

# In-Depth Energy Efficiency Policy Review of THE REPUBLIC OF TURKEY



ENERGY CHARTER SECRETARIAT  
2014



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## Introduction

Turkey ratified the Energy Charter Treaty (ECT) and the Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA) on 5 April 2001. By ratifying PEEREA, countries commit themselves to formulating and implementing policies for improving energy efficiency (EE) and reducing the negative environmental impacts of the energy cycle (Art. 5). The guiding principle of PEEREA is that contracting parties shall cooperate and, as appropriate, assist each other in developing and implementing EE policies, laws and regulations (Art. 3).

The core activity of the Working Group under the Energy Charter Protocol on EE and Related Environmental Aspects (PEEREA) is the development of in-depth reviews of member states' EE policies and programmes. Recommendations to the authorities of the states concerned, resulting from these in-depth reviews, are presented to the Energy Charter Conference for discussion and endorsement.

The role of the in-depth reviews of the EE policy, undertaken on a peer basis by the Working Group, is to enhance the level of cooperation amongst contracting parties (Article 3.1). The in-depth reviews are used to assess progress, promote continuous dialogue and transfer information. They are a tool for offering peer assistance to governments in developing and implementing EE policies.

The review team was composed of officials from countries that are Parties to the Protocol: Mr Johan Vetlesen from the Norwegian Ministry of Petroleum and Energy, Mr Laurent Minère from the Netherlands Enterprise Agency, Mr Artan Leskoviku from the Albanian National Agency of Natural Resources and Mr Hasan Ozkoc from the EU Delegation to Turkey. The team also included Ms Gabriela Prata Dias from the Energy Charter Secretariat and was supported by Mr Sinan Yorukoglu and Dr Wietze Lise from AF-Mercados EMI. The team visited Ankara between 18 and 22 November 2013 and discussed a range of issues with government agencies and other stakeholders (listed in Annex IV).

Key sources of information for this report include the previous in-depth review of the investment climate and market structure in the energy sector of Turkey (2007), In-depth Review of EE Policies and Programmes of Turkey (2003), national policies and relevant laws as posted on ministry websites, and other relevant publications of the Government of Turkey, reports of international financial institutions such as the European Bank for Reconstruction and Development (EBRD), International Monetary Fund (IMF), World Bank (WB), IFC, International Energy Agency (IEA), Transparency International and the institutions of the EU.





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Executive summary

## Background

The Turkish economy has achieved high GDP growth rates after it overcame the deepest economic crisis of its history in 2001. This is mainly due to regulations and audits to decrease the banking sector's fragility, sound fiscal policies and mass privatizations of public enterprises. The average yearly growth rate of GDP was about 5% between 2002 and 2012.

Turkish import and export activities have been increasing from the early 2000s, except during the global economic crisis in 2009. The average annual growth rate between 2002 and 2013 was approximately 14% for exports and 15% for imports. During the same period, trade volume in services has been increasing as well.

The current account deficit was \$75.1 billion in 2011, about 10% of the GDP, before decreasing to \$48.5 billion (about 6% of GDP) in 2012. The current account deficit increased again in 2013 to \$64.9 billion, about 8% of GDP.

As a result of the "open door" policy of the country, the number of foreign and joint ventures has increased up to today. Foreign investments remain an important factor for the continuation of stable social and economic development in the country. Average net inflows of foreign direct investment to the country have been 1.8% of GDP for the period 2002–2012.

## Energy and Energy Efficiency Policy

Turkey is a developing country, and energy use in Turkey is increasing rapidly due to its increasing population, production and industrialization. Projections show that the electricity demand will increase annually by 6.7% and 7.5% in the next decade for the low and high (business-as-usual) scenarios respectively (TEIAS, 2012).

The World Bank (2011) shows that there is a saving potential of 4.6 Mtoe from the manufacturing industry, 4.8 Mtoe from the transport sector and 7.1 Mtoe from the household sector, leading to a total saving potential of 16.5 Mtoe relative to 2009. Taking the same year as a basis, this amount equals 2.0 billion euros in the manufacturing industry, 5.4 billion euros in the transport sector and 5.8 billion euros in the household sector, adding up to a savings potential of 13.2 billion euros.

Securing long-term energy independence is an important policy goal for Turkey. Current energy policy promotes domestic energy sources, and strives to make use of the available Renewable Energy Sources (RES) potential.

Turkey's EE policy is guided by the Energy Efficiency Law, which aims to increase efficiency in the use of energy resources, to reduce the burden of energy costs on the economy and to protect the environment. The EE Law and its secondary regulations provide the legal basis and measures to promote and support EE improvements, including establishing and operating EE service markets including energy service companies (ESCOs), energy auditors and EE projects, and Voluntary Agreement schemes to encourage energy-saving investments.

The EE Strategy Paper adopted by the High Executive Committee and issued in the Official Gazette on February 25, 2012 proposes determining a political framework supported with result-oriented and solid targets and to define, together with the enterprises responsible for performing them, the activities required to be made in order to reach targets, to make sure that the public and the private sector and NGOs act participatory and in collaboration.

## RES Policy

The energy sector plays a central role in the economy of Turkey. Energy production, however,

largely relies on imports of fossil fuels, namely coal, oil and natural gas. At present, 74% of the primary energy supply of Turkey comes from imports.

Since 2005, the Turkish Government has taken steps to change the status quo. Priority for the development of RES is reflected by the Law on Utilization of RES for the Purpose of Generating Electrical Energy (2005), Turkey's accession to the International Renewable Energy Agency (IRENA) in June 2009, and the adoption of the MENR Strategic Plan (2010–2014).

The assessment of RES potential in Turkey showed that there was already 25,857 MW of RES installed capacity (including hydro resources) as of January 2014 (TEIAS). There is considerable potential for RES in Turkey, estimated at 720 TWh/year, which is three times the gross demand of 242 TWh in 2012. The availability of dam hydro can be used to balance the intermittent output of wind and solar. Moreover, the output of thermal power plants could be significantly reduced by developing this RES potential, which could make GDP growth more sustainable and long lasting.

In the Electricity Energy Market and Supply Security Strategy Paper of 2009, the primary target is to increase the share of domestic sources. Turkey sets the following targets for development of RES by 2023, the centenary of the establishment of the Turkish Republic:

- At least 30% share of RES in electricity generation will be reached (including dam hydro).
- The wind plant installed capacity will reach up to 20,000 MW by 2023.
- The installed capacity for the geothermal power plants will reach up to 600 MW by 2023.
- Technically and economically feasible hydroelectric potential will be put into use.
- The use of solar energy in electricity generation will be commenced.

Turkey has favourable policies in place for RES development:

- There is a RES Law in place, providing feed-in tariffs (FIT) to RES producers for 10 years:
  - o 73 \$/MWh for hydro and wind electricity
  - o 105 \$/MWh for geothermal electricity
  - o 133 \$/MWh for solar and biomass/waste electricity
  - o Moreover, if local content is added to the project, an additional 23–92 \$/MWh (for 5 years) could be earned per project
- There is a spot market which can function as an alternative sales point for RES generators.
- Tenders have been organised to obtain connection permissions, where RES project developers agreed to pay amounts up to 30–40 \$/MWh of generated electricity back to the Turkish Government.
- The banking system in Turkey has built up considerable experience with financing RES projects.

## Summary of the Overall Assessment of Progress

Privatisation in the power and gas sector continues: power distribution company privatisations are completed and generation asset privatisation is ongoing. The privatisation of generation assets has been preceded by a large-scale rehabilitation of power plants, and this process is expected to continue after privatisation. Moreover, most gas distribution companies are privatised as well. The eligible customer limit has been reduced to 5 GWh since January 2013. Also, due to the distribution company privatisations, a process is now in place to reduce theft

and losses from 14.6% on average in 2011 to around 12.1% with separate targets for each distribution company in 2015.

The main objective of the Government of Turkey in the field of energy has been to become less dependent on imports for meeting energy demand. To meet this objective, a strategy document was published in 2009 which set targets for 2023: to achieve 30% of power generation from RES and to reduce the share in power generation of natural gas below 30%.

Under the “European Union – Turkey Progress Report 2013” which was concluded as part of the EU accession policy, Turkey’s efforts were in the following areas: security of supply, internal energy market, renewable energy, energy efficiency, and nuclear safety and radiation protection.

International Financial Institutions (IFI) have set up large funds for energy efficiency investments together with renewable energy investments. The size of these funds is impressive with over \$3 billion. Currently, the government does not treat energy efficiency projects as a special category of investments.

Concerning energy pricing, Turkey is well on track. The introduction of the Automatic Pricing Mechanism (APM) in early 2008 has improved the cost reflectiveness of energy prices considerably. Nevertheless, actual import costs are not always directly reflected in consumer prices as dictated by the APM. Hence, the APM is not always implemented as planned, which leads to temporary price subsidisation.

The government is commended for their work on the EE strategy paper of 2012. This paper has set out seven strategic goals, which are further subdivided into concrete actions and timelines.





Recommendations

## **General Recommendations**

- The government's energy policy should continue to reflect the potential contribution of energy efficiency towards decreasing fuel imports and supporting economic growth and the environment.
- Energy efficiency and renewable energy should continue to be given high priority by the government. Future energy policies should be supported by detailed analysis of economic energy efficiency potentials in all sectors of the economy. The barriers impeding the realization of these potentials should be mitigated.
- The Ministry of Energy and Natural Resources (MENR) should strengthen its capacity to analyse and assess energy efficiency and renewable energy as a basis for future policy development.
- The rehabilitation of generation, transmission and distribution assets in the power sector needs to also continue when the privatisation is completed. The further efficient development of production, transmission and distribution assets in the gas sector needs to continue. This will maximise fuel burning efficiency and minimise the technical transmission and distribution losses.
- Energy strategies and policies should be consistent with long-term goals, and set objectives for key end-use sectors.
- Turkish energy efficiency legislation should continue to be aligned with the relevant EU energy efficiency-related policy and legislation.

## **Institutional Framework**

- Additional efforts are required to strengthen the capability of the newly established General Directorate of Renewable Energy (GDRE), possibly by establishing an effective, appropriately staffed dedicated authority with a clear coordination function.
- The role of GDRE should be strengthened to enable them to have a leading role in developing RES in Turkey.
- Enhancement of inter-ministerial coordination is needed, in particular among other public policymakers in the fields of energy, environment, transport, housing and industry.
- The government should consider ways and means to strengthen work on energy efficiency at regional and local levels, such as regional authorities and municipalities.
- The efforts of various stakeholders, including IFIs, professional and sector associations, universities, research centres and NGOs need to be supported and included in the government's policy formulation and evaluation.
- The government should continue to support research and development activities on renewable energy and energy efficiency technologies.

## **Energy Market and Pricing**

- The government, with the assistance of the Energy Market Regulatory Authority (EMRA), should continue their work with cost-reflective pricing.
- In order to promote energy efficiency measures, further financing of energy efficiency projects through the distribution tariffs should be considered.
- The restructuring of the electricity and gas market is commended and should continue including tariff setting in transmission and distribution which create system efficiency.

## Specific Energy Efficiency Programmes and Measures

- The Energy Efficiency Strategy Paper of 2012 should be supplemented by an energy efficiency policy road map for 2023 and beyond. This long-term road map needs to be made operational through short-term action plans with priorities and intermediate monitoring and evaluations.
- Based on the further assessment of energy efficiency potential, the government should set targets for priority sectors.
- The government should continue to establish high efficiency standards for new and existing buildings, with focus on energy efficiency labelling schemes and minimum energy performance standards. These should include both construction characteristics and use of the buildings. The authority should ensure that compliance and enforcement procedures are in place.
- The government should continue stimulating energy efficiency through a wide range of measures for the buildings and industry sectors, such as compulsory energy audits, benchmarking, dissemination of information on energy efficiency measures, and involving sector associations in communication and information campaigns.
- The government should further facilitate the development of the market for energy services through a wide range of measures, such as a subsidy scheme for energy audits, simplified procedures for investments in energy efficiency projects, and simplified procedures for certification of energy efficiency companies.
- Energy efficiency in the transport sector should be an integrated approach, including public transport, public procurement of energy-efficient vehicles, infrastructure, and regional and city planning.
- The government should continue to give priority to licensing of highly efficient cogeneration and district heating plants.
- Awareness raising and information dissemination activities to promote energy efficiency should be continued and enhanced, particularly in municipalities, households and SMEs.
- Turkey should continue participating in various international energy efficiency-related initiatives.

## Renewable Energy Sources

- RES development should continue to be a priority for Turkey. Objectives, goals and targets for RES, with a timetable, should be improved in a future Renewable Energy Strategy Paper and/or Action Plan.
- The government should continuously assess support mechanisms such as the feed-in tariff system, possibly extending it to cover heat from renewable sources.
- The revenues from water and wind rights (and solar rights in the future) tendering could be earmarked to start a RES revolving fund.
- More financial resources should be dedicated to decentralised RES generation. Private distribution companies should be stimulated to facilitate connections.
- The development of RES resources needs to be carefully considered in light of comparative cost, grid access and dispatch. In the long term the government should consider using hydro and other technical options as a backup to store intermittent renewable energy like wind and solar.

### **Energy Efficiency Financing**

- The government should allocate sufficient financial resources for increasing energy efficiency in public and state-owned buildings and public lighting, and at the same time introduce incentives for private and residential sector initiatives in energy efficiency and RES.
- The government should ensure a good coordination mechanism with IFIs and donor communities, including priority settings, monitoring at the national level, and compatibility with the overall national strategy on energy efficiency and renewable energy.
- The government should explore which financial incentives are most appropriate for stimulating energy efficiency in different sectors.

### **Data Collection and Monitoring**

- To support monitoring of achieved results, a centrally coordinated project database needs to be set up and collect data from all activities related to energy efficiency in Turkey.
- Results at the project level should be aggregated at the national level in order to periodically assess the implementation progress of national policies.
- The existing statistics on the building stock should be improved first, so that they can be used to estimate the energy-saving potential for the building sector and support the policymaking and improvement process.
- The government should ensure full implementation of international environmental reporting standards and methodologies concerning renewable energy and energy efficiency.



Краткое изложение

Турция ратифицировала Договор к Энергетической Хартии (ДЭХ) и Протокол к Энергетической Хартии по вопросам энергетической эффективности и соответствующим экологическим аспектам (ПЭЭСЭА) 5 апреля 2001 года. Ратифицируя ПЭЭСЭА, страны принимают на себя обязательства по формулированию стратегий в области повышения энергетической эффективности и ослабления воздействия на окружающую среду энергетического цикла (Ст.5).

Группа международных экспертов посетила Анкару 18-22 ноября 2013 года и обсудила ряд вопросов с представителями государственных органов, промышленности и другими заинтересованными сторонами с целью доработки настоящего углубленного обзора.

### **Исходная информация**

Турецкая экономика достигла высоких темпов роста ВВП после преодоления глубочайшего в своей истории экономического кризиса в 2001 году. В основном это является следствием принятия нормативных актов и аудитов, направленных на снижение степени нестабильности банковского сектора, разумной налогово-бюджетной политики и массовой приватизации государственных предприятий. Среднегодовой темп роста ВВП в период между 2002 и 2012 гг. составлял порядка 5%.

Деятельность Турции в сфере импорта и экспорта расширяется с начала 2000-х годов, за исключением периода глобального экономического кризиса в 2009 году. Среднегодовой темп роста экспорта в период с 2002 по 2013 год составлял порядка 14%, а импорта - 15%. В тот же период возрастал и объем торговли услугами.

Дефицит текущего платежного баланса в 2011 году составил 75,1 млрд. долл. США - примерно 10% ВВП, прежде чем он снизился до 48,5 млрд. долл. США (примерно 6% ВВП) в 2012 году. В 2013 году дефицит текущего платежного баланса вновь увеличился до 64,9 млрд. долл. США - примерно 8% ВВП.

В результате осуществляемой страной политики «открытых дверей», число иностранных и совместных предприятий увеличивается вплоть до сегодняшнего дня. Иностранные инвестиции по-прежнему являются важным фактором, способствующим дальнейшему устойчивому социально-экономическому развитию страны. Средний чистый приток прямых иностранных инвестиций в страну в период с 2002 по 2012 годы составлял 1,8% ВВП.

### **Политика в области энергетики и энергоэффективности**

Турция является развивающейся страной, и потребление энергии в Турции стремительно растет вследствие увеличения её населения, производства и индустриализации. Прогнозы свидетельствуют о том, что в следующем десятилетии спрос на электроэнергию будет ежегодно возрастать на 6,7% и 7,5% при сценариях низкого и высокого (обычного) роста, соответственно (TEIAS, 2012).

Всемирный банк (2011 г.) указывает на наличие потенциала сбережения в объеме 4,6 млн. т.н.э. в промышленности, 4,8 млн. т.н.э. в транспортном секторе и 7,1 млн. т.н.э. в секторе домохозяйств, что увеличивает общий потенциал сбережения на 16,5 млн. т.н.э. с 2009 годом. Если принять тот же год в качестве базисного, то данный объем эквивалентен 2,0 млрд. евро в промышленности, 5,4 млрд. евро в транспортном секторе и 5,8 млрд. евро в секторе домохозяйств, что в сумме составляет потенциал экономии в объеме 13,2 млрд. евро.

Важной целью политики Турции является обеспечение энергетической независимости в долгосрочной перспективе. Нынешняя энергетическая политика содействует расширению использования местных источников энергии и стремится к использованию имеющегося потенциала возобновляемых источников энергии (ВИЭ).

Политика Турции в области ЭЭ руководствуется Законом об энергоэффективности, целью которого является повышение эффективности использования энергетических ресурсов, уменьшение бремени затрат на энергию в экономике и защита окружающей среды. Закон об энергоэффективности и его подзаконные акты обеспечивают правовую основу и предусматривают меры по поощрению и поддержке повышения энергоэффективности, включая создание и функционирование рынков услуг в сфере ЭЭ, в том числе энергосервисных компаний (ЭСКО), энергетических аудиторов и проектов в области ЭЭ, а также схем Добровольных соглашений для стимулирования инвестиций в энергосбережение.

В Стратегическом документе по вопросам ЭЭ, принятом Высшим исполнительным комитетом и опубликованном в «Официальном вестнике» 25 февраля 2012 года, предлагается создать политическую основу, подкрепленную четко определенными целями, ориентированными на достижение результатов, и совместно с ответственными за их достижение предприятиями определить, какие виды деятельности необходимы для достижения этих целей с тем, чтобы гарантировать деятельность общественности, частного сектора и НПО на основе принципов совместного участия и взаимодействия.

### **Политика в области ВИЭ**

Энергетический сектор играет главную роль в экономике Турции. Однако производство энергии в значительной степени зависит от импорта ископаемого топлива, а именно угля, нефти и природного газа. В настоящее время 74% предложения первичной энергии в Турции обеспечивает импорт.

С 2005 года Правительство Турции предпринимает шаги для изменения существующего положения дел. О приоритетности освоения ВИЭ свидетельствуют Закон об использовании ВИЭ с целью производства электроэнергии (2005 г.), вступление Турции в Международное агентство по возобновляемой энергии (IRENA) в июне 2009 года и принятие Стратегического плана Министерства энергетики и природных ресурсов (МЭПР) (2010–2014 гг.).

Оценка потенциала ВИЭ в Турции показала, что по состоянию на январь 2014 г. уже имеется 25 857 МВт установленной мощности на базе ВИЭ (в том числе гидроресурсов) (TEIAS). Турция обладает значительным потенциалом в области ВИЭ, который оценивается в 720 млрд. ТВт.ч в год, что в три раза превышает валовой спрос, составивший 242 млрд. ТВт.ч в 2012 году. Наличие плотинных ГЭС может использоваться для сбалансирования непостоянных объемов ветровой и солнечной энергии. Кроме того, благодаря освоению этого потенциала ВИЭ, можно было бы существенно снизить объем производства на теплых электростанциях, что могло бы обеспечить большую стабильность и продолжительность роста ВВП.

Основной Стратегического документа по вопросам рынка электроэнергии и надежности снабжения 2009 года является увеличение доли местных источников. Турция ставит перед собой следующие цели по освоению ВИЭ к 2023 году - столетию создания Турецкой Республики:

- Доля ВИЭ в производстве электроэнергии достигнет как минимум 30% (включая плотинные ГЭС).
- Установленная мощность ветроэлектростанций составит до 20 000 МВт к 2023 году.
- Установленная мощность геотермальных электростанций составит до 600 МВт к 2023 году.
- Начнет использоваться технически и экономически целесообразный гидроэнергетический потенциал.
- Будет начато использование солнечной энергии в производстве электроэнергии.

В Турции проводится политика, благоприятствующая освоению ВИЭ:

- Существует Закон о ВИЭ, предусматривающий льготные закупочные тарифы для производителей энергии на базе ВИЭ в течение 10 лет:
  - 73 долл. США/МВт.час за электроэнергию, произведенную с использованием гидро- и ветровой энергии
  - 105 долл. США/МВт.час за электроэнергию, произведенную с использованием геотермальной энергии
  - 133 долл. США/МВт.час за электроэнергию, произведенную с использованием солнечной энергии и биомассы/электроэнергию из отходов
- Более того, если в проект включен местный компонент, то в рамках каждого проекта возможно получение дополнительного дохода в размере 23-92 долл. США/МВт.час (в течение 5 лет)
- Существует спотовый рынок, который может функционировать в качестве альтернативной точки продаж для производителей электроэнергии от ВИЭ.
- Были организованы тендеры на получение разрешений на подключение, в ходе которых разработчики проектов в области ВИЭ согласились выплачивать Правительству Турции суммы в размере до 30-40 долл. США за МВт.час выработанной электроэнергии.
- Банковская система Турции накопила значительный опыт финансирования проектов в области ВИЭ.

### **Краткое изложение общей оценки прогресса**

Продолжается приватизация в электроэнергетическом и газовом секторах: завершена приватизация электрораспределительных компаний и осуществляется приватизация генерирующих активов. Приватизации генерирующих активов предшествовала масштабная реконструкция электростанций, и ожидается, что этот процесс продолжится и после приватизации. Кроме того, также осуществляется приватизация большинства газораспределительных компаний. С января 2013 года лимит для квалифицированных потребителей был снижен до 5 ГВт.час. Благодаря приватизации распределительных компаний, в настоящее время также происходит процесс, целью которого является сокращение краж и потерь, в среднем составлявших 14,6% в 2011 году, примерно до 12,1%, с отдельными целевыми показателями для каждой распределительной компании на 2015 год.

Основная цель Правительства Турции в области энергетики заключается в снижении зависимости от импорта при удовлетворении спроса на энергию. Для достижения этой



цели, в 2009 году был опубликован стратегический документ, в котором определены целевые показатели на 2023 год: достижение доли ВИЭ в производстве электроэнергии от возобновляемых источников в размере 30% и снижение доли природного газа в производстве электроэнергии до уровня менее 30%.

Согласно Докладу о прогрессе Турции на пути присоединения к Европейскому Союзу 2013 года, подготовленному в рамках политики присоединения к ЕС, Турция осуществляла деятельность в следующих областях: надежность снабжения, внутренний энергетический рынок, возобновляемые источники энергии, энергоэффективность, ядерная безопасность и радиационная защита.

Международные финансовые учреждения (МФУ) создали крупные фонды для инвестиций в повышение энергоэффективности наряду с инвестициями в возобновляемую энергетику. Впечатляет объем этих фондов, составляющий свыше 3 млрд. долларов США. В настоящее время правительство не рассматривает проекты в области энергоэффективности в качестве особой категории инвестиций.

