turkish financial sector and international financial institutions focused on economic development, will consider analysing the possibility of enabling mechanisms that mitigate capital risk to support geothermal exploration and drilling activities***	Financial	Use of geothermal potential.	Geothermal promoters / investors	Under consideration	Under consideration
Support for the MTA in expanding its early stage of geothermal exploration activities. ***Turkish government, in collaboration with the international financial institutions focused on renewable energy development, will consider analysing the possibility of providing support to the MTA in scaling up surface and shallow drilling exploration activities across the country***	Technical/ Financial	Greater exploration of geothermal potential	MTA	Under consideration	Under consideration
Land Usage Fee Incentives (Law No: 6094) (8). ***Discount of 85% for permission, lease, easement and servitude rights fees for generation facilities based on renewable energy resources. It will be applicable for the first 10 years, including the period***	Legislative	Investments in renewable energy. New power capacity and energy generation for heating.	Investors	Exists	2005-2020

of investment and operation.					
Reduction in electricity bills, in-house waste treatment facilities. Law on the Environment *(Law No: 2872)* (9), *amended in 2006, establishes that industrial plants receive a reduction of up to 59% of their electricity bills if they set up their own waste treatment facilities.*	Legislative	Licensed use of waste.	Investors	Exists	From 2006 ongoing
Permits unlicensed power generation up to 1 MW and the receipt of feed-in tariff revenues. **Electricity Market *(Law No: 6446)* (6).**	Legislative	Investment in renewable energy and distributed generation.	Private households, investors	Exists	From 2013 ongoing
Permits unlicensed power generation up to 5 MW and the receipt of feed-in tariff revenues. **Electricity Market *(Law No: 6446)* (6).**	Legislative	Investment in renewable energy and distributed generation.	Private households, investors	Planned	Under consideration
Reviewing of procedures for licensing and issuing permits for unlicensed generation, in order to reduce their costs and establish deadlines for the different administrative tasks. ***In the medium term, there will be a revision of administrative requirements to avoid delays and adopt the procedure outlined in Directive 2006/123/EC on services in the internal market.*** ***Among others, the following measures will be taken into consideration: positive administrative silence, time limit for administrative tasks and a one-stop-shop.***	Legislative	Enabling promotions of facilities.	Investors	Planned	Under consideration
Reviewing of licensing and issuing of permit procedures for renewable energy facilities in order to avoid delays. ***In the medium term, there***	Legislative	Enabling promotion of facilities.	Investors	Regulation studies for authorisation of General Directorate	Under consideration

will be a revision of the administrative requirements to avoid delays and adopt the procedure outlined in Directive 2006/123/EC on services in the internal market. ***Among others, the following measures will be taken into consideration: positive administrative silence, time limit for administrative tasks and a one-stop-shop.***				of Renewable Energy in the name of the Ministry of Energy and Resources are ongoing	
Review of transmission system operator legal framework. ***In the medium term, a revision might be considered for the system operator revenue model: An incentive based on renewable energy penetration could be established taking into consideration the positive externalities.***	Legislative	Enabling facilities promotion	Investors, TEİAŞ	Under consideration	Under consideration
Grid operation procedures to enable large renewable energy penetration.	Soft	Improvement of the transmission grid and enabling renewable energy capacity connection.	Investors, TEİAŞ	Planned	Under consideration
Implementation of systems to monitor and manage renewable energy penetration in the grid and monitoring in the same centre which should be close to National Load Dispatch Centre (MYTM). ***TEİAŞ considers implementing, in the short and medium term, systems for monitoring and managing a large number of renewable energy facilities***	Soft	Enabling renewable energy capacity connection.	Investors, TEİAŞ	Planned	Under consideration
Implement the legal framework to develop distributed generation based on renewables. ***Establish the following:***	Legislative	Increase of distributed renewable energy.	DSO, investors, households	Planned	Under consideration