Что касается ценообразования в энергетике, то Турция добивается значительных успехов. Внедрение автоматического механизма ценообразования (АМЦ) в начале 2008 года значительно улучшило отражение затрат в ценах на энергию. Тем не менее, фактические затраты на импорт не всегда прямо отражены в розничных ценах, диктуемых АМЦ. Поэтому АМЦ не всегда применяется в соответствии с планом, что приводит к временному субсидированию цен.

Работа правительства над Стратегическим документом по вопросам ЭЭ заслуживает высокой оценки. В этом документе изложены семь стратегических целей, которые, в свою очередь, подразделяются на конкретные меры и сроки.





Рекомендации

## **Общие рекомендации**

- Энергетическая политика правительства должна и впредь отражать потенциальный вклад энергоэффективности в уменьшение импорта топлива и содействие экономическому росту и защите окружающей среды.
- Правительству следует и впредь отдавать приоритет энергоэффективности и возобновляемой энергетике. Будущие энергетические стратегии должны опираться на детальный анализ экономического потенциала энергоэффективности во всех секторах экономики. Следует уменьшать барьеры, препятствующие реализации этого потенциала.
- Министерству энергетики и природных ресурсов (МЭПР) следует укреплять и расширять свои возможности в сфере анализа и оценки энергоэффективности и возобновляемой энергетики как основы для разработки будущей политики.
- Модернизацию объектов генерации, передачи и распределения в электроэнергетическом секторе следует продолжить и после завершения приватизации. Необходимо продолжить дальнейшее эффективное развитие объектов производства, передачи и распределения в газовом секторе. Это максимально повысит эффективность сжигания топлива и сведет к минимуму технические потери при передаче и распределении.
- Стратегии и политика в области энергетики должны соответствовать долгосрочным целям и ставить задачи для ключевых секторов конечного потребления.
- Турецкое законодательство в области энергоэффективности следует и впредь согласовывать с соответствующей политикой и законодательством ЕС в области энергоэффективности.

## **Институциональная структура**

- Необходимы дополнительные усилия для расширения возможностей недавно созданного Генерального директората по возобновляемой энергетике (ГДВЭ), возможно - путем создания эффективного и должным образом укомплектованного специального органа с четко определенной координационной функцией.
- Следует укреплять роль ГДВЭ, чтобы он мог играть ведущую роль в освоении ВИЭ в Турции.
- Необходимо повышать степень межведомственной координации, в особенности между другими государственными директивными органами в области энергетики, окружающей среды, транспорта, в жилищном секторе и промышленности.
- Правительству следует рассмотреть пути и способы активизации работы в области энергоэффективности на региональном и местном уровнях, например, на уровне региональных органов власти и муниципалитетов.
- Деятельность различных заинтересованных сторон, в том числе МФУ, профессиональных и отраслевых ассоциаций, университетов, научно-исследовательских центров и НПО необходимо поддерживать и учитывать при разработке и оценке политики правительства.
- Правительству следует и впредь оказывать поддержку научно-исследовательским и опытно-конструкторским работам в сфере технологий в области возобновляемых источников энергии и энергоэффективности.

## **Энергетический рынок и ценообразование**

- Правительству, при содействии Управления по регулированию энергетического рынка (EMRA), следует продолжать работу, связанную с отражающим затраты ценообразованием.
- В целях содействия мерам по повышению энергоэффективности следует рассмотреть вопрос о дополнительном финансировании проектов по повышению энергоэффективности за счет тарифов на распределение.
- Реструктуризация рынков электроэнергии и газа заслуживает высокой оценки и её следует продолжать, включая установление тарифов на передачу и распределение, что обеспечивает эффективность системы.

## **Конкретные программы и меры в области энергоэффективности**

- Стратегический документ по вопросам энергоэффективности 2012 года следует дополнить дорожной картой политики в области энергоэффективности до 2023 года и на последующий период. Необходимо обеспечить реализацию этой долгосрочной дорожной карты посредством краткосрочных планов действий с учетом приоритетов и промежуточного мониторинга и оценок.
- Исходя из дальнейшей оценки потенциала повышения энергоэффективности, правительству следует установить целевые показатели для приоритетных секторов.
- Правительству следует продолжать работу по внедрению высоких стандартов эффективности новых и существующих зданий, уделяя основное внимание системам маркировки и минимальным стандартам энергоэффективности. Они должны включать как строительные характеристики, так и стандарты эксплуатации зданий. Органам власти следует обеспечить наличие процедур соблюдения и обеспечения выполнения.
- Правительству следует и впредь стимулировать энергоэффективность с помощью широкого спектра мер, предназначенных для зданий и промышленных секторов, таких как обязательные энергетические аудиты, сопоставительный анализ, распространение информации о мерах по повышению энергоэффективности, а также привлечения отраслевых ассоциаций к участию в разъяснительно-информационных кампаниях.
- Правительству следует и впредь содействовать развитию рынка энергетических услуг с помощью широкого спектра мер, таких как схемы субсидирования энергетических аудитов, упрощенные процедуры осуществления инвестиций в проекты в области энергоэффективности и упрощенные процедуры сертификации компаний, занимающихся вопросами энергоэффективности.
- Энергоэффективность в транспортном секторе требует комплексного подхода, в том числе в сфере общественного транспорта, государственных закупок энергоэффективных транспортных средств, инфраструктуры и регионального и городского планирования.
- Правительству следует и впредь отдавать приоритет лицензированию высокоэффективных ТЭЦ и теплоцентралей.
- Следует продолжать и расширять деятельность по повышению уровня осведомленности и распространению информации в целях повышения энергоэффективности, особенно в муниципалитетах, домохозяйствах и на малых и средних предприятиях (МСП).

- Турции следует и впредь участвовать в различных международных инициативах, связанных с энергоэффективностью.

### **Возобновляемые источники энергии**

- Освоение ВИЭ должно по-прежнему являться приоритетом для Турции. Цели, задачи и плановые показатели в области ВИЭ вместе с конкретными сроками следует уточнить в будущем Стратегическом документе по вопросам ВИЭ и/или Плана действий в области возобновляемой энергетики.
- Правительству следует постоянно оценивать механизмы поддержки, как например, систему льготных закупочных тарифов, и, возможно, расширить сферу её действия для охвата тепла от возобновляемых источников.
- Поступления от проведения тендеров на предоставление прав на использование гидроэнергии, энергии ветра (а в будущем - солнечной энергии) можно было бы резервировать для создания оборотного фонда ВИЭ.
- Следует выделять больше финансовых ресурсов на децентрализованное производство электроэнергии от ВИЭ. Следует оказывать содействие частным распределительным компаниям для облегчения подключений.
- Необходимо тщательно продумать вопрос об освоении ВИЭ в свете сравнительных издержек, доступа к энергосистеме и распределения нагрузки. В долгосрочной перспективе, в качестве резервного варианта правительству следует рассмотреть возможность использования гидроэнергии и другие технические возможности аккумулирования энергии непостоянных возобновляемых источников, таких как ветровая и солнечная энергия.

### **Финансирование энергоэффективности**

- Правительству следует выделять достаточные финансовые ресурсы на повышение энергоэффективности общественных и государственных зданий и уличного освещения и, вместе с тем, вводить стимулы для инициатив частного и жилищного сектора в области энергоэффективности и ВИЭ.
- Правительству следует обеспечить наличие отлаженного механизма координации с МФУ и сообществами доноров, в том числе определение приоритетов, мониторинг на национальном уровне и соответствие общей национальной стратегии в области энергоэффективности и возобновляемых источников энергии.
- Правительству следует выяснить, какие финансовые стимулы наиболее целесообразны для стимулирования энергоэффективности в различных секторах.

### **Сбор данных и мониторинг**

- Для содействия мониторингу достигнутых результатов необходимо создать централизованно координируемую базу данных по проектам и осуществлять сбор информации обо всех видах деятельности, связанных с энергоэффективностью в Турции.
- Результаты на уровне проектов следует суммировать на национальном уровне для проведения периодической оценки хода реализации национальной политики.
- В первую очередь следует уточнить имеющиеся статистические данные об общем фонде

зданий, чтобы их можно было использовать для оценки потенциала энергосбережения в строительном секторе и содействия процессу разработки и совершенствования политики.

- Правительству следует обеспечить полное внедрение международных стандартов экологической отчетности и методик, связанных с возобновляемыми источниками энергии и энергоэффективностью.







Background

## Brief Country Overview

### Geography

The Turkish Republic is a Eurasian country located in the Southeast European region and the Middle East. Approximately 97% of its area (called Anatolia) is in Asia and the rest (Eastern Thrace or Rumelia) is in Europe. Turkey covers a territory of 785,347 km<sup>2</sup> bordering with Georgia (276 km), Armenia (328 km), Azerbaijan/Nakhchivan (15 km) and Iran (560 km) on the east, Iraq (384 km) and Syria (877 km) on the south, and Bulgaria (269 km) and Greece (203 km) on the north-west. Turkey has a combined coastline of 4,763 km on the eastern coast of the Aegean Sea and the northern coast of the Mediterranean Sea, and a coastline of 1,778 km on the southern coast of the Black Sea. In addition, the Sea of Marmara, which is an inland sea of Turkey, has a coastline length of 1,275 km. Turkey has played an important role in trade and transport since the beginning of commerce, both in the Mediterranean and along the Great Silk Road.

According to TURKSTAT statistics, Turkey's population was approximately 76.7 million by the end of 2013 (see Table 1) and this has been increasing gradually (about 1.3% per year) each year. The territory of Turkey consists of 957 districts in 81 provinces. The main cities are Istanbul, Ankara and Izmir. Ankara, the capital, is situated in the centre of Anatolia and it is the second largest city in Turkey after Istanbul. It covers an area of 25,437 km<sup>2</sup> and has a population of around 5 million inhabitants. On the other hand, Istanbul, which is the largest city, has a population of over 13.8 million and covers an area of 5,313 km<sup>2</sup>.

Turkey is characterized by a diverse landscape. Mountains cover most of the total area of the country. The average altitude is over 1,100 meters and it increases from west to the east. The major mountains of Turkey include Mount Ararat, Mount Erciyes, the Kaçkar Mountains and the Taurus Mountains. The highest peak is Mount Ararat at 5,137 meters.

The climate in Turkey is quite variable with four main climate types, namely Mediterranean, Continental, Marmara (transition) and Black Sea climate. The average annual temperature in the country is 14.2 °C, while it reaches 15–20 °C in southern and western parts of the country and drops to 5–7.5 °C in the east. Precipitation is variable too, with an average of 600–1,000 mm per year. It is lowest in central eastern Turkey (250–500 mm) and highest in the mountains of the east Black Sea region (1700–2,200 mm).

Turkey is a rich country in terms of mineral resources and other mines. The major mineral source of Turkey is boron, having about 64% of the world's reserves. In addition, there are significant deposits of feldspar, bentonite, perlite and pumice. An area that must be specifically mentioned is the west of the Black Sea region (Zonguldak, in particular), which is the only basin where hard coal is found, together with lignite which is more abundant and dispersed across the country. Major deposits of trona, meerschaum, gypsum, and natural stones including marble, travertine and granite scattered all over the country, are of particular interest. Deposits of uranium, gold and other precious metals, mineral spring water, etc. also form part of the geology of Turkey.

### Demography

Turkey has a population of about 75.6 million (2012). Key demographic indicators are set out in Table 1 below.

**Table 1** Key demographic indicators

	2012	2013
<b>Population, end year total (millions)</b>	75.6	76.7
<b>Population growth (annual %)</b>	1.2	1.3
<b>Life expectancy at birth, female (years)*</b>	76	79
<b>Life expectancy at birth, male (years)*</b>	72	74

\* 2011 and 2012 respectively

Source \_WB (2012) and TURKSTAT (2013)

According to TURKSTAT, the country has a labour force of about 28.2 million as of October 2013, of which 2.7 million (9.7%) are unemployed. The services sector employs 49.8% of the whole labour force, followed by agriculture and industry with 23.5% and 19.1% respectively. 16.3% of the population lives under poverty as of 2012.

## Climate Change

Climate change scenarios for Turkey propose an increase in the average temperature and rainfall (Ministry of Environment and Urbanisation, 2013). The average annual temperature increase between 2011 and 2040 is expected to vary between 0.5 °C and 1 °C. In the period 2041–2070, the increase in the surface temperature is expected to vary between 1.5 °C and 2.4 °C and by 2100 it is projected that the temperature increase will reach 3.5 °C in winter and 6 °C in summer. In some scenarios, the increase in the temperature is projected to reach over 7 °C in the last 30 years of the 21st century (2071–2100). The increase will be higher in winter for the eastern and inner parts of the country, while it will be higher in summer for south-eastern Turkey and the coastal regions. Rainfall in 2011–2040 is expected to increase up to 30% in winter and spring compared to the period 1961–1990 (MEU, 2013). However, in the coming years (2041–2100), the precipitation is expected to decrease in most of the country, especially in the Mediterranean and Southeast Anatolian regions, whereas it will increase in the northern parts, namely the Black Sea region. Other than those, the changes in the amount of rainfall will be relatively insignificant.

Climate change will significantly affect water resources in Turkey. The sectors most exposed to climate change are tourism, agriculture and energy.

## Political System

The structural formation of Turkey's political system was initiated by way of the acceptance of the first Constitution of the Republic of Turkey on 20 April 1924. With a few additions in the following years, the constitution established Turkey as a democratic, constitutional, secular and unitary republic. The Constitution is based on the principles of unity of powers, except for jurisdiction. Later, with the Constitution that was accepted in 1961, a complete parliamentary system was established with a separation of the legislative, executive and judicial powers. According to the traditional concept of the separation of power, the Constitution determines that the executive power is held by the president of the Republic of Turkey and the Council of Ministers, the legislative power is carried out by the Parliament – the Grand National Assembly of Turkey, with 550 deputies – and the judicial power is held by the independent courts. The current Constitution in effect in Turkey was accepted in 1982.

The deputies of the Grand National Assembly of Turkey are elected on the basis of a majority system, during general, equal and direct elections by free, private and secret ballots. The Grand National Assembly develops constitutional laws, Acts and orders on issues within its power. It gives the vote of confidence to the appointment of the prime minister and to the Council of Ministers.

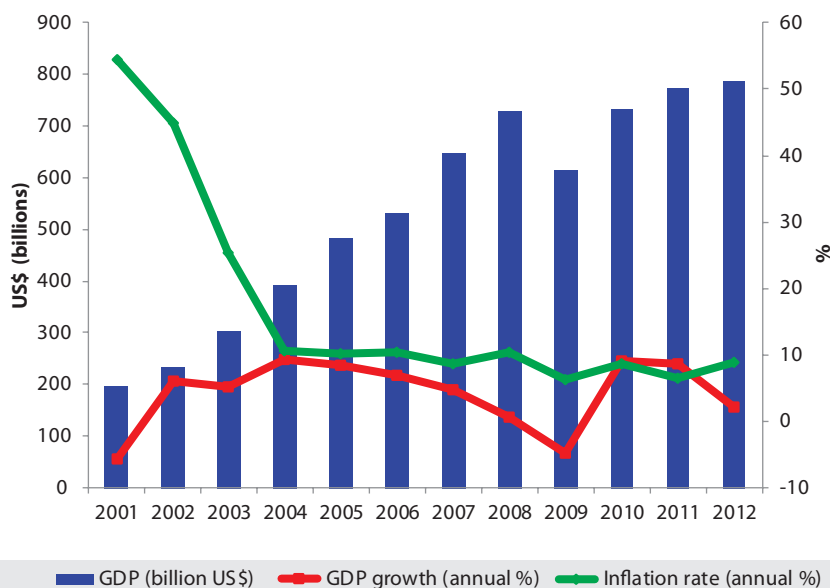
The government (Cabinet of Ministers) is subordinate to the president, who appoints the prime minister and Cabinet. The Cabinet of Ministers oversees the implementation of the general policy of the government, and of the state budget and financial, credit and monetary policies, as well as state social programs.

Turkey is a member of the United Nations, the Organization for Security and Cooperation in Europe (OSCE), the Organization for Economic Co-operation and Development (OECD), the North Atlantic Treaty Organization (NATO), the Black Sea Naval Co-operation Task Group (BLACKSEAFOR), the World Health Organization (WHO), the European Bank for Reconstruction and Development (EBRD), the D-8 (Developing Eight), the G-20 (Group of Twenty), the Council of Europe (COE), the International Monetary Fund (IMF), the Organization of the Islamic Conference (OIC), the International Energy Agency (IEA), and the World Bank (WB). Turkey is a candidate country for accession to the European Union (EU).

## **Economy**

The economic development of the country until around the end of World War II can be considered as the era of the reconstruction, formation and industrialization of a newly founded Republic. After that, the economy started to become more dependent on external loans and credits, foreign capital and investments, and liberalization. The country moved into a more stationary period and the state intervened in the economy for regulating purposes. Dependency on foreign capital and imports increased, especially during the 1980s, although there have been exceptions in periods where exports increased with economic growth. Most recently, Turkey has gone through national economic crises in 1994, 1999 and 2001, and was moderately affected by the global economic crisis of 2009.

The average growth rate of GDP for the period 2002–2012 was around 5%. The next graph shows the GDP values and growth rates for Turkey for the period 2001–2011.

**Figure 1\_GDP development of Turkey**

Source\_WB, 2013

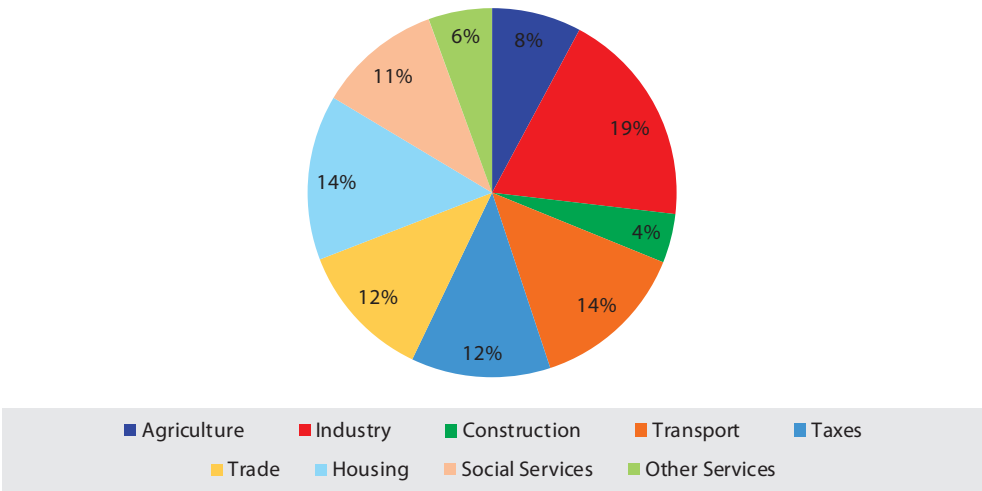
The Turkish economy has achieved high GDP growth rates after it overcame the deepest economic crisis of its history in 2001. This is mainly due to the regulations and audits to decrease the banking sector's fragility, sound fiscal policies and mass privatizations of public enterprises. The average yearly growth rate of GDP was about 7% between 2002 and 2007. However, the effects of the global economic crisis began to be observed by the end of 2008 all over the world, whereas the Turkish economy experienced a recession in 2009, the first one since the 2001 crisis, with a negative GDP growth rate of 4.8%. Strong macroeconomic fundamentals, a strong mid-term program to reduce uncertainties and a continuing capital inflow helped the economy to recover from the downturn, and Turkey became one of the fastest-growing economies in the world in 2010 with a real GDP growth of 9%. This high growth rate and measures to reduce unemployment resulted in a lower unemployment rate in 2010 (down to 11.9%). The significant growth in the economy continued in 2011 and the GDP growth rate for 2011 reached 8.5%, before decreasing to 2.2% in 2012.

The components of the GDP by sector in 2012 are illustrated in Figure 2 below. The GDP of the country is not dominated and driven by one single specific sector, but is distributed over several sectors. Industry is the leading sector, with a share of 19% of the total GDP, followed by transport (14%), housing (14%), taxes (12%) and trade (12%).

Industry is one of the most developed sectors in Turkey. The most important subsectors are fuel and energy, chemistry, manufacturing, metallurgy, mining, food industry and light industry. Agriculture is another important sector, with as main products cereals (especially wheat and barley), vegetables, sugar beets, cotton, fruits, tobacco, tea, hazelnuts, oil, vegetables and cattle breeding.

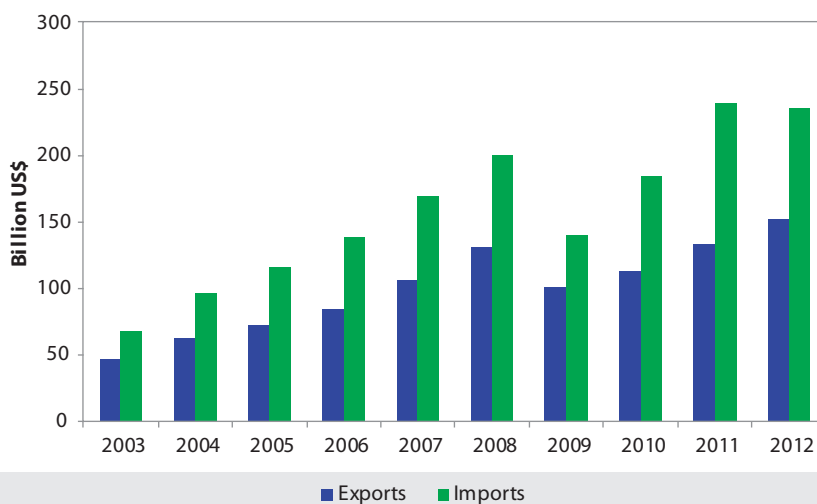
According to the 10th Development Plan published in July 2013, the main medium-term objective of the state policy in the field of industry is to develop a competitive manufacturing structure based on exports via increased efficiency and accelerated industrialization, led by the private sector. Similarly, efficiency increases are also targeted in agriculture and service sectors, whereas lower dependency on imports and low-cost, safe satisfaction of demand is aimed for in the energy sector. In order to achieve these targets, a predictable and stable macroeconomic environment must be established. The main activities include the modernization and reconstruction of equipment facilities, increasing the competitiveness of national products, the flow and efficiency of investments, increasing the labour force participation rate, and encouraging research and development processes.

**Figure 2** Components of GDP, 2012



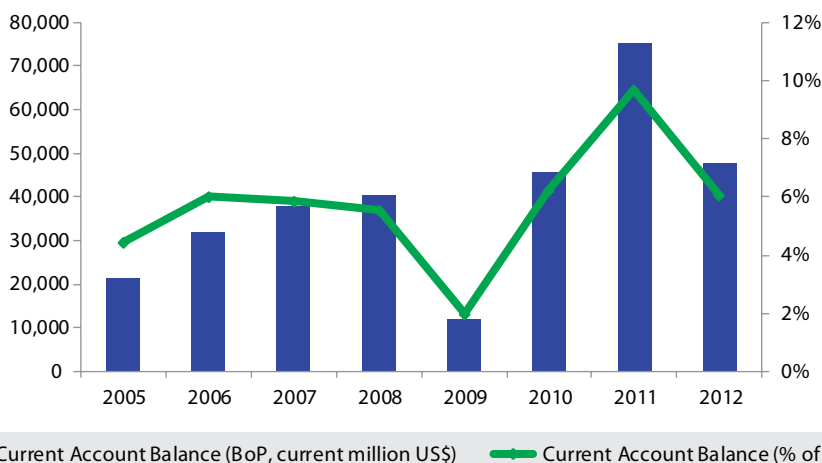
Source\_Ministry of Development of Turkey, 2013

Import and export activities have been increasing over the last few years and there has been a noticeable increase in net imports of goods and services in the last two years. There has been a significant decrease in the volume of net exports in 2009 as a result of the global economic crisis, but the increasing trend was re-established in 2010. Exports reached \$152 billion in 2013 with vehicles, machinery, equipment and parts, ferrous metals and goods, textiles and garments, mineral fuels, fruit and vegetables as the main export items. Imports, \$252 billion as of 2013, consisted of mineral fuels, vehicles, machinery, equipment and parts, ferrous metals, plastics, precious stones and chemicals. The EU is the major destination for the export of Turkish goods. The main trade partners of Turkey are Germany, Iraq, Iran, United Arab Emirates, United Kingdom, Russia, Italy, France and USA. Turkey is a founding member of the World Trade Organization (WTO) since the establishment of the Organization in 1995.

**Figure 3**\_Net Exports and Imports of Turkey

Source\_Ministry of Economy of Turkey, 2014

The current account balance of the country shows that the account deficit peaked at \$75.1 billion in 2011, about 10% of the GDP, before decreasing to \$48.5 billion (about 6% of GDP) in 2012. The current account deficit increased again in 2013 to \$64.9 billion, about 8% of GDP.

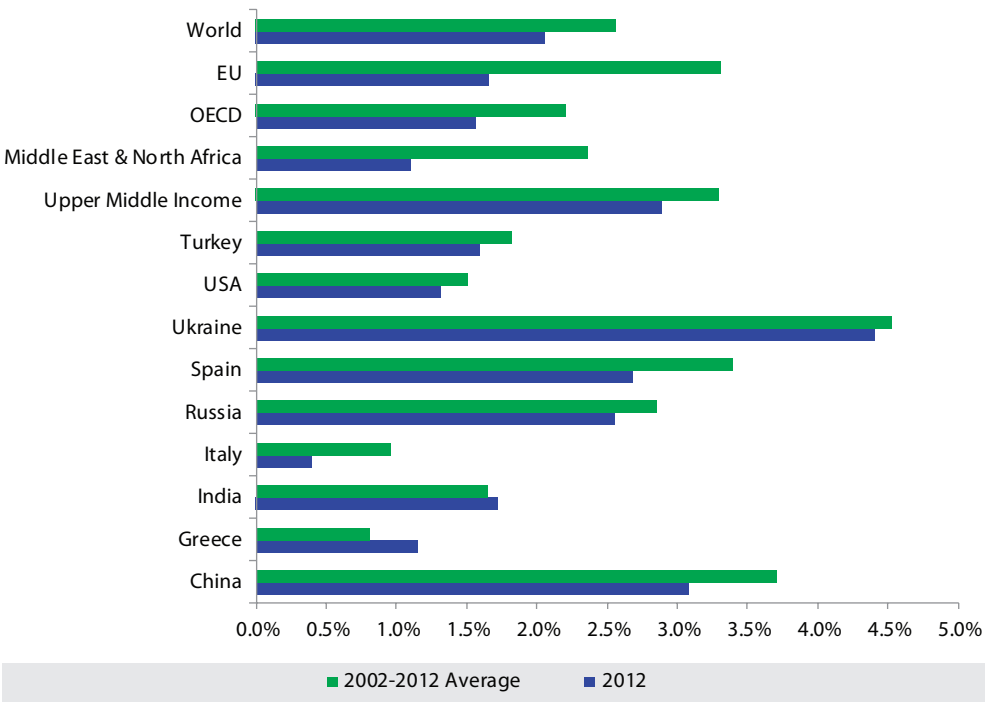
**Figure 4**\_Current Account Balance of Turkey

Source\_WB, 2013

As a result of the “open door” policy of the country, the number of foreign and joint ventures increased since the 1950s, when the foreign investments to the country have been stimulated.

According to data from the Ministry of Economy, there were 34,094 industrial enterprises in Turkey with foreign investments from 164 different states by the end of June 2013. Foreign investments remain an important factor for the continuation of a stable social and economic development in the country. Average net inflows of foreign direct investment to the country have been 1.8% of GDP in the period 2002–2012.

**Figure 5** Turkey and comparative countries (upper-middle-income): Foreign direct investment, net inflows (% of GDP)



Source\_WB, 2013

## Energy Supply and Demand

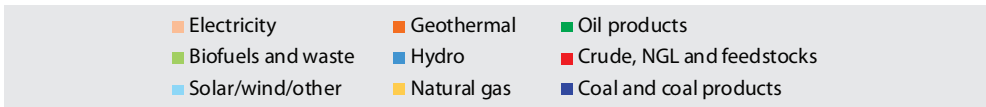
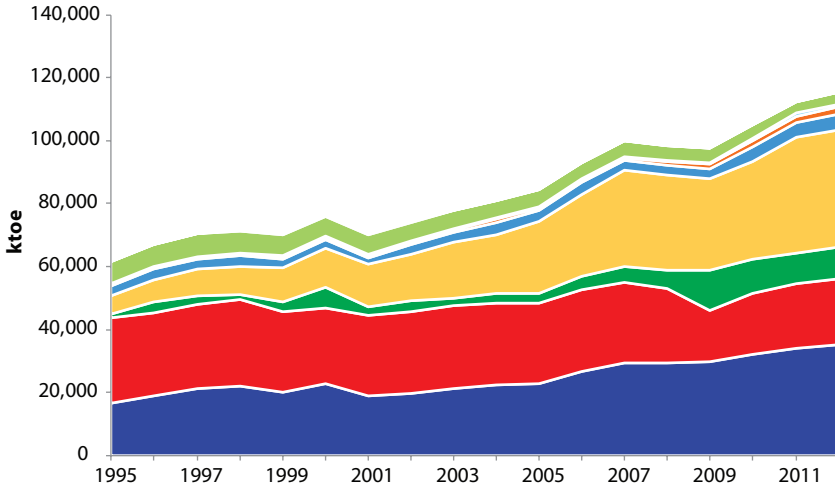
### Energy Balance

At present, Turkey’s gross energy consumption relies largely on fossil fuels. According to IEA statistics, about 74% of the primary energy supply of the energy sector comes from imports. Oil, natural gas and coal together represent 99.7% of all energy imports of Turkey. Detailed information on these energy resources, their production, consumption and import amounts is provided in the next section.

Primary energy demand has been increasing between 1990 and 2012, except during major economic crises. This is illustrated in the next two graphs, showing an average growth rate of 2.9% between 1990 and 2012 (see Figure 6) and a significant increase in the share of natural gas (see Figure 7). In addition, Table 2 shows the distribution of energy sources over the main sectors of the Turkish economy in 2011.

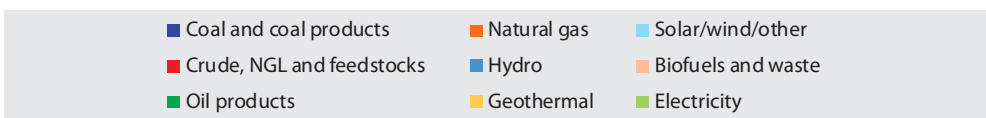
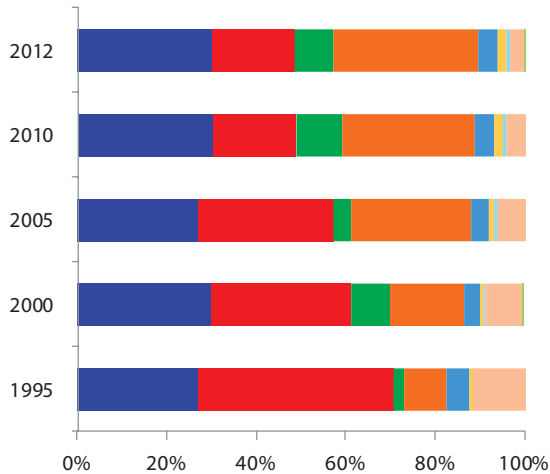


**Figure 6**\_Total primary energy supply



Source: IEA statistics, 2013

**Figure 7**\_Distribution of sources in total primary energy supply between 1995 and 2012



Source: IEA statistics, 2013

**Table 2\_Energy Balance of Turkey in 2011 (ktoe)**

	Coal and coal products	Crude, NGL and feedstocks	Oil products	Natural gas	Hydro	Geothermal	Solar/wind/other	Biofuels and waste	Electricity	Heat	Total
<b>Production</b>	17840	2342	0	625	4501	2059	1036	3661	0	0	32064
<b>Imports</b>	15533	17963	18521	36115	0	0	0	0	392	0	88524
<b>Exports</b>	0	0	-7467	-588	0	0	0	0	-313	0	-8369
<b>Total primary energy supply</b>	33925	20621	9798	36778	4501	2059	1036	3661	78	0	112459
<b>Total final consumption</b>	13094	0	28229	17666	0	1463	441	3546	15805	1216	81458
<b>Main activity producer electricity plants</b>	66217	0	904	104048	52338	694	4723	469	0	0	229393
<b>Main activity producer heat plants</b>	25	0	21	1161	0	0	0	9	0	0	1216
<b>Industry</b>	6939	0	1559	7877	0	0	0	0	7366	1216	24957
<b>Transport</b>	0	0	14557	219	0	0	0	16	58	0	14849
<b>Residential</b>	5786	0	1275	7225	0	1463	441	3530	3807	0	23528
<b>Commercial and public services</b>	278	0	0	2040	0	0	0	0	4131	0	6449
<b>Agriculture/forestry</b>	0	0	4894	21	0	0	0	0	428	0	5343
<b>Fishing</b>	0	0	0	31	0	0	0	0	15	0	46
<b>Non-specified (other)</b>	90	0	0	0	0	0	0	0	0	0	90
<b>Non-energy use</b>	0	0	5944	252	0	0	0	0	0	0	6196

Source\_IEA, 2013

## Coal, Oil and Gas

Turkey is currently a net importer of coal, oil and natural gas. The total net import of crude oil in Turkey was 19.1 Mtoe and net import of oil products was 12.2 Mtoe, while natural gas imports totalled 37.3 Mtoe and coal imports were 18.7 Mtoe in 2012, based on IEA statistics. There are also a number of existing fields and also fields under development in Turkey, and it is expected that new exploration will positively contribute to decreasing the dependency on imports in coal and oil consumption of the country. Also, the General Directorate of Mining Research and Exploration (MTA) of MENR recently announced the discovery of new lignite reserves in Turkey.

The most abundant hydrocarbon energy source in Turkey is coal, specifically lignite. Coal is the second primary energy source supplied in Turkey, coming after gas, and is by far (more than half of the total) the largest source of energy produced in Turkey. In 2011, coal provided 15.5% (35.8 Mtoe) of Turkey's total primary energy supply. A little less than half of the total coal (17.6 Mtoe) comes from import, which consists of 87% hard coal. On the other hand, 18.1 Mtoe (15.8% of the total supply) is provided by domestic coal, which consists of 91% lignite.

The total lignite reserve in Turkey is geographically dispersed across the country and is about 13.9 billion tonnes, of which 96.7% is proved reserves, 3.2% is probable and about 0.1% is

possible. This amount corresponds to 7.1% of the world lignite reserves. As for hard coal, Turkey has more scarce reserves when compared to lignite, and these reserves of about 1.32 billion tonnes are mostly located in and around the Zonguldak.

Turkey's total marketable coal production was 76 million tonnes in 2011. Lignite accounted for about 95% of the total production (approximately 72.5 million tonnes). According to the MENR statistics (2012 Coal Sector Report), the total amount of coal (hard coal, lignite and asphaltite) consumed in Turkey in 2011 was a little higher than 100 million tonnes, split into 26 million tonnes hard coal, 74 million tonnes lignite, and 0.9 million tonnes asphaltite. Turkey is thus largely dependent on hard coal imports (over 90% of the national consumption). According to MTA statistics, Turkey imported in 2012 a total of 28.4 million tonnes of hard coal (worth about \$4.8 billion) from other countries, mainly from Russia, Colombia and the USA.

In Turkey, activities related to oil and natural gas are carried out by the state-owned Turkish Petroleum Company (TPAO), related to the MENR. According to the TPAO 2012 Sector Report, the amount of oil produced in 2012 was 2.3 million tonnes, which is about 4% less than the 2011 production. By the end of 2012, the recoverable oil reserves of Turkey were 43.2 million tonnes (294.8 million barrels), whereas the total (proved, probable and possible) oil reserves amounted to 1.03 billion tonnes. Around 93% of the explored oil reserve fields are considered as small-sized and 7% are mid-sized. According to IEA data, the total primary energy supply consisted in 2012 of 21.1 million tonnes crude oil and 10.1 million tonnes other oil products. In the same year, the total net import of crude oil was 19.1 million tonnes and the net import of oil products was 12.2 million tonnes.

The TPAO 2012 Sector Report states the amount of natural gas production in 2012 was 664 million m<sup>3</sup>, which is equivalent to 520.5 Mtoe (IEA), and over 16% less than 2011 levels. As of the end of 2012, the total proved, probable and possible natural gas reserves of Turkey were 25.78 bcm, of which 6.84 bcm is recoverable. According to IEA statistics, natural gas contributed to Turkey's primary energy supply with 37.25 Mtoe in 2012, while total net imports have been 37.29 Mtoe in the same year. In addition, total natural gas consumption in 2011 was 37.7 Mtoe.

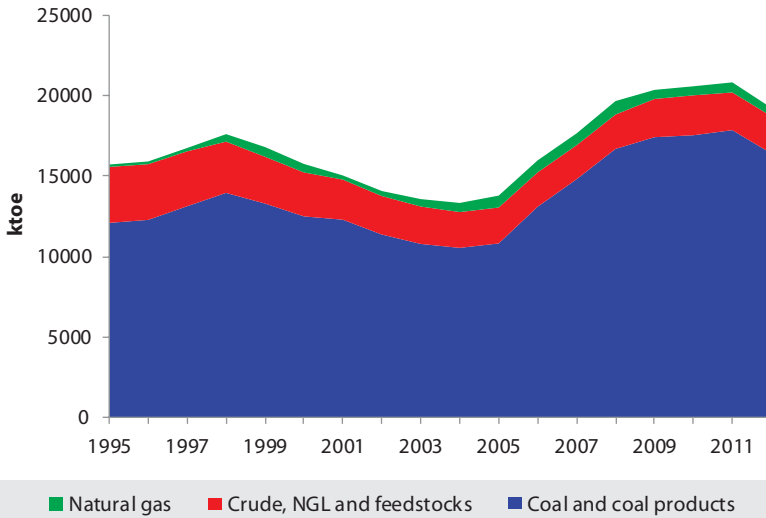
Turkey, as a country surrounded by sea on three sides, can increase its hydrocarbon reserves, especially natural gas, by exploring its on- and offshore potential. For that purpose, international agreements with companies like Shell have been signed and exploration activities for natural gas are taking place since 2004 in the Black Sea, Mediterranean Sea and Aegean Sea.

The main infrastructure for import and transit of hydrocarbons includes:

- The Baku–Tbilisi–Ceyhan (BTC) pipeline, which opened in May 2005, has a maximum capacity of 1 million barrels per day (or 50 million tonnes per year). TPAO has a share of 6.53% in the BTC pipeline project, which is one of the main crude oil import (and transit) sources of Turkey.
- The Azeri–Chirag–Guneshli (ACG) Project, established by the State Oil Company of the Azerbaijan Republic (SOCAR), currently provides oil to Turkey. Further field development studies are ongoing.
- The South Caucasus Natural Gas Pipeline (SCP) from Shah Deniz Field and the Trans-Anatolian Pipeline (TANAP) projects, also aimed at transit into Europe, currently provide natural gas to Turkey.

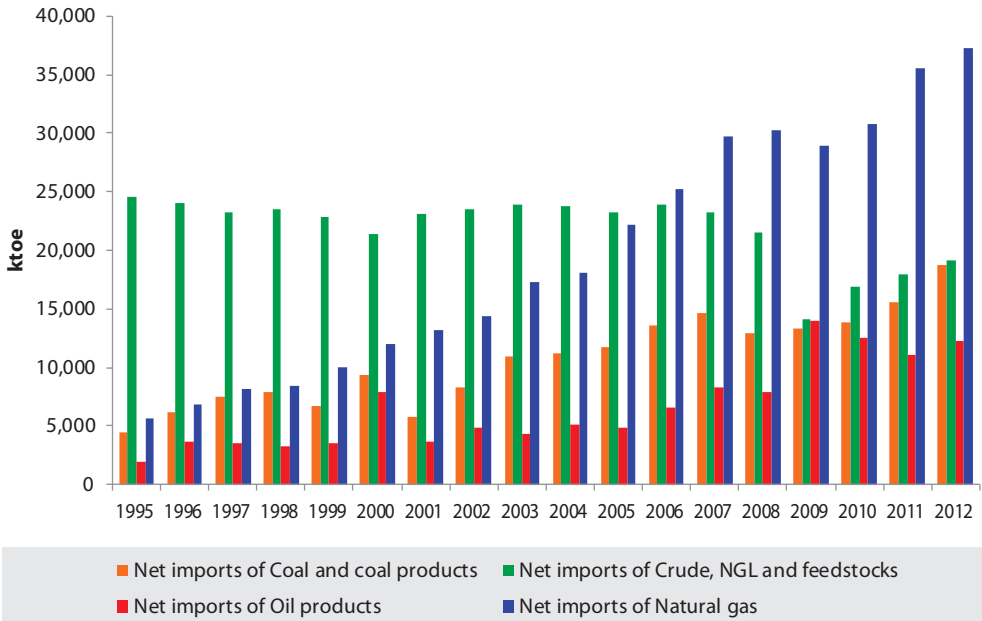
The following figures give an overview of the production of hydrocarbons in Turkey since 1995 (see Figure 8) and of the net imports of hydrocarbons by Turkey since 1995 (see Figure 9).

**Figure 8** Production of coal, oil and natural gas in Turkey



Source\_ IEA statistics, 2013

**Figure 9** Net imports of coal, oil and natural gas by Turkey



Source\_ IEA statistics, 2013

## Renewable Energy Sources

Turkey has vast resources of almost all types of RES: solar, wind, geothermal, hydro and biomass. There are significant agricultural activities in large areas of the country that could provide residues for biomass combustion or gasification. High average annual wind velocities create potential for the efficient utilization of wind power, in particular along the Mediterranean shores. There is also a large solar energy potential due to favourable climatic conditions, in particular in the southern half of Turkey. The country is also rich in geothermal power. Existing Hydro Power Plants (HPPs) already cover about 30% of their economic potential. Thus, HPP are the most developed RES in the country, and there is still a large potential for further implementation. The further development of RES is one of the government's strategic priorities (see the section on RES policy for more details).

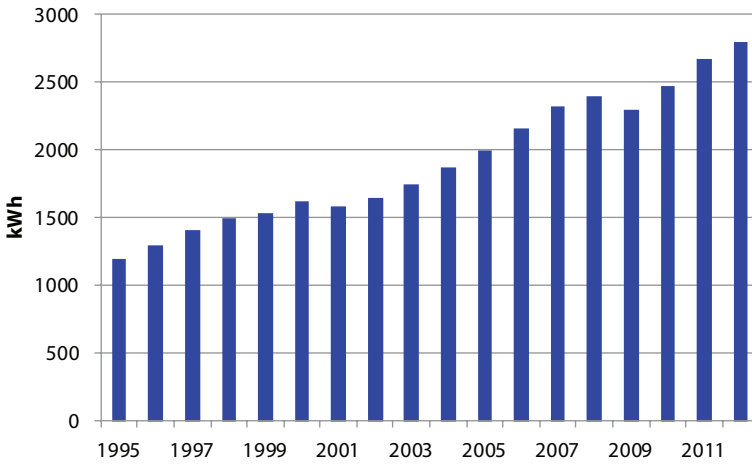
Most of the RES generators are independent power producers (IPPs). Based on the latest data of TEIAS (Turkish Electricity Transmission Company) from 2012, non-hydro RES had with 6.8 TWh a 2.83% share in total production in 2012, whereas the share of non-hydro RES in total installed capacity was 5.23% or 3,363 MW as of the end of January 2014.

## Electricity

The power sector is important to the development of the Turkish economy, as both in general and in Turkey, energy (and electricity) consumption is related to GDP growth. Turkey is fully electrified, and electrical power is mainly used in the residential and industrial sectors. Electricity is the third most utilized energy source in the country (after oil and natural gas). The installed generating capacity was of about 64.044 MW by the end of 2013, of which thermal power stations contribute with 38.448 MW and hydro power stations make up most of the remaining balance with 22.289 MW. Installed capacity of the non-hydro RES was insignificant until recently. However, investment efforts on generation and transmission of RES have improved in the last few years, reaching 5.2% of the total installed capacity. Conversion to RES for power generation can also provide an important leap forward to improving energy efficiencies and environmental impacts of power plants.

The development of electricity consumption per capita shows an increasing trend, with an average yearly growth of 5% from 1995 until 2012, with exceptions during the domestic economic crisis in 2001 and during the global economic crisis in 2009. The actual level of electricity consumption per capita in Turkey (2,801 kWh in 2012) is, however, well below the average in developed economies, like for example about 6,850 kWh/year per capita in the EU-27.

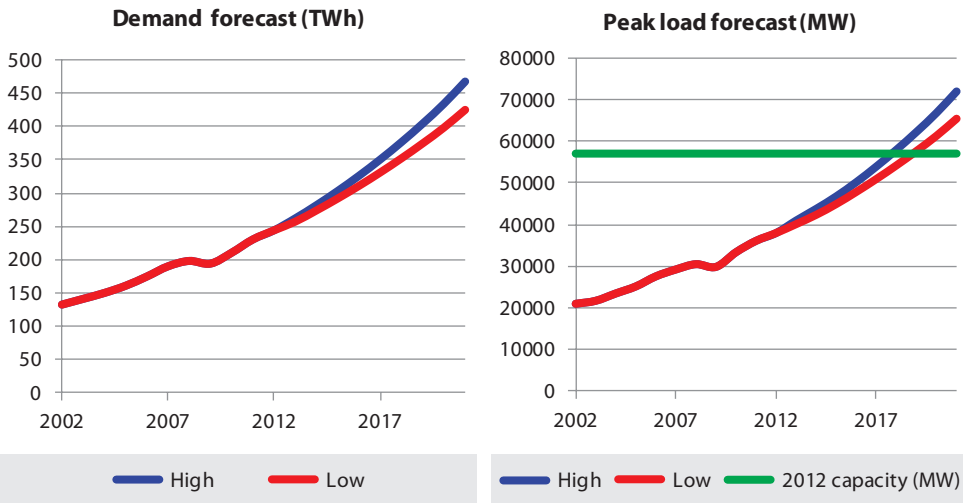
**Figure 10** Electricity consumption per capita in Turkey



Source\_ IEA statistics, 2013

According to TEIAS (2012), the demand for electricity is expected to double between 2011 and 2021 in the High scenario, whereas a growth of 84% is foreseen in the Low scenario. The peak demand is also expected to double between 2011 and 2021.