connection to the grid, creating the revenue model, distribution system balancing and signalling.					
Reinforce international electricity interconnections. **Georgia, Azerbaijan, Armenia, Iran, Iraq, Syria, Bulgaria and Greece.**	Soft	Enable the penetration of RES and improve the reliability of the system.	Energy promoters, TEİAŞ	Exists (being developed)	From 2012 ongoing
Obligation to purchase the excess electricity generated. ***The Law on the Utilisation of Renewable Energy Resources for the Purpose of Generating Electrical Energy (Law No: 5346)* (7) *states that distribution companies holding retail licenses are obligated to purchase the excess electricity generated by the unlicensed renewable energy generators (at feed-in tariff prices).***	Legislative	Enable RES penetration.	Investors	Exists	2005
Establish incentives to promote the installation of capacitor banks in wind farms.	Legislative	Improvement of energy quality and system reliability. Incentive for wind energy penetration.	Wind energy investors, TEİAŞ	Planned	Under consideration
Biofuels obligation ***To obtain a biodiesel content of at least 1% by January 1, 2014, 2% by January 1, 2015, and 3% by January 1, 2016 (this regulation was cancelled according to Official Gazette No. 28688 which was published on June 25, 2013).*** ***To obtain a bioethanol content of at least 2% by January 1, 2013, and 3% by January 1, 2014.***	Legislative	Increased use of biofuels.	Biofuel Investors, transportation sector Ministry of Food, Agriculture and Livestock Ministry of Energy and Resources	Exists	From 2013 ongoing
Biofuels tax exemption ***The Energy Market Regulator Authority has established that 2% of biofuels (biodiesel and bioethanol) produced from domestic***	Legislative	Increased use of biofuels.	Biofuel Investors, transportation sector Ministry of Food, Agriculture and	Exists	From 2011 ongoing

raw material that is blended with diesel fuel is exempt from the special consumption tax (ÖTV is the Turkish acronym).			Livestock Ministry of Energy and Resources		
Stimulate collaboration plans between biomass energy investors and the agricultural sector.	Soft	Increased biomass usage.	Investors, farmers	Planned	Under consideration
Incentives to develop energy crops.	Legislative	Increased use of biofuels.	Biofuel promoters, investors, trans-portation sector, Ministry of Food, Agriculture and Livestock	Partially exists	Under consideration
Develop the Directive 2010/31/EU of 19 May, 2010 on the energy performance of buildings in order to promote distributed generation based on renewable energy in buildings and zero emission buildings.	Legislative	Promote distributed generation based on renewable energy.	Investors, households YEGM	Partially exists	Under consideration
Training and education initiatives. Introducing specific programmes that enable personnel to deal with new energy technologies: training plans and academic involvement.	Soft	Establishing qualifications for professionals.	Professionals, population at large.	Planned	Under consideration
Introduction of green certificates for electricity generated in renewable energy power plants.	Legislative	Increased preference for renewable energy con-sumption that will further encourage its generation	All renewable energy investors	Planned	Under consideration
Within the scope of Renewable Energy Resources Area Regulation (YEKA), the measurement of selected solar fields to be completed under one unit	Legislative	To prevent effort, resource and time loss due to measurement of areas in close proximity.	Solar energy investors	Planned	Under consideration

Combination of generation and power	Legislative	Removing the disadvantage of not experiencing scale economy for small-scale investments.	All renewable energy investors	Planned	Under consideration
Actualisation of renewable energy cooperatives	Legislative	Easy access to project finance for licensed and unlicensed projects and enabling scale advantage	All renewable energy investors	Planned	Under consideration
Financial support to promote the development of the hot dry rock geothermal technology	Financial	Investment in research activities to develop materials and technology	Investors	Planned	Under consideration
Financial support for the promotion for Tidal/Wave, sea thermal and marine current energy technologies	Financial	Use of tidal/ wave and current potential.	Investors	Planned	Under consideration
Development of the Turkish National Energy Efficiency Action Plan (NEEAP)	Legislative	Promote energy efficiency actions	Turkish government, energy Sector	Planned	Under consideration

Source: (MENR, 2014, pp. 26-29)