**Figure 11** Demand and peak load power projection for Turkey

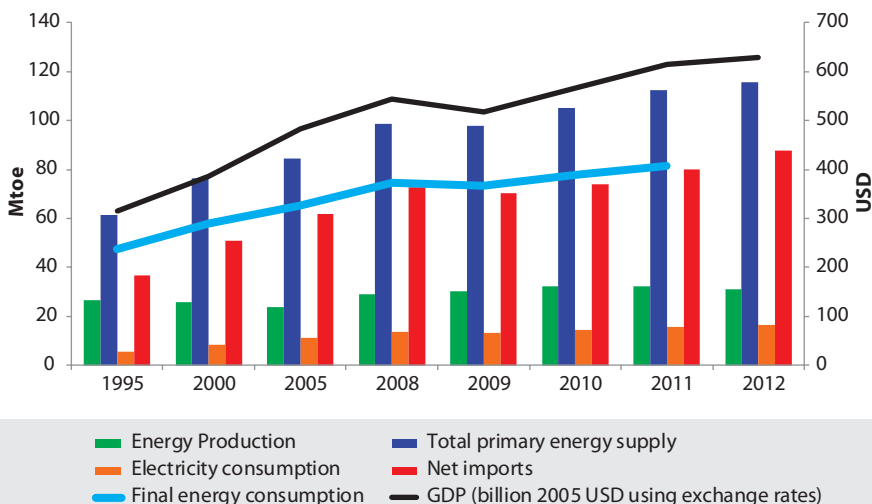


Source\_ TEIAS (2012)

## Evolution of Energy Production, Imports and Consumption

The evolution of energy production, imports, primary energy supply, electricity and energy consumption values in the period 1995–2012 is illustrated below. The GDP indicator is also given in the graph to represent the relation between economic growth and energy developments.

**Figure 12** Energy production, net imports and total primary energy supply



Source: IEA statistics, 2013

Energy production and energy consumption values were relatively low in 1995. Since then, the economy has grown by an average rate of 4.1% until 2012, while energy and electricity consumption followed the same path with GDP. There is also a clear link between economic growth and energy imports. Net energy imports increased on average by 5.5% per year after 1995, from 39.8 Mtoe in 1995 to 98.7 Mtoe in 2012. This significant increase in imports was needed to cover the increased energy consumption in the country, because the domestic energy production increased with a lower average rate of 1.0% per year in the period 1995–2012.

## Electricity Generation

TEIAS is a state monopoly owning all assets related to electricity transmission activities. TEIAS prepares investment plans for the transmission segment of the energy sector. It also defines, revises and submits tariff proposals to EMRA for approval for connection to the system and its use. TEIAS also prepares forecasts of the electricity market development as a whole, and it is responsible for the balancing of demand and supply in the market and the resulting settlement process. The Market Financial Settlement Center has been created within TEIAS's organization. Thus, in addition to being a system operator, TEIAS also acts as the market operator. In addition, several types of entities and end-users have direct access to the transmission grid. These are generally the large generation units (on the generation side) and large industrial facilities (on the consumption side).

The Turkish distribution grid can be defined as all assets which have a voltage power lower than 36 kV. In addition to distribution companies, various entities – especially Organized Industrial Zones (OIZs) – are also eligible to receive a distribution license within their own borders. All of the existing 21 distribution companies have been privatized as of September 2013. The privatization method in Turkey follows the process of auctioning off of Transfer of Operating Rights (TOR) of the distribution assets in the respective territories, usually for 30 years. TEDAS (Turkish Electricity Distribution Company) will continue to own the distribution assets now operated by private companies.

State-owned hydro and thermal power plants are owned and operated by EUAS (Turkish Electricity Generation Company). EUAS, in accordance with the forecasts of the market developments prepared by TEIAS, has the legal mandate to construct, lease and operate new power plants in order to ensure the security of electricity supply. There are also private producers in Turkey, called Independent Power Producers (IPPs). In addition, there are auto-producers, but these became IPPs by the end of 2013 due to the new Electricity Market Law, nr. 6446 (EML).

The Turkish Wholesale Electricity Trading Company (TETAS) sells the electricity generated by the units built by the private sector under the Build–Operate–Transfer (BOT), Build–Operate–Own (BOO) and TOR contracts. BOT, BOO and TOR schemes involve long-term power purchase agreements, with the state being the sole buyer of the output. These purchase agreements carry “take or pay” clauses and almost all of the purchase obligations are expected to expire by 2020. TETAS executes the transfer of existing purchase agreements from BOO, BOT and TOR generators for the purpose of sale to distribution companies. TETAS is authorized, on conditions defined by law, to conclude new agreements, to execute and to terminate the concluded and transferred agreements. Moreover, any stranded costs that may arise due to such contracts are recovered through TETAS’s wholesale tariffs.

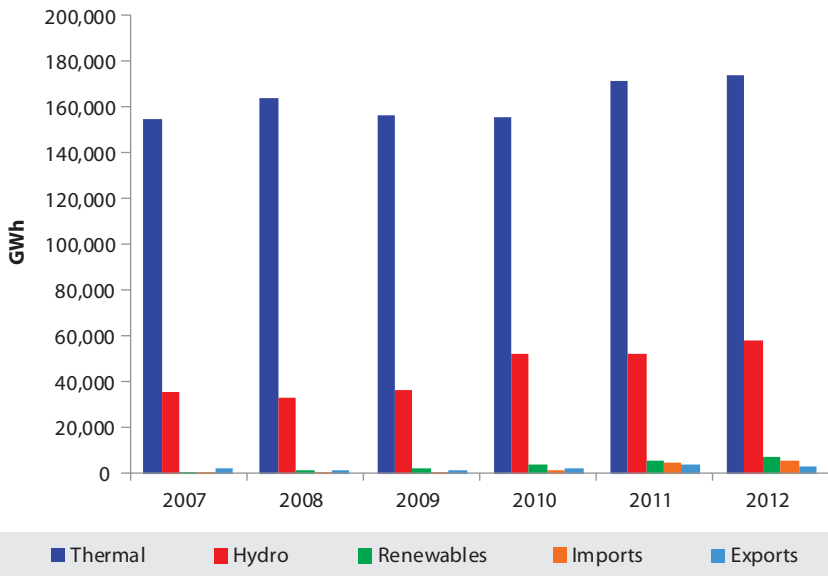
**Table 3** Electricity statistics for 2006–2012 (GWh)

	2006	2007	2008	2009	2010	2011	2012
<b>Total Generation</b>	176,299	191,558	198,418	194,812	211,208	229,393	239,497
<b>Coal and coal products</b>	46,650	53,431	57,716	55,684	55,047	66,217	68,013
<b>Oil products</b>	4,340	6,526	7,519	4,804	2,180	904	1,638
<b>Natural gas</b>	80,691	95,025	98,685	96,095	98,144	104,048	104,500
<b>Hydro</b>	44,244	35,851	33,270	35,958	51,796	52,338	57,865
<b>Geothermal</b>	94	156	162	436	668	694	899
<b>Wind</b>	127	355	847	1495	2916	4,723	5,861
<b>Biofuels and waste</b>	153	214	219	340	457	469	721
<b>Electricity imports</b>	573	864	789	812	1,144	4,556	5,827
<b>Electricity exports</b>	2,236	2,422	1,122	1,546	1,918	3,645	2,954
<b>Total final electricity consumption</b>	150,848	163,354	170,604	165,088	180,212	197,937	207,063

Note: Total final electricity consumption is equal to net power consumption plus internal consumption during generation.

Source: TEIAS, 2013



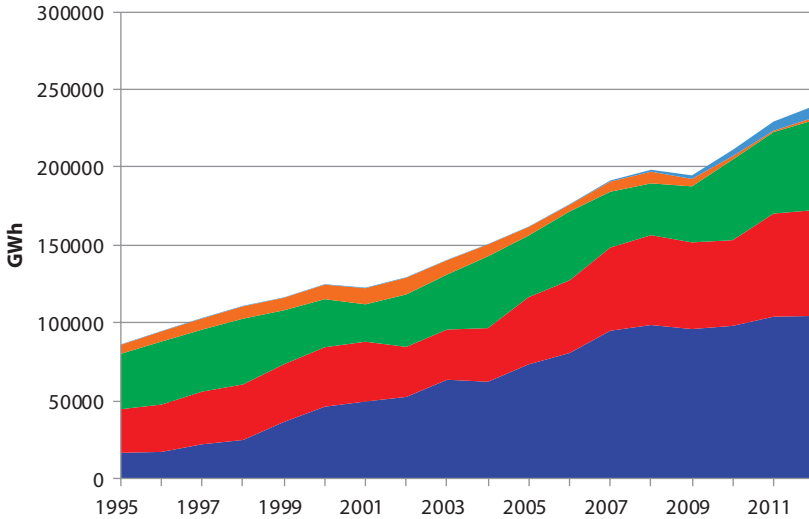
**Figure 13** Electricity balance 2007–2012

Source: TEIAS, 2013

About 60% of the electricity generation is based on fossil fuels. The figure below shows a strong increase of the share of natural gas (in Combined Cycle Gas Turbines) since 1995, which is now the major source for electricity generation. Turkey uses its lignite sources mainly for electricity generation, but the share of imported coal has been increasing recently. Heavy oil is only used for covering peak demand.

Hydropower is the major renewable source for electricity generation. Firewood is used mainly for domestic purposes.

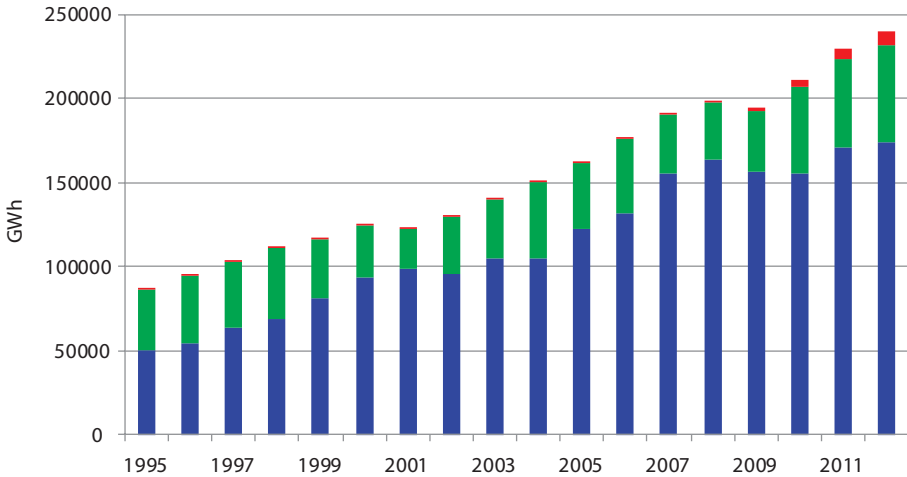
**Figure 14** Electricity generation by fuel



Renewables Oil products Hydro Natural gas Coal and coal products

Source: IEA statistics, 2013 and TEIAS, 2013

**Figure 15** Electricity generation by power plant type



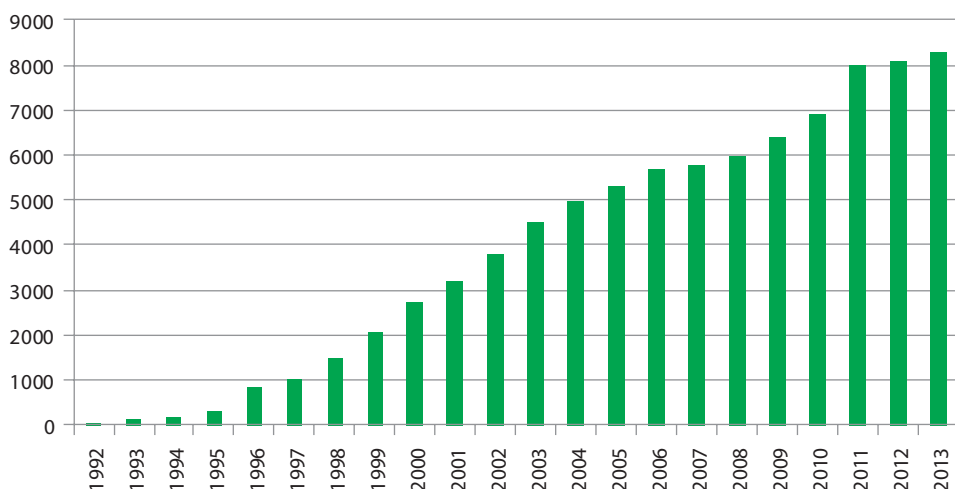
Renewables Hydro Thermal

Source: IEA statistics, 2013 and TEIAS, 2013

According to latest energy statistics of TEIAS, as of 2012 losses in the transmission system were 2.6%, whereas losses in the distribution system were 12.7%.

The installed cogeneration capacity in Turkey was about 8.3 GW by the end of October 2013, which constitutes about 13% of the total installed capacity.

**Figure 16\_Cogeneration installed capacity in Turkey, in MW, 1992–2013**



Source\_TURKOTED presentation

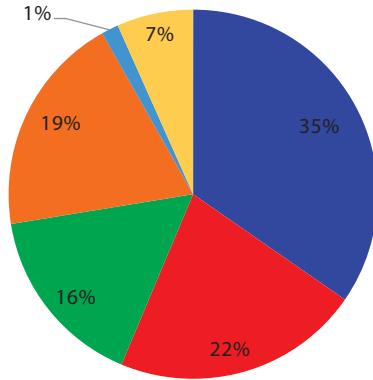
A district heating scheme has been recently realized in Turkey. Doga Enerji provides district heating and hot water to 9,000 houses in Esenkent-Istanbul from its Esenyurt CCGT Cogeneration Power Plant, with an installed capacity of 180 MW.

## Energy Consumption Trends by Sectors

### Total Final Energy Consumption

The total final energy consumption (TFEC) by energy source is presented in the graph below. Oil, gas and coal have a dominant share of 72%. The remaining part consists mainly of electricity (19%), but also heat (1%) and others (7%).

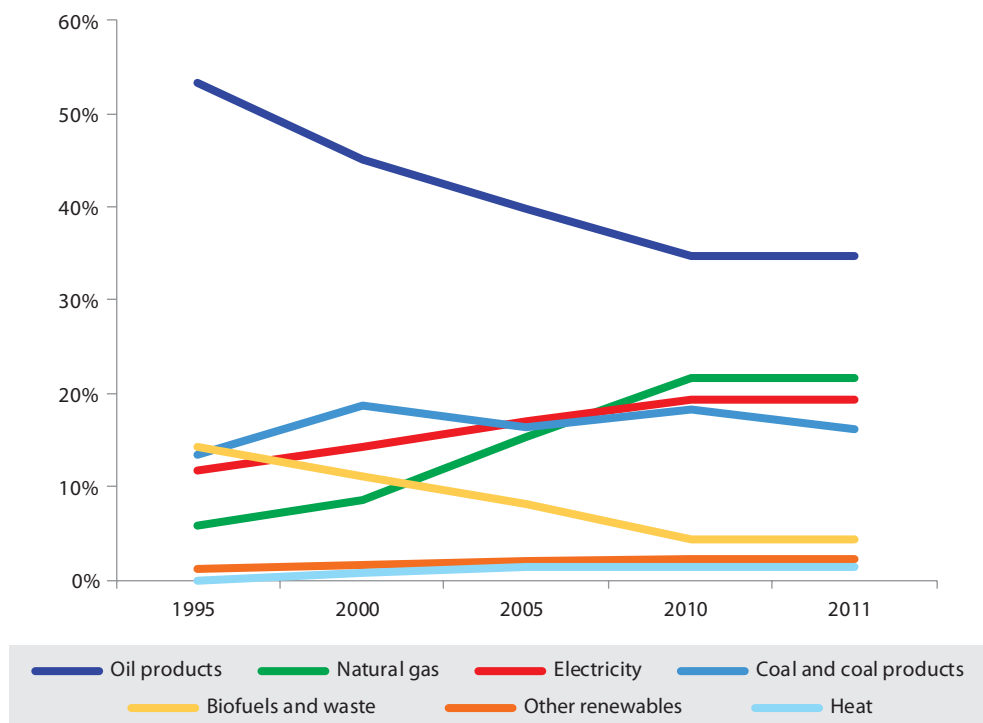
**Figure 17\_Final energy consumption in 2011**



■ Oil products ■ Natural gas ■ Coal ■ Electricity ■ Heat ■ Other (Renewables)

Source: IEA statistics, 2013

The following figure shows the shares of various energy sources in the final energy consumption over the years. The share of oil products decreased gradually from 53% in 1995 to 35% in 2011, while natural gas increased from 6% in 1995 to 22% in 2011. Coal products increased from 14% to 19% in 2000, to decrease to 16% in 2011. Electricity consumption accounted for an increasing proportion of final consumption, rising from 12% in 1995 to 19% in 2011.

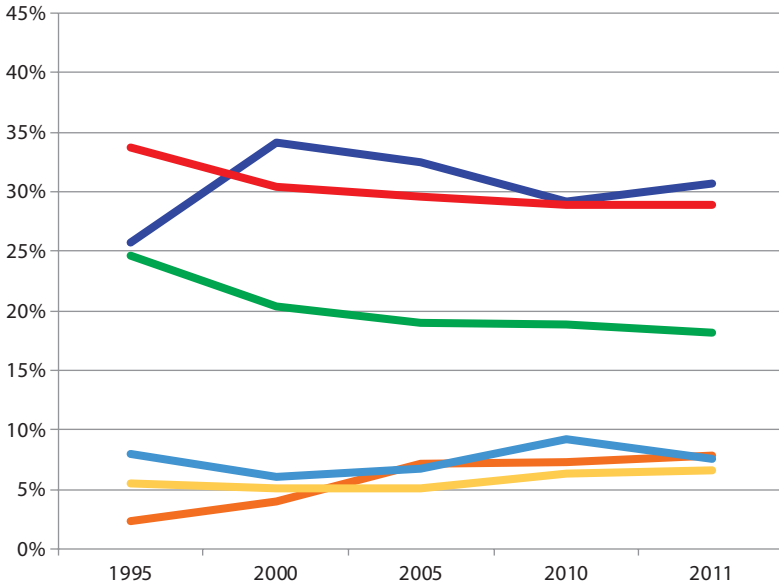
**Figure 18** Trends in final energy consumption

Source: IEA statistics, 2013

### Final Energy Consumption by Sector

Industrial consumption accounts for 31% of total final consumption in 2011 and is followed by residential (29%) and transport (18%). Services and Non-energy use have a share of about 8% each in final consumption. The following figure shows that the shares of the different sectors have been rather stable over time.

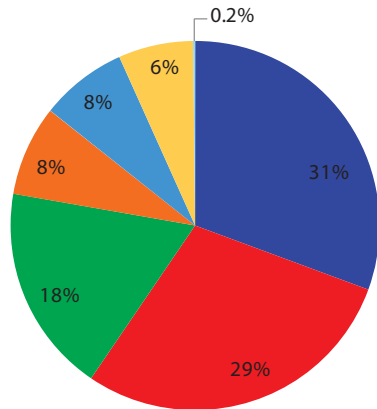
**Figure 19** Shares in final energy consumption 1995–2011



— Industry   
 — Residential   
 — Transport  
— Non-energy use   
 — Commercial and public services   
 — Agriculture/forestry

Source IEA statistics, 2013

**Figure 20** Shares in final energy consumption in 2011



■ Industry   
 ■ Residential   
 ■ Transport   
 ■ Commercial and public services  
■ Non-energy use   
 ■ Agriculture/forestry   
■ Non-specified (other)

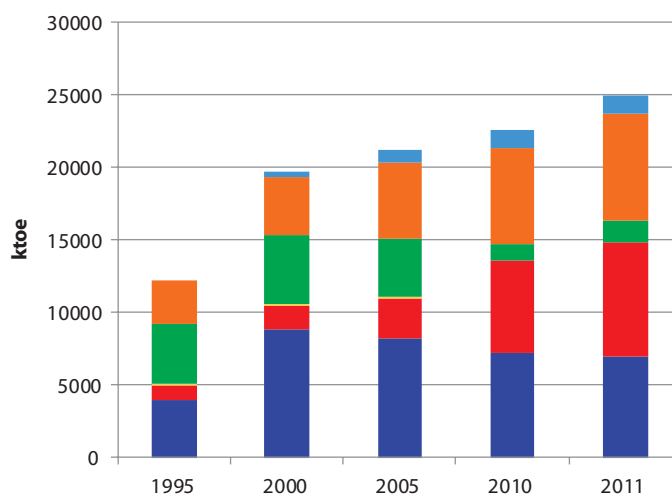
Source IEA statistics, 2013

## Industry

The figure below shows the trend of final energy consumption in the industrial sector since 1995, specified by fuel. Industrial energy consumption increased substantially from 1995 until 2011, from 12 Mtoe in 1995 to 25 Mtoe in 2011.

Natural gas is the preferred fuel and it contributes to the bulk of energy used in industry, having a share of 32% in 2011. The share of oil products in industry is only 6%. Electricity constitutes about 29% of the total energy consumption in industry in 2011, whereas coal and coal products had a share of 28%.

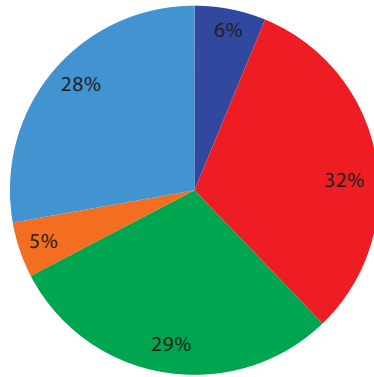
**Figure 21** Final energy consumption of the industrial sector 1995–2011



■ Heat   
 ■ Electricity   
 ■ Oil products  
■ Other (renewables)   
 ■ Natural gas   
 ■ Coal and coal products

Source: IEA statistics, 2013

**Figure 22**\_Shares in final energy consumption of the industrial sector in 2011



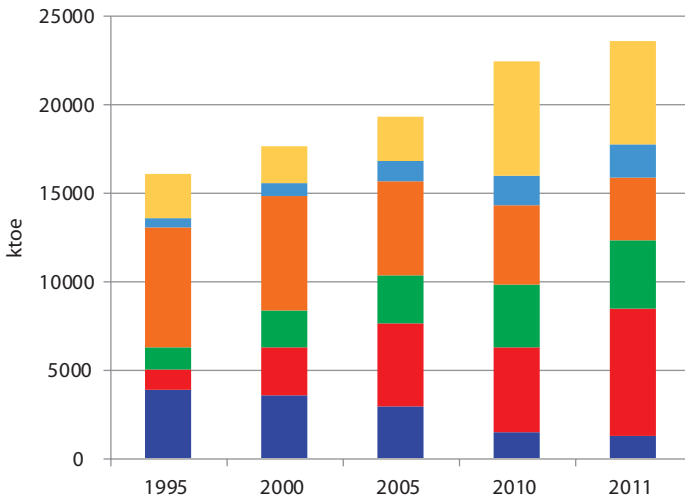
■ Oil products   ■ Natural gas   ■ Electricity   ■ Heat   ■ Coal and coal products

Source\_I EA statistics, 2013

## Residential

Residential energy consumption increased gradually from 16 Mtoe in 1995 to 24 Mtoe in 2011, with an average yearly growth of 2.4%.

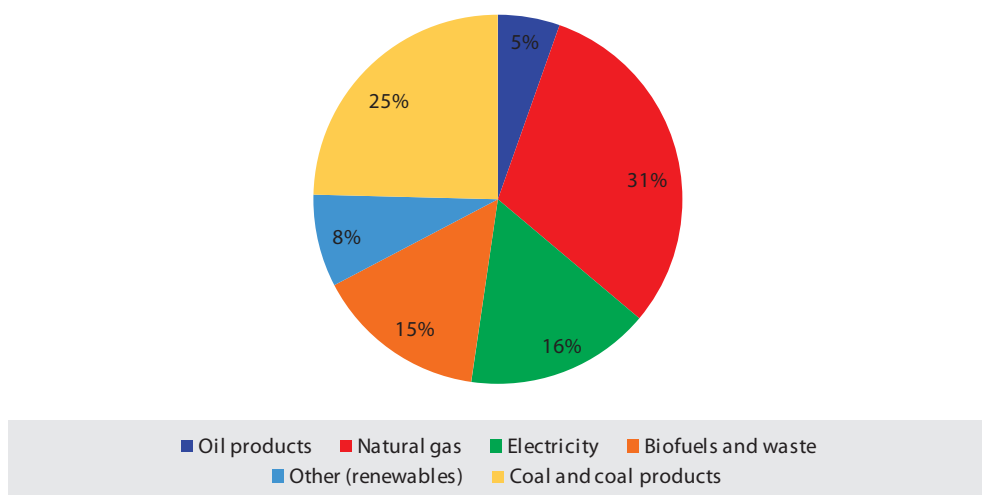
**Figure 23**\_Final energy consumption of the residential sector, 1995–2011



■ Coal and coal products   ■ Other (renewables)   ■ Biofuels and waste  
 ■ Electricity   ■ Natural gas   ■ Oil products

Source\_I EA statistics, 2013



**Figure 24** Shares in final energy consumption of the residential sector in 2011

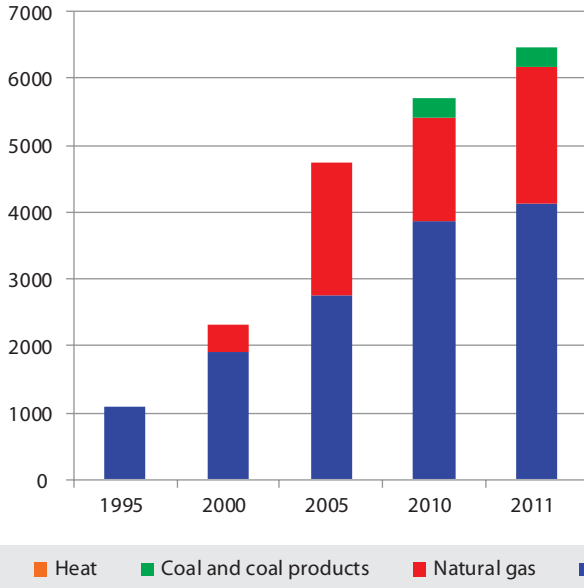
Source: IEA statistics, 2013

Fossil fuels covered 61% of the energy use in the residential sector in 2011 (natural gas had a share of about 31%, coal and coal products 25%, and oil products 5%). The share of renewable energies was 23%, with 15% for biofuels and waste and 8% for other renewable energies. Electricity represented the remaining 16%.

## Services

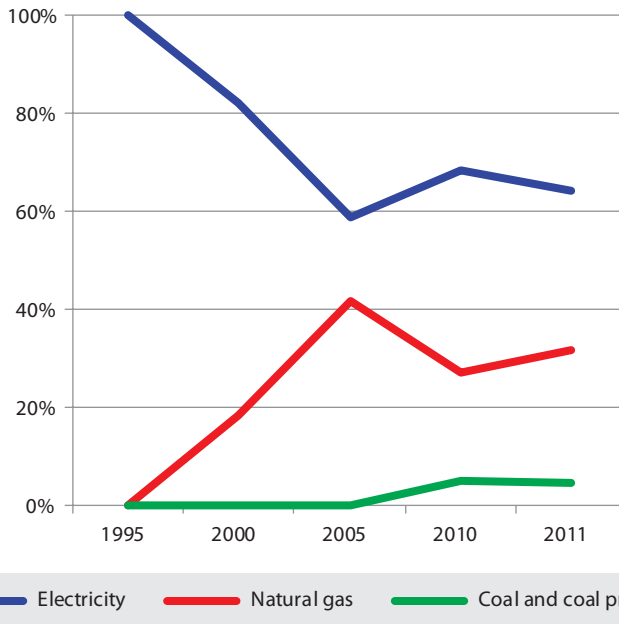
Services comprise the commercial and public sectors. Total energy consumption in services increased during the period 1995–2011 with an average yearly growth of 6.5%.

**Figure 25** Final energy consumption of the services sector, 1995–2011



Source: IEA statistics, 2013

**Figure 26** Shares in final energy consumption of the services sector, 1995–2011



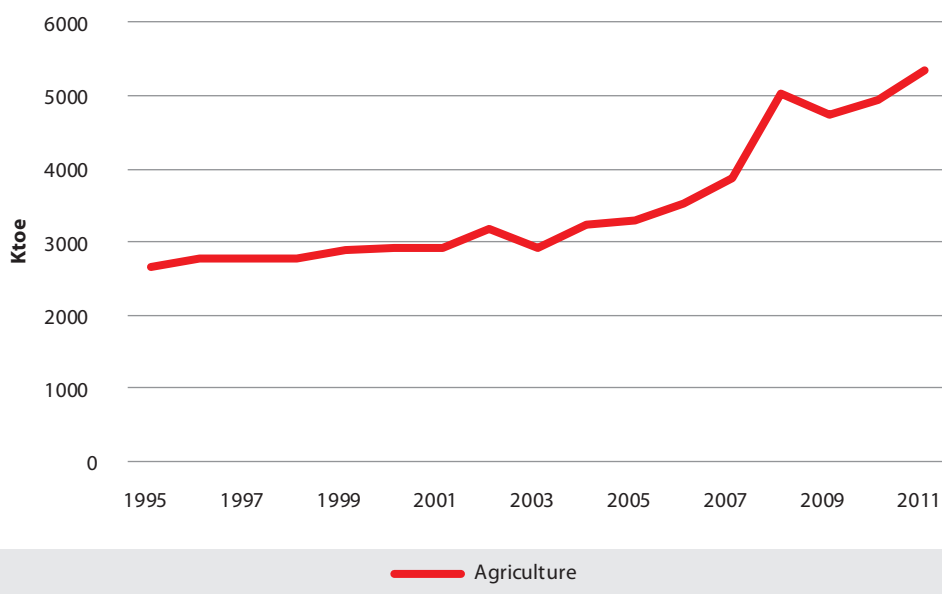
Source: IEA statistics, 2013

The figures above show a strong increase in the use of electricity and natural gas in the services sector since 1995. The share of electricity was above 60% in 2011, and the share of natural gas increased to 32%. Remarkably, coal and coal products are also being used since a few years ago in the service sector. This is most probably driven by the recent increases in the price of natural gas.

## Agriculture and Forestry

The final energy consumption of the agriculture and forestry sector has been stable during 1995–2005 at around 2,900 ktoe, and started to increase after 2005 up to 5,300 ktoe in 2011. Oil products have a share of 92% in the total final energy consumption of the sector and the remaining balance is met by electricity. The share of natural gas is insignificant.

**Figure 27** Final energy consumption of the agricultural sector, 1995–2011

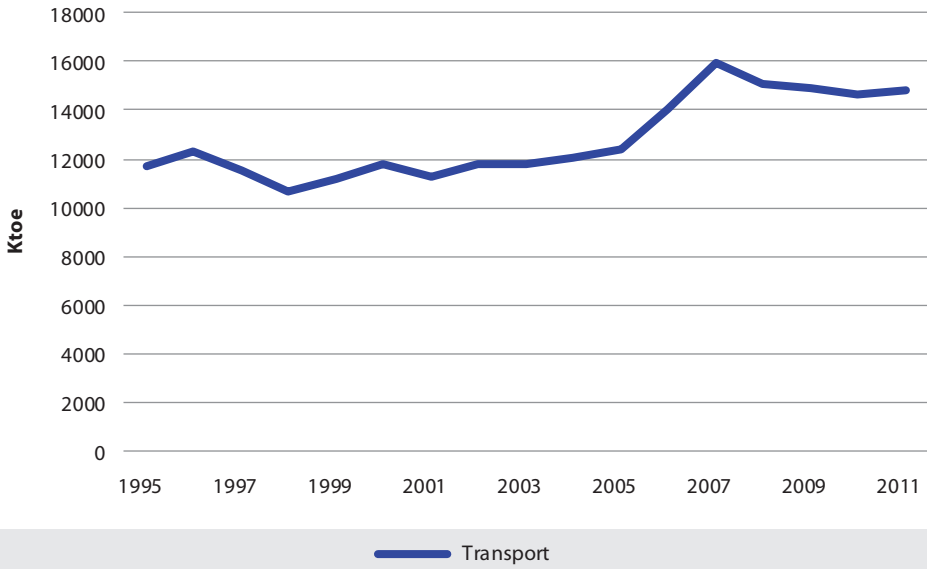


Source: IEA statistics, 2013

## Transport

Energy use in transport has been stable during 1995–2005 at 11.7 Mtoe. After a peak in 2007 at 16 Mtoe, it stabilized around 15 Mtoe during the period 2008–2011. Almost all of the final energy consumption in the transport sector is met by oil products (98%). The remainder is made up by natural gas, electricity and biofuels, totalling 2%.

**Figure 28** Final energy consumption of the transport sector, 1995–2011



Source: IEA statistics, 2011



Energy Policy

## Background

Turkey is a developing country and energy use in Turkey is increasing rapidly due to increasing population, production and industrialization. Projections show that the electricity demand will increase annually by 6.7% and 7.5% in the next decade for the low and high (business-as-usual) scenarios respectively (TEIAS, 2012). According to IEA statistics, Turkey's total final consumption of energy (TFC) was 81.5 Mtoe in 2011. Moreover, the need for investments in the energy sector within the next 15 years is calculated to be in the order of \$118 billion, whereas dependency on energy import reached 74% in 2012, according to IEA statistics.

Securing long-term energy independence is therefore a policy goal for Turkey. Current energy policy promotes domestic energy sources, and strives to make use of the available RES potential.

## Energy Policy Goals

Turkey pursues strategies and implements policies to secure a safe energy supply. Within the scope of the long-term target of achieving energy independence, Turkey's energy policy principally aims at:

- Making energy available for the consumers in terms of cost, time and amount
- Exploiting public and private facilities within the framework of free market practices
- Reducing dependency on imports
- Securing a strong position in regional and global trade of energy
- Ensuring the availability of diversified resources, pathways and technologies
- Ensuring maximum use of RES
- Increasing EE
- Minimizing negative environmental impact of the production and use of energy and natural resources.

The Government of Turkey adopted the MENR Strategic Plan (2010–2014), which identifies and sets development targets for the various sub-sectors within the energy sector along with a package of specifically defined measures for the next four years. Overall, the Strategic Plan consists of 11 goals under 5 different strategic themes, which are Energy Supply Security, the Regional and Global Effectiveness of the Country in Energy, Environment, Natural Resources, and Corporate Development. The main objective of the MENR Strategic Plan is to make use of the energy and mining resources effectively, efficiently, securely and in a timely and environmentally friendly manner, to reduce the dependency on imports. The principal specific goals of the Strategic Plan are:

- to provide diversity in resources by giving priority to domestic resources
- to increase the share of RES in the energy supply
- to increase EE
- to make the free market conditions fully operative and to improve the investment environment
- to provide resource diversity in the area of oil and natural gas and to take the measures for reducing the risks due to imports

- to turn the country into an energy hub and terminal within the framework of the regional cooperation processes by using the country's geo-strategic position effectively
- to minimize the negative environmental impacts of the activities related to energy and natural resources
- to increase the contribution of the country's natural resources into the national economy
- to provide for the domestic utilization of the county's industrial raw material, metal and non-metal mineral reserves by increasing their production
- to increase the effectiveness of the management of energy and natural resources
- to be the pioneer and supporter of innovation in the area of energy and natural resources

The Turkish electricity sector is largely based on three main sources, namely coal, natural gas and hydroelectric power, while oil products are mostly used in transportation. As the use of coal and natural gas (and oil) largely depends on foreign sources, the MENR target is to broaden the foundation of the electricity sector to five main sources by also including RES and nuclear energy. The following targets are envisaged to be achieved by 2023, the centenary of the establishment of the Turkish Republic:

- completely making use of the domestic coal and hydro potential
- maximizing the use of RES
- incorporating nuclear energy into electricity generation by 2020
- maintaining a rapid and continuous improvement in EE to reach EU levels

### Legal Basis

The following laws governing the energy sector have been adopted by Parliament:

- Electricity Market Law (2013); replaced the EML of 2001 and amendment (2013)
- Natural Gas Market Law (2001)
- Petroleum Market Law (2003)
- LPG Market Law (2005)
- Law on Utilization of RES for the Purpose of Generating Electrical Energy (2005)
- EE Law (2007)
- Law on Geothermal Resources and Mineral Waters (2007)
- Law on Construction and Operation of Nuclear Power Plants and Energy Sale (2007) This Law also introduced regulations regarding the utilization of domestic coal resources for the purpose of generating electrical energy, encouraging the establishment of domestic coal-fired thermal power plants.

The old Electricity Market Law (no. 4628), passed on 20 February 2001, and replaced by a new one on 14 March 2013 (no. 6446), defines legal, economic and social fundamentals for state policy on the sufficient, quality, sustainable, low-cost and environmentally friendly generation, transmission, distribution, trade and use of electricity within the competitive market environment, as well as main directions for policy implementation. With the passage of the Law no. 6446, the previous Law no. 4628 changed to Law on Organization and Tasks of Energy Market Regulatory Authority (EMRA).

The Laws on Natural Gas, Petroleum and LPG Markets cover the regulation about the safe and economical distribution, trade, supply, and using activities of the related energy sources within the competitive market environment in a transparent, fair and stable way.

The Electricity Market Law requires that individuals and legal entities obtain a special license for conducting activities in the generation, transmission, distribution, retail wholesale import and export of electricity, and market operation, if not otherwise determined by law. Transmission of electricity is conducted by the state-owned firm TEIAS.

The purpose of the Law on Utilization of RES is to generalize the use of RES in electricity generation, to make use of RES in a quality, reliable and economical way, and to reduce GHG emissions for the protection of the environment.

According to the Supply Security Strategy Paper accepted in May 2009, the main approach is to balance supply and demand, and to make sure the sector develops compatibly with the targets defined for source variability, foreign dependency, environmental impacts, etc. Based on the Strategy Paper, TETAS would purchase electricity through bilateral contracts, public investments on electricity generation will be accelerated and the transmission network system will be improved. The Paper considers also privatization of some entities, which is discussed next.

## Energy Market Liberalization

According to the Electricity Sector Reform and Privatization Strategy Paper approved in March 2004, the country will begin privatization of enterprises in the electricity sector. The Strategy Paper describes the privatization of enterprises in electric power generation and distribution. In accordance with the Privatization Law no. 4046 and the Privatization Administration, local and international investors were expected to participate in the privatization which includes facilities and enterprises in the electricity energy generation and distribution sectors.

There has been limited competition in the Turkish electricity sector, due to the monopoly of a single state-owned vertically integrated company, the Turkish Electricity Authority (TEK). The initial unbundling of the sector took place on 1994, when the TEK was separated into two state-owned companies: TEAS (Turkish Electricity Generation and Transmission Company), responsible for generation and transmission activities, and TEDAS, responsible for distribution and retail sale activities. Later, with the acceptance of Electricity Market Law in 2001, a further unbundling and reorganization of TEAS took place by separating it into three state-owned companies: EUAS, responsible for operating the state-owned power generation facilities, TEIAS, which is responsible for operating the national grid, and TETAS, responsible for purchasing the electricity from the producers and the sale of this electricity to the distribution companies. This new law also created an autonomous regulatory body (Energy Market Regulatory Authority, EMRA), mandated to initiate a major electricity market reform program.

In the current situation, above mentioned electricity market activities can be carried out under the following licenses:

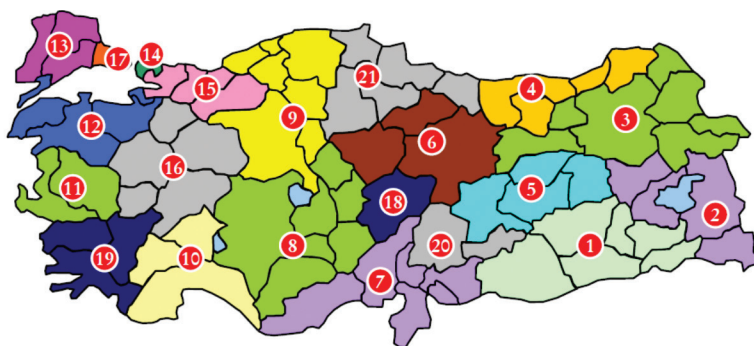
- Generation
- Transmission
- Distribution
- Supply
- Market operation



At present, TEIAS performs all transmission activities, whereas other activities are carried out by both state-owned and EMRA-licensed private establishments. TEIAS owns all publicly owned assets related to electricity transmission activities. In addition to being a system operator, TEIAS also acts as the market operator.

The Turkish distribution grid includes all medium-voltage assets (below 36 kV). In addition to distribution companies, various entities – especially Organized Industrial Zones (OIZs) – are also eligible to receive a distribution license within their own borders and to act as a potential competitor to distribution companies. Owing to the operational problems as a result of the geographical structure, the size of the region as compared to energy purchased and technical/financial characteristics, the existing contracts, and the current legal process in Turkey, the country has been divided into 21 distribution regions. The map of these 21 regions is shown in the next figure.

**Figure 29** The distribution regions in Turkey



Source: IEA statistics, 2011

Distribution has been privatized in all 21 regions as of September 2013 through auctioning off of TOR of the distribution assets, usually for 30 years. TEDAS will continue to own the distribution assets operated by the private companies.

State-owned hydro and thermal power plants are owned and operated by EUAS. As part of the sector reform strategy, EUAS is assigned a portfolio of hydroelectric, lignite and gas-fired plants. Whilst the major hydro plants are considered to be strategic assets remaining under EUAS (state) ownership, the thermal power plants and the smaller hydro plants are planned to be privatized before 2015. Already 52 small-scale, mainly run-of-the-river type hydro units were tendered out and being transferred to private owners. EUAS will also take over the ownership of the physical generation assets associated with any BOT and TOR contracts awarded in the past, following the expiration of power purchasing contracts.

Although it has not yet been officially announced, it is anticipated that MENR will privatize some public generation units by portfolios. The Privatization Administration started already with a first tender for Thermal Power Plants (TPP) in 2011, but it had to be cancelled due to low interest shown. The tendering process was resumed at the end of 2012, and by August 2013, three TPP tenders had been concluded (for the 1,156 MW natural gas Hamitabat power plant in Tekirdag, the 600 MW lignite Seyitomer power plant in Kutahya, and the 457 MW lignite Kangal power plant in Sivas). In addition, the Privatization Administration has launched tenders

for three more power plants in the second half of 2013 (for the 300 MW Catalgazi coal-fired power plant in Zonguldak, and the 420 MW Yenikoy, the 630 MW Kemerkooy, and the 630 MW Yatagan lignite-fired power plants in Mugla). Moreover, since 2009, it was decided that DSI will no longer construct new hydro plants (except for the existing ones under construction, and the ones initially planned to be built by private companies but which they later gave up building of because of high expropriation, road relocation or similar costs, just like Yusufeli and Tunca Dam). The ones under construction will also be privatized after commencement of operation. In total, the installed capacity of the generation units planned to be privatized amounted to 13,619 MW, as of the end of October 2013.

## Institutional Framework

The MENR was established upon Presidential Approval No. 4-400 dated 25-12-1963 on the basis of the authority vested by Law No. 4951. The Law on Organization of MENR was provided for on 13-02-1983 through Decree Law No. 186, which was finalized by Law No. 3154 enacted on 01-03-1985. MENR was founded to help define targets and policies related to energy and natural resources in line with the defence, security and welfare of the country, and improvement and strengthening of the country's national economy, and to ensure that energy and natural resources are researched, developed, generated and consumed compatibly with those targets and policies.

The MENR functions as the central executive body responsible for the formulation of national policy relating to the energy and mining sectors. MENR also has the following duties and responsibilities:

- Strategic planning by:
  - determining the short- and long-term needs of the country for energy and natural resources
  - assisting with the examination, operation, improvement, evaluation, control and protection of energy and natural resources
- Policymaking by:
  - determining and appraising of the pricing policies for generation, transmission, distribution and consumption of the underground and ground energy and natural resources and their products
  - collecting and evaluating the required information for carrying out the duties assigned with the legislation, and carrying out the preparation studies for the determination and development of long-term policies
- Annual budget preparation and follow-up of the budget expenditures of the state companies and other establishments under the control of MENR
- Preparation of major energy standards codes and regulations
- Dealing with environmental, climate and energy investment matters
- Preparing views for proposed laws related to the energy and related topics and following them through Parliament

Since the first days of its establishment, MENR established close relations with all international organizations operating in the sphere of fuel and energy and carried out due measures for the expansion of these contacts. There are five major General Directorates under the Minister:

- General Directorate of Energy Affairs
- General Directorate of Mining Works
- General Directorate of Petroleum Affairs
- General Directorate of Renewable Energy (GDRE)
- General Directorate of Foreign Relations and EU

Furthermore, the energy state companies and establishments are administratively connected to MENR:

- General Directorate of Mining Research and Exploration (MTA)
- Turkish Atomic Energy Authority (TAEK)

Directly related state companies are:

- Turkish Electricity Transmission Company (TEIAS)
- Electricity Generation Company (EUAS)
- Turkish Electricity Contracting and Trading Company (TETAS)
- Turkish Electricity Distribution Company (TEDAS)
- Turkish Coal Company (TKI)
- Turkish Petroleum Corporation (TPAO)
- Petroleum Pipeline Company (BOTAS)
- Eti Mine Works General Management (ETI MADEN)
- Turkish Hard Coal Company (TTK)
- Turkish Electromechanics Industry (TEMSAN)

In addition, affiliated institutions are:

- National Boron Research Institute (BOREN)
- Energy Market Regulatory Authority (EMRA)

The Electricity Market Regulatory Authority had been established by Law no. 4628 and was later renamed the Energy Market Regulatory Authority as per the provisions of Natural Gas Market Law no. 4646. With the enactment of the Petroleum Market Law no. 5015 and Liquefied Petroleum Gas (LPG) Market Law no. 5307, the Authority has been commissioned to regulate and supervise the downstream petroleum and LPG markets.

The objective of the aforementioned laws is to establish a financially viable, stable and transparent energy market, which will function as per the provisions of private law and within a competitive environment to ensure the independent regulation and supervision of the market. The ultimate goal of these laws is to provide sufficient electricity, natural gas, petroleum and LPG of good quality to consumers, at low cost, in a reliable and environmentally friendly manner.

EMRA responsibilities are:

- Setting secondary legislation
- Granting licenses to market participants and authorization of investment in new facilities
- Supervising the licensed bodies financially and operationally

- Review and approval of gas and electricity tariffs and transport tariffs
- Defining performance standards and monitoring of quality of services
- Handling complaints and settling disputes
- Auditing market activities

EUAS, in accordance with forecasts of the market's development and prepared by TEIAS that takes into account investments of the private sector, is given the legal mandate to construct, lease and operate new power plants to ensure the security of electricity supply. In 2012, EUAS managed 43.4% of the installed capacity of Turkey (subdivided into 49.3% hydro, 16.6% natural gas, 31.3% lignite and hard coal, and 2.7% liquid fuels). EUAS generated a total of 90,823 GWh in 2012, which corresponds to 38% of Turkey's total electricity generation.

## Energy Pricing

Cost-based pricing, also called Automatic Pricing Mechanism (APM) as per the High Planning Council Decision No. 2008/T-5 dated February 14, 2008 (Cost Based Pricing Mechanism for State-owned Economic Enterprises in Energy), will be in place at the end of the transition period (end of 2015).

APM is intended to reflect changes in cost components of electricity for end-users. This mechanism applies to TKI (Turkey State-owned Coal Institution), BOTAS (State-owned Natural Gas and Petrol Transmission Company), EUAS, TETAS, and distribution companies in which the state has a majority ownership and falling under law no. 4046 on privatization applications (i.e. TEDAS distribution regions). Except for the EUAS portfolio and distribution companies, none of the above state entities are expected to be privatized.

According to the APM, for each quarter (monthly for BOTAS) there is an automatic price adjustment based on several calculations. Those calculations, basically, are to reflect changes in all fuel and generation costs:

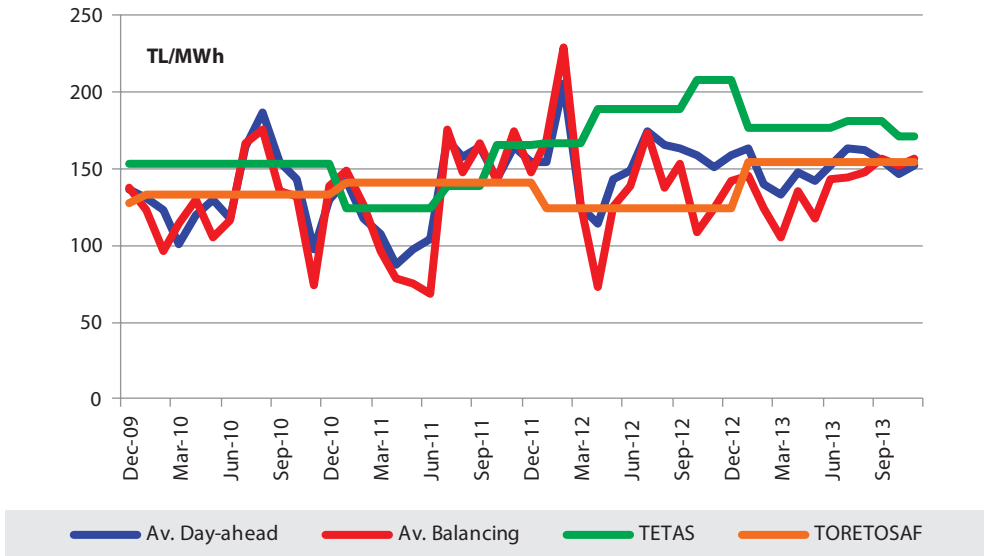
- Change in TETAS cost (BOT/BOO/TOR power plants and EUAS Hydro)
- Change in EUAS Portfolio Generation Groups' generation cost
- Change in BOTAS natural gas cost
- Change in TKI coal cost

Since 2005, the Average Wholesale Price in Turkey (TORETOSAF) has been determined by the EMRA Board with due regard to TETAS sale prices and volumes in the related year, sales prices and volumes of portfolio generation groups, distribution companies' purchase volumes and prices from PMUM, generation volumes of auto producers and generation companies, approved industrial single-phase tariffs, and average technical loss ratios in middle-voltage level. Since 2005 TORETOSAF has been announced and since 2006 a spot price, which is the average day-ahead market price, has been formed under a competitive market environment, reflecting demand and supply conditions.

On 1 December 2009, the Final Balancing and Settlement Regulation brought two different prices instead of hourly set System Marginal Prices: Day-Ahead Market Clearing Price (MCP) and Balancing Power Market Price, which is also equal to SIP (System Imbalance Price). MCP is the system marginal price determined under the day-ahead market and the SIP is the price determined for the purposes of balancing within the context of balancing power market, irrespective of transmission system congestion.

The MCP, Balancing Market price, TETAS price and TORETOSAF development between 2010 and December 2013 are shown in the figure below.

**Figure 30** Development of Balancing Market Price and Average Wholesale Price (TORETOSAF) (2010–2013)



Source\_EMRA, PMUM

As can be seen in the figure above, the average monthly market prices are lower than TORETOSAF and TETAS prices in spring and autumn but higher in summer and winter. Market prices are formed according to the demand–supply balance in the market and since there is low demand to high generation in spring and autumn, market prices decrease. Low price generation increases due to the priority of hydro generation in dispatch, whereas low demand is because of the consumption profile. Prices in the order of 80 \$/MWh are caused by the common marginal price-setting technology in Turkey: Natural Gas, which constituted 43% of generation in 2012.

The legal eligible customer threshold is determined by the Board of EMRA before 31 January every year. It was set at 480 MWh for 2009. Before 2009, it was 1,200 MWh, and it was even more than 3,000 MWh in 2007. In 2010–2011, the customers consuming above 30 MWh are legally able to choose their own supplier. As of 2014, the eligible customer limit has been further decreased to 4.5 MWh per year. The “Electricity Energy Market and Supply Security Strategy Paper”, published by the MENR in 2009, stated the goal to eliminate the limit for all customers except residential customers by 2011 and by 2015 for the residential customers, in line with the EU directives by allowing all customers to choose their suppliers. Although there has been a delay in implementing this goal, the eligible customer limit is decreasing year by year and it is on the agenda to also allow residential customers to freely choose their supplier by 2015.

The policy of a national retail tariff is due to finish by the end of 2015. The second tariff period was started as of 2011 and will continue until the end of 2015. Tariffs to be employed by retail

licenses (now supplier licenses) within this tariff period were approved by EMRA in 2010, and have been reviewed quarterly, taking into account the APM and data received from relevant licensees. Accordingly, within the parameters of the Price Equalization Mechanism, subsidies are determined. During the first tariff period, especially in the latter part, there has been a heavy cross-subsidization of industrial customers at the expense of commercial customers. This caused high churn rates among eligible commercial customers in 2010. The existing tariffs, showing the cross-subsidy, are set out in the table below.

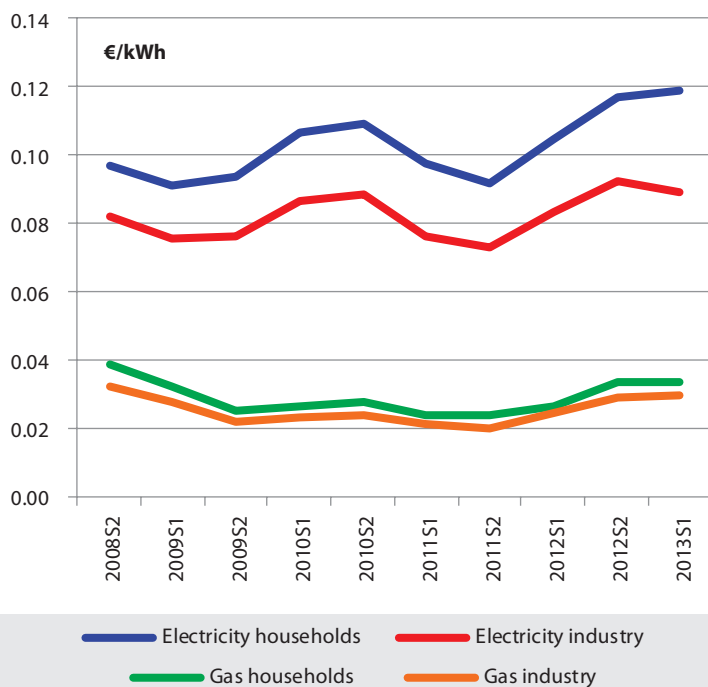
**Table 4** Breakdown of the National Retail Tariffs of distribution companies valid from 2013-Q4 (TL/MWh)

Connection Type	Customer group	Energy including retail margin	Distribution including loss	Retail services	Transmission	Total
Type #1	Industry-HV*	177.25	0.00	4.39	0.00	181.64
Type #2	Industry-MV	196.99	0.00	4.39	7.21	208.58
Type #3	Industry-MV	204.43	11.29	4.39	7.21	227.31
Type #4	Industry-MV	204.43	11.29	4.39	7.21	227.31
	Industry-LV	217.04	17.63	4.39	7.21	246.26
	Commercial	252.04	21.96	4.39	7.21	285.59
	Households	249.69	22.58	4.39	7.21	283.86
	Irrigation	216.53	22.55	4.39	7.21	250.67
	Lighting	227.41	23.92	4.39	7.21	262.92

\* Transmission connected customers pay transmission usage fees to TEIAS directly

Source\_EMRA

The following graph presents the industrial and household electricity and gas prices in Turkey. As is commonly the case, household prices are higher than industrial prices and electricity prices are higher than gas prices. The prices have been relatively stable, but started to increase in 2012. The only exception is the electricity prices for industry, which decreased in the first half of 2013.

**Figure 31** Development of industrial and household electricity and gas prices in Turkey

Source\_Eurostat statistics







Energy Efficiency Policy

## Overview

Turkey's EE policy is guided by the EE Law, which aims to increase efficiency in energy resources and the use of energy, to ensure efficient use of energy, *to avoid waste, to alleviate the burden of energy costs on the economy and to protect the environment*. The EE Law and its secondary regulations provide the legal basis and measures to promote and support EE improvements, including establishing and operating the EE service market, such as energy service companies (ESCOs), energy auditors and EE projects and Voluntary Agreement schemes to encourage energy-saving investments.

According to the World Bank (2011), the EE potential amounts to 4.6 Mtoe in the manufacturing industry, 4.8 Mtoe in the transport sector, and 7.1 Mtoe in the household sector, leading to a total saving potential of 16.5 Mtoe relative to 2009. This EE potential represents a saving potential of 2.0 billion euros in the manufacturing industry, 5.4 billion euros in the transport sector and 5.8 billion euros in the household sector, adding up to a saving potential of 13.2 billion euros.

The EE Strategy Paper adopted by the High Executive Committee and issued in the Official Gazette on February 25, 2012 proposes to determine a political set-up supported with result-oriented and solid targets and to define the activities required to reach these targets, together with the enterprises responsible for performing them; it also needs to make sure that public and private sector and NGOs will collaborate effectively.

## Strategic and Legal Basis

According to the Fifth National Communication of Turkey under UNFCCC (United Nations Framework Convention on Climate Change), one of the three main focuses of Turkey's energy policies set by MENR is the assessment of EE potential, and the goal is "Using energy resources and energy efficiently and rationally from production to consumption". The Turkish Government puts special emphasis on EE and relevant targets are set through various state programs.

Turkey has been implementing strong policies to increase EE. The measures taken in this area were initiated by the EE Law No. 5627, which came into effect in May 2007. The Law envisages a number of administrative and financial activities promoting EE in the industrial, transport, building, services and electricity sectors of Turkey. These include:

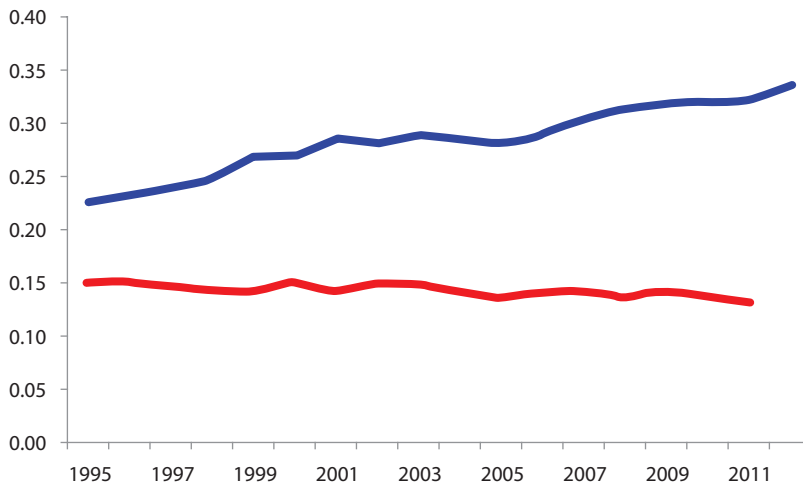
- Investment subsidies for EE projects in industrial enterprises. Applications can be submitted once per year (in January).
- Voluntary Agreements, signed with industrial enterprises committed to decrease their energy intensities. Applications can be submitted once per year (in October).
- EE Support Program for Small and Medium Sized Enterprises (SMEs), which provides training, audit and consultancy support.
- Energy Manager Training Programs, organized annually since 1997, through which more than 5,515 Energy Managers have been certified.
- Authorizing several institutions such as the Chamber of Mechanical Engineers, Chamber of Electrical Engineers, Osmaniye Korkut Ata University and Gazi University to give energy manager training, and giving authorization and also authorizing energy efficiency consultant companies to provide energy efficiency services such as energy manager training, energy, energy consultancy.
- Supporting cogeneration plants with higher efficiencies to reduce CO<sub>2</sub> emissions.

- EE upgrades and retrofit projects for the thermal and hydroelectric power plants through new technologies since 2005.
- Activities related to sustainable architectural design and green buildings, and to establishing a green building certificate system, starting with the establishment of the Turkish Green Building Association in 2007.

## Energy Intensity

Because of the electrification of the economy, the electricity intensity of the GDP has increased after 1995, whereas the energy intensity of the GDP has been stable since 1995, as can be seen in the figure below.

**Figure 32** Energy intensity of GDP

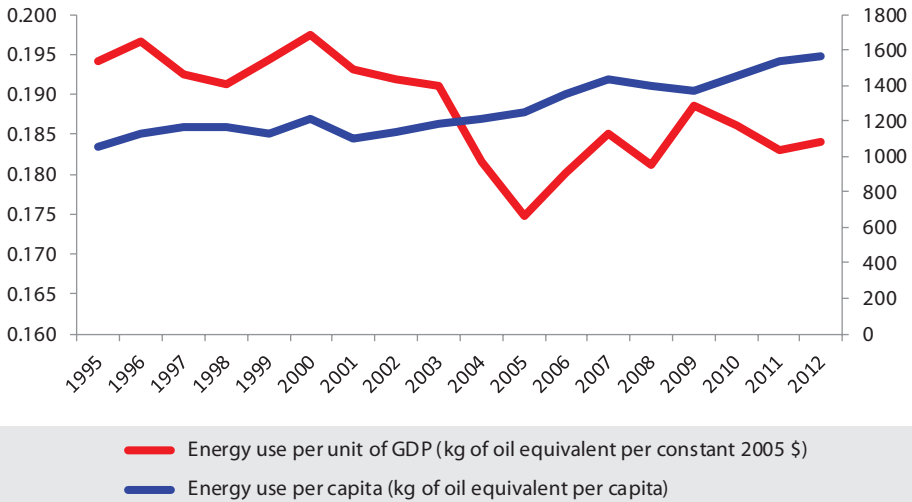


— Electricity consumption/GDP (kWh per 2005 USD)  
 — Final energy consumption/GDP (Mtoe per 2005 USD)

Source: IEA statistics, 2013

The energy intensity in Turkey has not shown much change since 1990. Energy use per unit of GDP was 0.195 in 1995 and it decreased to 0.184 in 2012, although the graph below shows some lower values as well during that period. This is the result of the country's high GDP growth while energy consumption also increased, albeit at a lower rate. In the same period, energy use per capita increased gradually from 1,030 koe in 1995 to 1,563 koe in 2012.

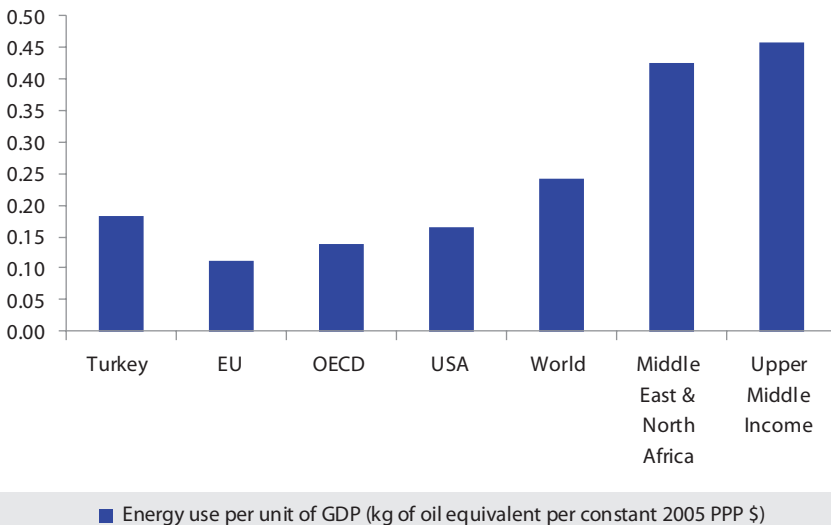
**Figure 33** Energy Intensity Indicators for Turkey



Source\_WB statistics, 2013

According to WB 2011 values, Turkey’s energy intensity of 0.18 koe per unit of GDP is below the world average of 0.24, but above the OECD average of 0.14 and above the average energy intensity of the EU Member States (0.11).

**Figure 34** Comparison of energy intensity indicators, 2011



Source\_WB statistics, 2013

## Implementing Energy Efficiency

Implementation of the EE Law and the taking of actions to increase energy efficiency are the responsibility of the Energy Efficiency Coordination Board (EECB) and GDRE. For that purpose, secondary legislation has been developed, and projects related to EE have been initiated by public and private institutions and NGOs.

### Power Sector

In the power sector, energy saving can be achieved by decommissioning obsolete equipment, and replacing it with new high-efficiency equipment, construction and commissioning of high- and small-capacity power plants, and construction of new substations and power transmission lines. To achieve this, Turkey has undertaken various activities:

- Cogeneration/Trigeneration technology: Cogeneration plants with total cycle efficiency of more than 80% are supported through entitlements to license exemption within the scope of the Regulation Regarding Unlicensed Electricity Generation in the Electricity Market. The regulation also obliges the electricity distribution companies to purchase the electricity generated by the micro cogeneration units at a certain price, similar to the feed-in tariff system for RES. This has resulted in emission reductions of 54,375 tonnes of CO<sub>2</sub> annually as a result of the cogeneration/trigeneration technologies implemented in 3 shopping malls, 6 hospitals, 3 airports, 7 hotels and 1 university.
- Rehabilitation of Public Plants: Efficiency values of the publicly owned thermal and hydroelectric power plants have been evaluated in order to increase efficiency in energy production. Upgrades and retrofits initiated in 2005 by EUAS in order to increase efficiency and production capacity through new technologies are expected to be completed in 2016. Of these upgrades, 787 projects have been completed by 2012 and 156 are underway in 4 hydroelectric plants and 16 thermal power plants. These rehabilitation projects will increase the performance, reliability and lifespan of the plants, and ensure compliance with the environmental legislation. The expected results include a production increase of 13.9 TWh per year, as well as improved generation processes, replacement of old/inefficient equipment with new and efficient ones (e.g. compensators, boilers, motor drivers), etc.
- Increased utilization of natural gas as auxiliary fuel in thermal power plants: A fuel conversion project at Ambarli fuel-oil plant, with an installed power of 630 MW, was initiated in 2008.
  - Two units of the plant with installed capacities of 150 MW are being converted from fuel oil to natural gas.
  - Two new units of 270 MW each, also including a waste heat boiler, will be added.
  - Three units of 110 MW will continue to run on fuel oil.
  - As a result, installed capacity of the plant shall be increased to 1,170 MW.
- Privatization of the Electricity Distribution Activities: The distribution grid of Turkey has been divided into 21 regions. The privatization of the electricity distribution activities should improve the operational efficiencies and reduce the high theft and loss rates in the distribution grid. For that purpose, target loss rates have been determined for each of the 21 distribution companies, with a penalty and reward mechanism related to the performance of the companies.
- Other activities already performed or planned in the transmission and distribution areas include thermal cameras for instantaneous failure detection, workforce optimization tools,

smart meters, power quality monitoring systems, and communication and control systems (e.g. SCADA, GIS). Smart grid applications have been partly in use in Turkey.

The Energy Efficiency Improvement Program, within the 10th Development Plan of Turkey, plans to generalize energy recovery, cogeneration and micro-cogeneration systems in electricity generation. Two targets of this plan have been defined as follows:

- Developing projects to make use of the waste heat of the existing coal-fired thermal power plants in regional heating and agricultural activities
- Generalizing electricity generation from waste heat in industry, creating a market for the sales of waste heat energy, and introducing supportive measures to establish the cogeneration and micro-cogeneration facilities to generalize these practices

Pilot projects are currently being implemented to recover waste heat from the TPPs. These projects provide hot water and heating to houses or greenhouses.

The EE Strategy Paper (2012–2023) states in this respect that the total average cycle efficiency of the coal-fired thermal power plants, including waste heat recovery, should be increased over 45% by 2023. Moreover, the electrical energy intensity should decrease at least by 20% by 2023, compared to current levels. Research and Development (R&D) activities and implementation projects are underway to improve efficiency in the power sector, especially in the field of electricity generation.

## **Built Environment**

Measures on new buildings focus on energy performance requirements. The requirements have been defined in the By-Law on Energy Performance of Buildings by the Ministry of Environment and Urbanization (MEU). The Regulation Regarding Energy Performance in Buildings that entered into force in 2009 stipulates measures, technical criteria and implementation guidelines to bring a more integrated approach for EE in buildings by setting minimum standards on the energy performance of new buildings, and of buildings which are subject to major renovation. It also includes a common methodology for calculating the energy performance of buildings. The requirements cover energy needs for space and hot water heating, cooling and lighting. Based on the regulation, all new buildings must have an energy performance certificate (valid for 10 years) indicating their energy performance class, whereas existing buildings will be required to have that certificate by May 2017. Also, central heating and metering systems are mandatory for new buildings over a certain size. Individual metering systems must be installed for the existing buildings having central heating systems as well.

The Energy Performance Certificate (EPC) for buildings is prepared using the BEP-TR system of MEU. ESCOs, universities and professional chambers authorized by the Ministry train the EPC experts. These 9,500 experts have approved around 113,000 EPC up to now via the BEP-TR system.

Activities related to sustainable architectural design and green buildings have been gradually increasing in recent years. There are currently 70 new buildings in the private sector awarded with green building certificates, such as LEED and BREEAM. Additionally, the Turkish Green Building Association, which was established in 2007 to contribute to the development of the construction sector in Turkey, is currently developing a green building certificate system specific to Turkey. There is no green building practice in public buildings yet. In order to gain experience, three public buildings (one service building and two school buildings) will be designed and built as green buildings within the scope of the Project for Increasing EE in Buildings. This project is implemented by GDRE, with the support of the Global Environment

Facility (GEF). The EE Strategy Paper expects that the number of environmentally friendly, green and sustainable buildings will increase in the coming years, also in public buildings.

Other EE activities in buildings mentioned in the Fifth National Communication of Turkey are:

- The four-year Project on Increasing EE in Buildings is implemented under the chairmanship of the GDRE and in coordination with the MEU, Ministry of National Education (MNE). It was initiated in 2011 and is supported by the GEF. It includes activities such as increasing the efficiency of legislative practices (primarily the Regulation Regarding Energy Performance of Buildings), improving legal and institutional infrastructure, and implementing pilot schemes that aim to introduce integrated building design approaches to the public.
- MEU applied in 2014 for a Project on Increasing EE in Buildings within the scope of the EU Instrument for Pre-Accession Assistance (IPA). The general objective of the project is to increase EE in Turkey to generate economic gains and make a positive contribution to climate change and energy security. As a result of this two-year project, the level of EE in new building designs and existing building rehabilitations will be increased. In addition to the activities on improvement of legislation and determination of EE criteria for new and existing buildings, the project also includes training and awareness-raising activities for technical personnel employed within the provincial organization of the Ministry, municipalities, local architects and engineers. Also, two existing buildings will be converted into energy-efficient buildings by MENR. The project is expected to start in 2014 and it is envisaged that this will reduce energy use by 10% within 5 years following completion of the project.

## Industry and Services

In order to effectively provide EE services such as training, audits and consultancy all over the country, GDRE is entitled to give authorizations to specific entities. Currently, Gazi University, Osmaniye Korkut Ata University, the Chamber of Mechanical Engineers, the Chamber of Electrical Engineers, and 32 EE service companies (ESCOs) have received authorization to provide EE services.

The most relevant activities and projects conducted in the Industry and Services sectors are described below:

- A five-year Project for Increasing EE in Industry started in 2011. This project is being implemented by GDRE, the Ministry of Science, Industry and Technology (MSIT), the Small and Medium Enterprises Development Organization (KOSGEB), the Turkish Standards Institute (TSE), the Technology Development Foundation of Turkey (TTGV), UNDP and UNIDO. The expected results of the project are higher efficiency of legislative practices, legal and institutional infrastructures, popularization of energy management and awareness of EE among the industrial enterprises and consultancy firms, and increase in the number of energy audits. Furthermore, pilot projects will be started to develop and improve EE services, and to demonstrate the benefits of energy management and energy efficiency. The project is expected to be completed in 2015 and has a budget of \$35 million.
- Energy management is an obligation in buildings and industrial plants above a certain size in Turkey. Certification programs for energy managers in building and industry sectors have been organized since 2002 first by GDRE, and later also by authorized institutions and firms. There are already over 5,500 certified energy managers in Turkey. GDRE also organizes every year, since 2002, international energy management courses for the Asian, Balkan and Middle Eastern countries. These courses are based on the ISO 50001 Energy

Management Standard, which has been adopted as the Turkish standard. According to the EE Strategy Paper (2012–2023), the ISO 50001 certificate will become compulsory in 2014 for the companies applying for Voluntary Agreements and EE projects. These companies will also need to establish an energy management unit. Moreover, each industry subsector will define an energy intensity reduction rate for the next 10 years. This reduction rate will be based on saving potentials per subsector, and it must be at least 10% reduction of the current energy intensity. The investments in EE improvement will be encouraged by MENR.

To monitor the EE activities in the industrial companies, the By-Law on Improving EE for the Utilization of Energy and Energy Resources obliges to conduct energy audits in all industrial plants consuming more than 5,000 toe per year, in buildings in the services sector with a total build area over 20,000 m<sup>2</sup> or with an annual energy consumption above 500 toe, and in public buildings with a total construction area over 10,000 m<sup>2</sup> or with an annual energy consumption above 250 toe. These audits will need to be renewed every four years. GDRE developed a database to collect data from industrial enterprises, and from private and public buildings meeting the above criteria. This data provide statistics per subsector on fuel use, CO<sub>2</sub> emissions and energy intensity, and allows comparisons to be made between sectors and regions.

Furthermore, the ENVER Portal has been set up to collect, process and monitor the energy use of industrial plants and buildings which report annually on energy consumption to GDRE. The methodology for the definition of EE indicators, the assessment of energy-saving potentials, and modelling have been developed so as to integrate EE to the forecasting of energy use.

Furthermore, benchmarking studies have been conducted in the cement sector in cooperation with the Turkish Cement Manufacturers' Association since 2001, and with 100% participation of all plants since 2009. This study allows plants to compare their specific energy consumption, to be aware of their performance and to improve their energy efficiency. This study has led other sectors to start similar benchmarking studies, for instance in iron and steel, textile, and ceramic sectors. Additionally, both the government and sector associations promote the use of energy-efficient equipment and processes in all sectors.

## **Public Sector**

As mentioned, green building practices have not been initiated in public buildings yet. However, there are significant attempts at EE improvements in the public sector. The targets specified in the EE Strategy Paper (2012–2023) are to decrease the annual energy consumption in public enterprises by 10% by 2015 and by 20% by 2023 when compared with the 2011 level. EE improvements in public buildings and other facilities of public enterprises will be realized through Energy Performance Agreements with consultancy companies. Also, the purchase of services and commodities in the public sector should comply with the minimum efficiency criteria determined by MENR, in particular when replacing vehicles and other equipment that have fulfilled their economic lives.

## **Transport**

The regulation issued in June 2008 by the Ministry of Transport, Maritime Affairs and Communication promotes the reduction of the unit fuel consumption and the increase of the efficiency standards of motor vehicles produced domestically, the development of public transportation in cities, and the installation of advanced traffic signalling systems. In addition, the EE Strategy Paper (2012–2023) aims at encouraging vehicles with small-sized engines and low emission levels, enforcing transportation master plans in cities, and developing and



promoting seaways and railroads for both public transportation and long-distance mass transportation instead of highway road transportation. Furthermore, electric vehicles, and use of biofuels and synthetic fuels in vehicles, will be encouraged by means of tax reductions.

## Home Appliances

The EE Law provides limitations on products with inefficient energy use, such as minimum EE standards for appliances in line with EU legislation. These standards, based on EU regulations under the Eco-design Directive, became effective in 2010. MSIT has adopted minimum energy performance standards for electric motors, standby/off mode energy consumption of electrical and electronic household and office equipment, non-directional household lamps, fluorescent lamps, external power supplies, simple set-top boxes, household dishwashers, washing machines, televisions, household refrigerating appliances, glandless standalone circulators and glandless circulators integrated in products and electric motors.

Mandatory energy labelling of appliances is harmonized with EU Directives. The By-Law on the Indication by Labelling and Standard Product Information of the Consumption of Energy and Other Resources by Energy-Related Products was published in the Official Gazette in 2011, in compliance with the 2010/30/EU Directive. Under this regulation, communiqués on dishwashers, refrigerators, washing machines, tumble driers, televisions, lamps (old versions) and electric ovens have been published.

The four-year Project on Market Transformation of Energy Efficient Household Appliances was initiated in 2010 in coordination with MSIT, the White Goods Manufacturers' Association of Turkey, and company Arcelik A.S. GDRE is the implementing agency, through the financial support from GEF. This project will contribute to popularizing the use of energy-efficient household appliances in Turkey, improving the related legislation, raising awareness in the public and among producers and retailers of white goods, and accelerating market transformation.

Some of the activities performed within this project so far are:

- communiqués on home appliances and their labelling
- workshops on energy-efficient home appliances with public and private sectors, and with NGOs
- training of auditors on eco-design and energy labelling

## Other Issues

### Awareness Studies

The most important awareness-raising activity is the EE Week which is organized every year in the second week of January since the beginning of the 1980s. Based on EE Law, the week includes the national EE forum with national and international experts participating. The 5th National EE Forum was organized in Istanbul between 8 and 11 January 2014.

EE project contests for Turkish industry and for students have been organized in order to increase the awareness and encourage the use of energy efficiently, to introduce successful EE projects and to share experiences and give awards in the EE Week. Each year, in cooperation with the Ministry of National Education and TUBITAK, painting and composition competitions among primary school students and project competitions among high school students on EE are held and they are rewarded during the EE Week. Similarly, competitions on EE

among industrial enterprises are also organized. Various national and international seminars, conferences and workshops have been organized, such as the ISO 50001 Energy Management Standard Workshop and TAIEX Workshop, also mainly under the coordination of GDRE.

### **Monitoring and Assessment**

The project “Development of Monitoring and Evaluation of Energy Efficiency in Turkey” has been carried out in 2010–2013 by GDRE and NL Agency, with the support of the Government of the Netherlands. The main objective of the project was to further develop Turkish expertise in monitoring and evaluation of existing and new energy efficiency measures and programmes. It addressed all sectors of the Turkish economy (industry, buildings, products, transport), through a series of workshops and case studies with participation of public and private organisations involved in promoting energy efficiency in Turkey. Additional pilot activities included the development of a quick scan for assessing the energy efficiency potential of individual companies, in order to extrapolate the results to sub-sector level (this scan has been applied in the test phase in government buildings and in the food sector), and the exchange of knowhow on energy efficiency measures among companies of the same sub-sector, during a series of sessions moderated by a sector specialist (this approach has been first introduced in two “Users’ Groups” on water usage and drying processes in the textile industry).

GDRE also plans to develop an information management system based on up-to-date and reliable databases. This project will enable the definition of performance indicators, allowing them to set achievable objectives, to monitor results, and to make comparisons over time and with other countries. The establishment of such a measurement and evaluation system will enable impact assessments supporting projections and simulations, integrated resource planning and legislation improvement.

### **Financing Energy Efficiency**

GDRE provides up to 30% investment subsidy for EE improvement projects in industrial companies. The cost of these projects should be less than 1 million Turkish Liras (TL), and the payback period should be 5 years or less. Eligible projects include EE improvement of existing systems, cogeneration, micro cogeneration and RES projects. The subsidy also covers the service fees of EE consultancy companies. In the period 2012–2013, 67 projects from 25 enterprises have been granted 6.8 million TL in total. In addition, industrial plants signing a voluntary agreement to reduce their energy intensity by at least 10% within three years can also receive a grant from GDRE. This grant can be up to 200,000 Turkish Liras, paid at the end of the agreement. Since 2009, 24 agreements have been made with a total grant of 2.6 million TL, but there have been only 3 applications for voluntary agreements in 2013.

KOSGEB provides support to SME’s, in particular for energy manager trainings, pre-audits, energy audits and consultancy services for efficiency improvement projects.

Turkey is also working with several international financial institutions to improve access to EE finance. Turkish private banks have started to offer several credit options for private projects to improve EE, as described in the Fifth National Communication:

- In order to finance RES and EE projects, Turkey has obtained a loan of \$600 million, \$500 million of which was provided by the World Bank and \$100 million by the Clean Technology Fund as a result of the Loan Agreements signed on 9 June 2009. The loan is provided under the Repayment Guarantee Provided by Treasury and is being used for RES and EE investments made by the private sector via the Industrial Development Bank of Turkey

(TSKB) and the Development Bank of Turkey (TKB). Supplementary financing of \$500 million was obtained from the World Bank for the project as a result of the Loan Agreements signed on 5 December 2011, and will be provided by TSKB and TKB. By end October 2013, \$136.5 million loan to 11 projects (mostly in industry) is disbursed by TKB and \$346.3 million loan to 57 projects of 30 companies is disbursed by TSKB.

- IBRD, under the Treasury Guarantee, has provided a financing for a total amount of USD 201 million; (each USD 67 million) to Türkiye Halk Bankası A.Ş., Türkiye Vakıflar Bankası T.A.O and T.C. Ziraat Bankası A.Ş., for the SME (Small and Medium Enterprises) Energy Efficiency Project which is designed to support energy efficiency investments by the SMEs in Turkey. The agreements pertaining to the said financing have been signed on May 6, 2013. The Project also includes a USD 3.64 million Grant from the Global Environment Facility to the Ministry of Energy and Natural Resources and to three intermediary banks to provide technical assistance services regarding energy efficiency investments by SMEs.
- Turkey is also benefiting from Clean Technology Fund (CTF) loans and Global Environment Facility (GEF) grants to promote emerging renewable technologies and to deploy energy efficiency investments. Turkey's CTF Investment Plan, envisaging a two Stage financing program for a total of 400 million Dollars, is designed to blend CTF concessional financing with World Bank Group and EBRD lending and Turkey's own resources to promote clean energy investments.
- Private sector investments for RES and EE have also been supported by the European Investment Bank (EIB), the European Bank for Reconstruction and Development (EBRD), German Development Bank Group (KfW Group), the French Development Agency (AFD) and the Islamic Development Bank Group (IDB Group).
- RES and EE projects are also supported by several other sources, such as TTGV and the UNDP GEF Small Grants Program. Also, Turkey is among the countries supported by the World Bank program Partnership for Market Readiness. This program ensures that developing countries and rising economic powers benefit from flexibility mechanisms that are within the scope of the UNFCCC climate change regime.

*Turkey Sustainable Energy Financing Facility (TurSEFF):* TurSEFF is a framework operation with up to \$265 million credit lines to be provided by EBRD to eligible commercial banks for on-lending to private sector borrowers for energy efficiency and small-scale renewable energy investments. The framework also provides free technical assistance by teams of local and international experts to the borrowing companies on their EE and RES projects. In addition, TurSEFF has standardized tools for calculations, and checklists and eligible equipment and supplier lists are available to borrowers to easily implement the projects. Within the framework, 100% of the projects' amounts can be financed by at most \$5 million loans, where specific KPIs are determined for EE and RES projects based on the size of the investment. During the period 2010–2012, TurSEFF has disbursed \$264 million to 374 projects in total, \$177 million of which is for EE and \$87 million is for RES projects.

## Organization of Energy Efficiency Activities

In Turkey the studies on EE and increasing usage of RES in the end-use sector have been carried out by GDRE. Its EE activities focus on training, audits, authorization of universities, chambers of engineers and EE consultancy companies, support of EE projects, voluntary agreements, increasing awareness, statistics, modelling, survey, monitoring, project development and management, and development of strategies and legislation. These activities are carried

out by the Energy Efficiency Department within GDRE. This department had a staff of 61 (42 engineers, 4 technicians, and 15 administrative staff) and a budget of 7.62 million TL in 2013.

An important multi-stakeholder body about EE is the Energy Efficiency Coordination Board (ECCB), which was established in 2007 by the EE Law. Detailed information about EECB is provided in the following parts of the report.

### **Ministry of Energy and Natural Resources**

MENR functions as the central executive body responsible for the formulation of national policy related to the industry and energy sectors.

GDRE is a governmental agency under MENR, which was established in 2011 as a follow-up of the General Directorate of Electrical Power Resources Survey and Development Administration (EIE). It is the principal regulatory institution in the sphere of alternative and RES and it is tasked with:

- assessment of RES such as hydro, wind, solar, geothermal and biomass in Turkey
- increasing awareness about the EE in industry and buildings
- monitoring and auditing of the EE projects and the R&D projects approved by EECB
- monitoring and assessment of developments in the areas of RES and EE, setting targets and priorities relevant to those subject in accordance with the country's needs and performing studies accordingly
- developing projections and recommendations for assessment of RES and increasing EE

### **Energy Efficiency Coordination Board**

ECCB was set up in 2007 by the EE Law. It prepares national EE strategies, plans and programs, monitors their establishment and implementation, and assesses their effectiveness. It also guides the EE activities performed by GDRE. EECB includes senior members from the following bodies: MENR, Ministry of Finance, Ministry of Transport, Maritime Affairs and Communication, MSIT, Ministry of Internal Affairs, MEU, Ministry of National Education, Ministry of Development, Turkish Treasury, Energy Market Regulatory Authority (EMRA), Turkish Standards Institution, Scientific and Technological Research Council of Turkey (TUBITAK), Union of Chambers of Turkish Engineers and Architects, Union of Municipalities of Turkey, and Union of Chambers and Commodity Exchanges of Turkey.

The duties, tasks and responsibilities of the EECB are:

- Prepare national EE strategies, plans and programs, assess their effectiveness, and coordinate their revision and the establishment and implementation of new measures where necessary
- Provide guidance on the EE activities performed by the General Directorate, and approve the authorization certificates issued by the GDRE to professional chambers and universities for spreading EE services
- Approve and monitor the applications prepared by industrial enterprises or firms hired by such enterprises, as well as the voluntary agreements signed, and monitor the results of implementation
- Establish temporary specialized committees with the participation of related public agencies, universities, private sector, enterprises and non-governmental organizations, whose expenditures will be funded from the budget of GDRE

- Set the agenda and determine the participants of the consultative board meetings to be organized by GDRE in November every year with the participation of authorized agencies, firms, professional organizations having public legal entity status as well as non-governmental organizations, and approve the meeting's concluding assessments and proposals for measures
- Determine and publish the authorization certificate and energy manager certificate fees in January every year

### **Non-governmental Organisations and Resources**

Together with the direct government promotion and implementation of EE measures, non-government organizations play an important role. Some of the most important NGOs in Turkey are described below:

#### **Energy Efficiency Association (ENVER)**

The Energy Efficiency Association (ENVER) is an independent national NGO of Turkey working to create awareness in people, helping them to use energy efficiently and productively, continually conduct scientific research and increase public knowledge by sharing findings with public enterprises and citizens. To achieve these goals, the Association organizes campaigns, promotions and activities in order to create awareness in the public about EE. The projects of ENVER include the "Energy Lady", which aims at teaching the women in the provinces to use energy efficiently primarily at home, and the "Web Conference on EE". The Association partners with the UN Industrial Development Organization (UNIDO) and European Council for an Energy Efficient Economy (ECEEE).

#### **Association of Energy Management (EYODER)**

EYODER is an NNGO, established in 2010, with the purpose of gathering the Energy Managers working freelance, in the public or the private sector under one roof with the employees and partners of EE Consultancy Firms. Among the duties of EE Consultancy Firms (ESCOs) are to provide energy management services and energy management trainings, implement EE improvement projects, and label existing buildings. There were 31 authorized ESCOs in October 2013, 16 of which are EYODER members. EYODER continues to implement EE studies on various public buildings in coordination with GDRE and MEU, and approximately 200 energy audits have been completed so far, including hospitals and office buildings.

#### **Turkish Cogeneration and Clean Energy Technologies Association (TURKOTED)**

TURKOTED was established in 1998 to introduce and promote the cogeneration technology in Turkey. The Association works to monitor and collect statistical data on the cogeneration sector in Turkey and determine technical and legal problems regarding cogeneration, and provide solutions to the related public institutions. They organize various meetings and conferences to promote the cogeneration technology and collaborate with governmental and non-governmental bodies such as MENR, MEU, TUBITAK and universities. These collaborations contributed to secondary legislation studies on cogeneration and clean technology in Turkey, and higher and lower efficiency definitions in the power sector.

#### **Other NGOs**

The Turkish Energy Efficiency Assembly (Tevem) is a civil organization established to support the construction of EE policies in Turkey, to establish social awareness of developments

and innovations related to the productive usage of energy and to create social negotiation and cooperation. Among the founders of the association are MENR, Union of Chambers and Commodity Exchanges of Turkey (TOBB), Turkish Exporters' Assembly, Independent Industrialists and Businessmen's Association (MUSIAD), Turkish Industry and Business Association (TUSIAD), International Competitiveness Research Institute, Turkish Confederation of Businessmen and Industrialists, ENVER, Anatolian Lions Businessmen's Association, Young Businessmen Confederation of Turkey, Association of Local and Regional Televisions, Economic Journalists Association, Architects & Engineers Group, World Energy Council Turkish National Committee (DEKTMK), which were later joined by KOSGEB, Istanbul Chamber of Commerce, and Business World Foundation.

KOSGEB subsidises services on energy audits and energy management training support to SMEs by giving grants to EE improvement, energy counselling and management training projects. Up to now, 70 projects related to Energy Efficiency have been supported by KOSGEB and 11 companies have benefited from the KOSGEB grant as most of the SMEs do not see the cost advantage of EE investments and are not informed about this area. The plan is to initiate pilot projects in selected enterprises to implement EE improvement practices and increase awareness among the SMEs.

TTGV is another NGO that gives support and grants to several technological and environmental development activities, including energy efficiency. According to the most recent data, TTGV has granted 14 EE projects of SMEs and large companies on EE with a total of about \$5.4 million.

### **International Collaborations**

National, international and regional collaborations in the field of EE and projects and activities are taking place in cooperation with the UN, World Bank, JICA, BSEC, ECO and also bilateral cooperation with the Netherlands and the USA. In January 2012, the 50th European Energy Network (EnR) event also took place in Istanbul, Turkey. International projects include a Twinning Project to increase EE in Turkey, in coordination with ADEME (France) and SenterNovem (the Netherlands) between 2005 and 2007, and a number of projects to increase EE in the industry sector during the 1980s and 1990s, in coordination with the World Bank and JICA from Japan. JICA also supported the Energy Savings in Turkey project in 2000–2005 by providing technical equipment and training the EE personnel in Turkey. In addition, projects for promoting and improving EE are underway with the support of international organizations and governments. Among them are:

Projects supported by UNDP and GEF:

- Project on Market Transformation of Energy Efficient Household Appliances
- Project on Promoting Energy Efficiency in Buildings
- Project on Improving Energy Efficiency in Industry

Bilateral Collaborations:

- The Netherlands (Project on Improving EE Monitoring and Evaluation)
- Japan (Third Country Training Program since 2002)
- USA (Near Zero Zone Project)
- AFD – KOSGEB Energy Efficiency in the SMEs Project



Renewable Energy Policy

## Overview

Since 2005, Turkey's leadership has taken steps to change the status quo and the government has recently started paying greater attention to developing RES. This is reflected by the Law on Utilization of RES for the Purpose of Generating Electrical Energy (2005), Turkey's accession to the International Renewable Energy Agency (IRENA) in June 2009, and the adoption of the MENR Strategic Plan (2010–2014).

While traditional energy sources such as coal, hydro and natural gas have historically been the main energy sources used in power generation in Turkey, the Turkish RES market has been emerging gradually since the adoption of the RES Law in 2005. The installed capacity of RES in Turkey as of the end of January 2014 amounts to 239.6 MW waste, 310.8 MW geothermal, 2,815 MW wind, 6,256 MW hydro from rivers, and 16,237 MW hydro from reservoirs. The following table shows how RES compares to other generation technologies in Turkey.

**Table 5\_Installed capacity and generation of RES in Turkey, end October 2013<sup>1</sup>**

	Installed Capacity (MW)	Generation (GWh)	Capacity factor
<b>Non-RES technology:</b>			
Fuel oil, asphaltite, naphtha	1338.3	3154.6	32.31%
Coal, lignite	13103.6	49691.9	51.98%
Natural gas, LNG	22594.9	87524.2	53.09%
Dam hydro	16027.0	37176.9	31.79%
<b>Sum</b>	<b>53063.8</b>	<b>177547.6</b>	<b>45.86%</b>
<b>RES technology:</b>			
Run-off-the-river hydro	5696.6	13103.9	31.53%
Wind	2688.8	6304.9	32.14%
Geothermal	310.8	968.3	42.70%
Biogas and waste	224.0	372.7	44.80%
<b>Sum</b>	<b>8920.3</b>	<b>20749.7</b>	<b>31.88%</b>

Note: the generation for biogas and waste is not specified in the TEIAS statistics and the capacity factor for 2011 is used instead.

Source\_ TEIAS, 2013

Based on publicly available data released by EMRA in February 2014, 273 RES generation licenses (234 wind, 20 geothermal and 19 biogas) are under construction representing an aggregate capacity of 8,174 MW. There are also a significant number of license applications pending at EMRA, mostly for wind, pointing to potential for continued expansion. In 2011, EMRA completed tenders for multiple applications for wind power with a total available transformer capacity of 78 GW from the pool of 751 applications which has been pending since 1 November 2007. TEIAS identified 5,500 MW of installed capacity from those applications to be connectable to transmission and distribution grids, subdivided into 1,378 MW single and 4,122 MW multiple wind license applications. These tenders increase the total licensed wind capacity to 7,760 MW. Hatay, Canakkale, Balikesir and Izmir are the provinces with most applications, due to their

<sup>1</sup> According to Turkish Cogeneration & Clean Energy Technologies Association (TURKOTED), Turkey's cogeneration installed capacity is 8.3 GW (all natural gas plants) and it is used mostly to provide steam for industry. Most of the cogeneration power plants have an efficiency over 70% and are operational for over 8,000 hours/year.



favourable wind conditions. In February 2012, EMRA published an official statement about wind power generation licenses. According to that statement, applicants have to perform measurements on the facility site for at least one year before being eligible to construct their generation facility.

However, many of the existing licenses pertain to plants that are under construction or facilities which have not started their operations yet. Also, financing has not been guaranteed for most of the licenses. As a consequence, the RES market is expected to remain relatively unsaturated in the medium term.

## RES potential

According to GDRE, the country's potential for different RES is as follows:

- Wind has an estimated economic potential of 48–50 GW (around 38 GW for onshore and 10 GW for offshore installation), based on the wind atlas prepared by GDRE. Currently, total licensed wind capacity is 9,690 MW, all of which have been granted their licenses between 2002 and 2013. The target is to achieve an installed capacity of 20 GW by 2023.
- The Turkey Solar Energy Potential Atlas (GEPA) identified a potential of 380 TWh (35 Mtoe) on an average annual total sunshine duration of 2,640 hours (daily total is 7.2 hours), and an average total radiation of 1,500 kWh/m<sup>2</sup>/year (daily total is 4.1 kWh/m<sup>2</sup>). There is at present no solar PV in Turkey. Applications for solar PV systems competing for a total capacity of 600 MW have been received in June 2013, which can benefit from the feed-in tariff of 133 USD/MWh. In total, 492 applications with a total capacity of 8,900 MW of solar PV (except one application for thermal) have been received and these are currently being evaluated by EMRA. It is planned that the licensing process will be finalized in the first quarter of 2014. In addition, as of the end of October 2013, a total of 541 applications are pending for unlicensed generation.
- There is a biomass potential from 4.8 million tonnes of biomass from forests, and over 15.3 million tonnes of agricultural waste having a total calorific value of 303 PJ. In total, the biomass potential of Turkey is 8.7 Mtoe. Under a conservative scenario this could support 600 MW of installed capacity.
- There is 31,500 MW of geothermal potential for heating purposes. GDRE estimates the economic potential of geothermal for power generation at 2,000 MW, of which 311 MW was already in operation by the end of October 2013. There are 27 projects licensed with a total capacity of approximately 656 MW, of which 11 are partially or fully operational. At the end of 2010, 17 out of 190 geothermal fields have a potential that is suitable for electricity generation.
- The theoretical potential of hydro is 433 TWh/year and the technically feasible potential is 216 TWh/year. There is an economically feasible potential of 160 TWh/year for reservoir-type hydroelectricity, of which 41.9 TWh was generated in 2012. Run-off-the-river hydro has an economic potential of 38 TWh/year, of which 12.5 TWh was generated in 2012. In total, Turkey has 16% of the economic hydro potential of Europe.

A set of estimates of achievable potential is set out below (blue numbers are calculated):

**Table 6**\_RES potential in Turkey

Source	Generation (TWh)	Capacity (GW)	Assumed capacity factor
<b>Hydro energy</b>	160	52	35%
<b>Run-off-the-river hydro</b>	38	14	30%
<b>Wind energy</b>	126	48	30%
<b>Solar energy</b>	380	217	20%
<b>Bioenergy</b>	4	0.6	70%
<b>Geothermal (power)</b>	12	2	70%
<b>Total power generation</b>	<b>720</b>	<b>332</b>	
<b>Geothermal (thermal)</b>	193	31.5	70%

Source\_MENR and GDRE, 2013

## RES strategy

In the MENR Strategic Plan (2010–2014) and Electricity Energy Market and Supply Security Strategy Paper issued in 2009, the primary target is to increase the share of domestic resources. Accordingly, measures are being taken to promote the use of indigenous resources, with the following targets for development of RES by 2023, the centenary of the establishment of the Turkish Republic:

- At least 30% share of RES in electricity generation will be reached
- The wind plant installed capacity will reach up to 20,000 MW by 2023
- The installed capacity for the geothermal power plants will reach up to 600 MW by 2023
- Technically and economically feasible hydroelectric potential will be put into use
- The use of solar energy in electricity generation will be commenced

The share of RES in electricity production was 27.3% in 2012, about 89% of which (24.2% of the total generation) came from hydropower (including large reservoirs), and the share of RES in all energy consumption was 6.7% in 2011. Realization of the 2023 targets will require strengthening of the regulatory framework by enacting and enforcing laws that promote RES projects other than hydro. The utilization of RES in Turkey remained limited to hydropower until today, although there is a vast potential in solar, wind, biomass and geothermal energy too.

Concerning barriers to RES deployment, Turkey is experiencing similar barriers to those observed in other countries. The RES development is still far away from reaching its economic potential, even though the situation in Turkey is unique and in some aspects favourable for RES development:

- The RES Law is in place, providing feed-in tariffs to RES producers (for 10 years):
  - 73 \$/MWh for hydro and wind
  - 105 \$/MWh for geothermal electricity
  - 133 \$/MWh for solar and biomass/waste electricity
- Moreover, if local content is added to the project an additional 23–92 \$/MWh could be earned (for 5 years) per project

- There is a spot market which can function as an alternative sales point for RES generators. It is generally preferred by wind and sometimes by hydro generators. The average spot market price has been around 85 \$/MWh over the last three years.
- However, due to multiple applications and constraints in the network, tenders to obtain a connection permission have been organised, where RES project developers agreed to pay amounts up to 30–40 \$/MWh generated electricity back to the Turkish government.<sup>2</sup>
- The banking system in Turkey has built up considerable experience with financing RES projects, even though a number of projects have benefited from subsidised financing arrangements. This is especially the case for run-of-the-river hydro projects.

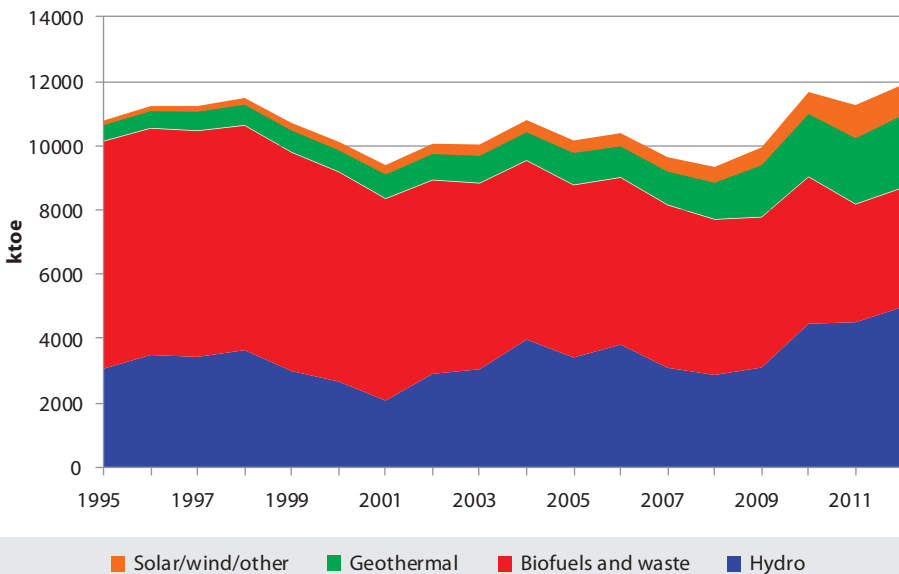
Moreover, Turkey has become 2nd in Europe and 4th in the world in the production of domestic solar hot water heating installations, with an installed capacity of 10.2 GWh in 2011.

The situation with unlicensed RES generation applications is less favourable by the end of 2013, where out of 1,120 projects, only 444 projects have been rejected and the remaining 676 projects have been found appropriate by TEDAŞ for further observation (by the end of 2013, 18 projects have been realized). Here various administrative barriers have discouraged developers, leading to the low success rate at present.

The grid is often a barrier towards RES development. In Turkey, the grid limitations and the high number of applications have led to some bottlenecks which add costs to RES project development. Without these additional costs, RES development in Turkey could be accelerated.

The following figure presents the total generation of RES expressed in ktoe.

**Figure 35**\_RES in primary energy supply



Source\_ IEA statistics, 2013

<sup>2</sup> See for instance: <http://www.tureb.com.tr/attachments/article/151/TEIAS%20Yarismalari%20Sonuc%20Raporu.pdf>

## Hydropower

Hydro is the main RES contributing to energy supply in Turkey. It accounted for 24% of electricity generation in 2012. Turkey had 20,438 MW of installed hydropower capacity in June 2013. The largest hydroelectric power plant has 2,405 MW installed capacity and is situated on the Euphrates River in Sanliurfa (Atatürk Dam and HPP). Furthermore, there are presently five hydroelectric power plants with a total installed capacity of 6,396 MW, three of which are the largest dams of Turkey, namely Atatürk, Karakaya and Keban. Water resources of Turkey are located in all seven geographical regions. There were 72 reservoir-type HPPs amounting to 16,027 MW and 374 run-off-the-river type HPPs amounting to 5,697 MW in October 2013.

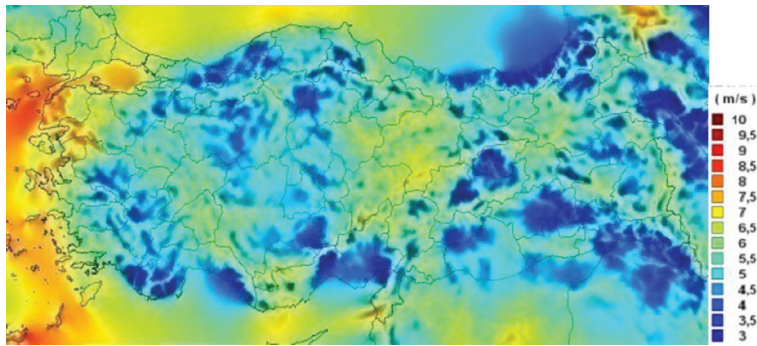
There is considerable potential for RES in Turkey and hydro is the most developed among them. According to studies by DSI, hydro reservoir is estimated to have an economic potential of 160 TWh/year, of which 41.9 TWh was generated in 2012, whereas river-type hydro has an economic potential of 38 TWh/year of which 12.5 TWh was generated in 2012 (GDRE estimates the total hydro potential of Turkey as 160 TWh). In total, Turkey has 16% of Europe's economic hydro potential.

The construction of hydropower plants plays an important role in solving issues of national importance such as flood control, clean production of electricity and the creation of new irrigation systems. As of July 2013, a total of 521 HPP are under construction with a total installed capacity of over 12,500 MW (based on EMRA data).

## Wind Power

Although there has been little implementation of wind energy in Turkey, interest has been growing. Its use has great prospects in most regions of Turkey. Calculations from governmental institutions suggest that wind has an estimated economic potential of around 38 GW for onshore and about 10 GW for offshore installation, based on the wind atlas as prepared by GDRE. The "Electricity Energy Market and Supply Security Strategy Paper" of 2009 aims at attaining a 30% share of RES generation (including dam hydro) in total national electricity generation by 2023, with an expected installed capacity of 20 GW wind power. According to TEIAS, there were 74 WPPs installed with an installed capacity of 2,815 MW in January 2014.

Most windy areas of Turkey are the Aegean Sea coast areas, the northern and western parts of the Marmara Sea coast (including the Thrace region), and some southern and inner parts of Anatolia. The average annual wind speed reaches 8–9 m/s in Canakkale (especially in the Gallipoli Peninsula). Other regions with high average wind speeds are northern Izmir, western Balikesir, and the Hatay province.

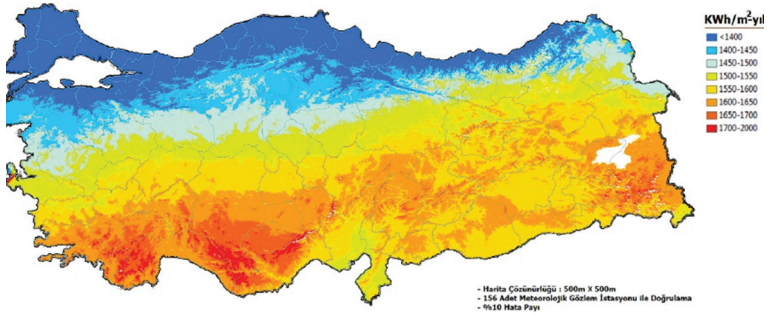
**Figure 36** Wind Energy Potential Map of Turkey

Source\_GDRE

## Solar Energy

The climatic conditions and geographical location of Turkey provide numerous opportunities for increasing the production of electricity and heat using solar energy. For example, the average global solar radiation is estimated at 1,500 kWh/m<sup>2</sup> per year (4.1 kWh/m<sup>2</sup> per day) in Turkey and the total annual sunshine duration is 2,640 hours (daily average of 7.2 hours). Although the solar energy potential using Concentrated Solar Power (CSP) technologies across the entire country is very high (380 TWh), no large-scale solar power installation exists. As of 2010, the amount of solar collectors installed in Turkey is around 12 million m<sup>2</sup> with a technical solar energy potential of 76 toe, and annual generation volume is 750,000 m<sup>2</sup>. However, there is at present no solar PV in Turkey and there is also no estimate of its economic potential. The potential for solar PV development is expected to be large in Turkey, a country with over 2,600 sunshine hours per year, but development is slow due to low incentives. MENR envisioned that applications for solar PV systems with a total capacity of 600 MW will be reached by the end of 2013, which can benefit from the feed-in tariff of 133 \$/MWh. Activities have been initiated to establish a 10–15 MW solar power plant at the Birecik Hydroelectric Power Plant site (377,000 m<sup>2</sup>) as a pilot. However, according to the regulation entered into force in 2010, the total capacity of solar farms cannot exceed 600 MW until 31 December 2013, and each solar energy project cannot exceed 50 MW.

Solar energy is widely used in Turkey for water heating, greenhouse heating and for drying agricultural products. Solar collectors are available in 3–3.5 million residences in Turkey, primarily in the Mediterranean, Aegean and Southeast Anatolian regions.

**Figure 37**\_Solar energy potential map of Turkey

Source\_GDRE

## Biomass

The rapid development of industry, agriculture and social services in Turkey opens new possibilities for energy production from biomass. The country has combustible industrial waste, forestry and waste from wood processing, agricultural products and organic wastes, domestic and municipal waste, and waste from areas polluted by oil and petroleum products, which can be used for energy production. In total, Turkey's waste potential is about 8.6 billion toe. The current energy use of biomass (6 Mtoe) is mainly for heating purposes.

According to the latest available data of 2008, there were in total 2,000 small-scale and 50 large-scale unorganized waste disposal areas, 32 organized landfills, and 4 composting plants in Turkey.

When compared to the world and the EU levels, the biodiesel production in Turkey is very limited. Biodiesel can be used as a fuel in the transportation sector in most of the country (except for the very cold regions), and also in housing and industry instead of fuel oil. However, there were only 34 licensed biodiesel production facilities in 2012. Due to the 0.91 TL/l Special Consumption Tax charged for biodiesel since February 2011, most of the producers have cancelled their licenses or stopped production, and only one facility continued producing (20,000 tonnes/year). According to EMRA, the total capacity of the licensed biodiesel producers is over 560,000 tonnes.

There were only three firms producing bioethanol in 2011. According to MENR, the total installed capacity of the bioethanol facilities is 160,000 tonnes. A legislation issued in September 2011 prescribes that the ethanol content of gasoline used as fuel should be at least 2% as of January 1, 2013, and at least 3% as of January 1, 2014.

Turkey's biogas potential based on animal waste is estimated to be 1.5–2 Mtoe. In October 2013, there were 38 installations of mainly landfill gas to electricity technology, with an installed capacity of 224 MW.

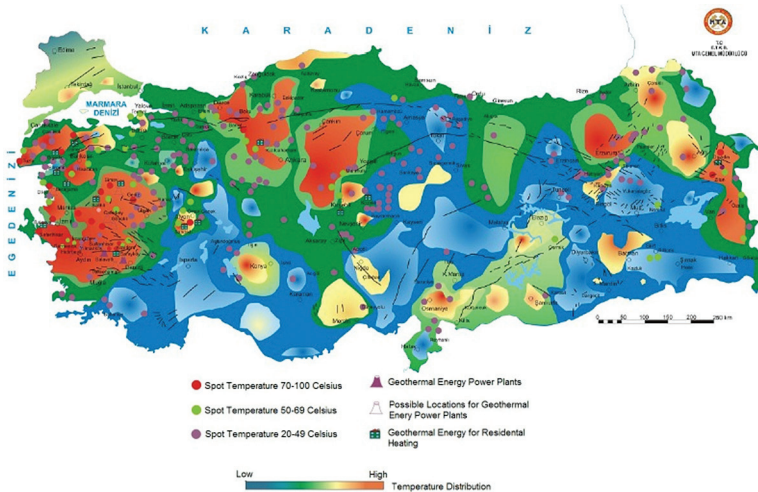
**Figure 38**\_Biomass energy potential map of Turkey

Source\_GDRE

## Geothermal Power

The territory of Turkey is rich in thermal waters. The geothermal potential for heating purposes is estimated to be 31,500 MW, of which 4,809 MW has been made available by MTA as of the end of 2012. Most of this geothermal potential (77.9%) is located in the Western Anatolian region and 55% of the geothermal areas in Turkey are suitable for heating practices. Moreover, it is estimated that about 2,000 MW of the economic geothermal potential is suitable for electricity generation while 635 MW of this amount has been proved until the end of 2012. At the end of 2010, 17 out of 190 geothermal fields have a potential suitable for electricity generation. There were 13 geothermal power plants with a total installed capacity of 311 MW by January 2014.

Geothermal energy is directly used for central heating systems, greenhouse heating and thermal tourism purposes (e.g. 805 MW is used for house heating and 2,506 MW for greenhouse heating).

**Figure 39**\_Geothermal energy potential map of Turkey

Source\_GDRE

## RES Implementation

As explained above, RES development has mainly focused on hydro and also wind, whereas biomass and geothermal are also gradually developing. Solar PV is still not developed at all. There is a long list of projects under construction. The situation in January 2014 is as summarised in the table below.

Since 2005, except for hydro power plants, very few activities involving RES have been implemented in Turkey, but there are some important projects in the pipeline for the period 2013–2014:

**Table 7**\_RES Projects under construction in Turkey

Technology	Number of projects	Licensed capacity (MW)
Large reservoir hydro	52	6,649
Run-of-river hydro	508	6,055
Wind	214	7,197
Geothermal	16	409
Landfill gas to power and waste heat	24	218
<b>Total</b>	<b>814</b>	<b>20,528</b>

Source\_EMRA, January 2013

In order to maximize the utilization of the country's wind energy potential and to make sure that additional RES will be connected to the transmission and distribution systems without any problem, studies on a hybrid project consisting of a pumped-storage hydropower plant and wind power plant have been initiated by GDRE, in the Yahyali district of Kayseri. The reason behind the decision of establishment of such a system is that 28,000 MW of the total 48,000 MW wind energy potential of Turkey seems impractical to connect to the network, due to system stability issues (the initial 20,000 MW is aimed to be embedded into the network by 2023). In general, energy generated from WPPs shows higher fluctuations within short time intervals. The purpose of the hybrid project is to guarantee that a fixed amount of energy is supplied to the network within a specified time period by compensating the imbalances between the power supplied by the WPPs and the guaranteed amount with the help of the pumped-storage HPP's reservoirs. However, these projects are difficult to implement as wind potential is mostly in the western parts of the country while hydro is mainly generated in the north and east. Parties associated to the project are GDRE, EUAS and TUBITAK MAM Energy Institute.

With the project called Wind Power Monitoring and Forecast Center (RITM), all wind power plants are aimed to be connected to the Center. By end of 2013, 20 WPPs were connected to RITM. Currently, total installed capacity of the WPPs connected to the Center is 1038.1 MW. In the next months, it is targeted that a total of 24 WPPs connect to the system and then be extended countrywide. The project is executed by GDRE with cooperation of TUBITAK MAM Energy Institute. In 2012, a budget of 3.2 million TL has been reserved for the project, 1.3 million TL of which is used. The project will be completed by April of 2014.

In addition, in the first half of 2013, investment projects for 100 energy power plants have been accepted by GDRE, 79 of which are based on RES. The total installed capacity planned in these RES projects is 1,105 MW, which corresponds to 36% of total energy investments. It should be



noted that 50 of these investments are hydro with a total capacity of over 827 MW, while 22 wind power plants represent 244 MW installed capacity. The remaining RES investments are in biomass and waste power plants.

## Policy Framework and Regulations

As part of its bid for EU membership and as a result of its rapidly growing energy demand, Turkey introduced the RES Law in 2005. Since then, a number of RES regulations to supplement that law have been adopted.

Pursuant to the RES Law,<sup>3</sup> the following resources currently qualify as RES:

- Wind
- Solar
- Geothermal
- Biomass
- Biogas
- Wave, current and tidal energy resources (not present in Turkey)
- Hydropower resources of either canal or run-off-the-river type, or with a reservoir area of less than 15 km<sup>2</sup>

Regulations are not yet tailored to each energy resource individually. As the Turkish RES market develops, it is expected that specific regulations accommodating the characteristics of each generation segment will be introduced.

The RES Law provides a purchase guarantee coupled with a guaranteed feed-in tariff for the benefit of all RES certified producers that commence their operations before 31 December 2020.

The benefit of the guarantees, which are granted through the RES certificates, is for a 10-year period. However, each RES certificate has a term of one year and must be renewed annually.

Under the RES Law, each retail licensee must source a portion of its electricity from RES certified producers. The magnitude of the purchase obligation for each retail licensee for any given year is determined based on the ratio of such retail licensees' total sales in the previous calendar year to the total amount of electricity sold in Turkey in that year. The purchase guarantee is intended to encourage investment in the RES sector by providing a guaranteed and relatively predictable minimum cash flow stream over the first 10 years of the operational life of the investment. This would substantially reduce the market risk of the investment, and therefore the cost of credit. The By-Law on Certification & Support of Renewable Energy Sources, which defines the methodology and processes to exercise this purchase guarantee, was issued by EMRA in October 2013. Currently, non-compliance of RES purchase (Article 16 of the Electricity Market Law, which describes penalties to be implied) results in financial penalties with a possibility of revocation of license. Also, electricity generation activities on a facility with at most 1 MW installed capacity can be performed without having a license.

The legislation grants various additional incentives to RES project developers, including, among others:

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<sup>3</sup> As amended by Law No. 6094 on December 29, 2010

- An option to make use of forested land and state-owned land to construct a RES plant and transmission and/or distribution lines connecting to the grid, at a discount of 85% of the land use fees during the first 10 years of the investment and/or operation period, provided that such a plant starts its operations before the end of 2015
- A 90% reduction in the pre-license and license application fees
- Exemption from annual license fee payments for the first 8 years following the facility completion date
- Priority in connecting to the transmission or distribution grid

**Table 8** License Fees as of 2013 (TL)

	Plant size	Fee
<b>Pre-License/License Application Fee</b>	0 < P ≤ 10 MW	5,000
	10 < P ≤ 25 MW	10,000
	25 < P ≤ 50 MW	15,000
	50 < P ≤ 100 MW	25,000
	100 < P ≤ 250 MW	50,000
	250 < P ≤ 500 MW	100,000
	500 < P ≤ 1000 MW	150,000
	P > 1000 MW	250,000
<b>Annual Fee</b>	0.02 TL per MWh generation	
<b>License Renewal</b>	50% of the License Fee	

Source\_EMRA

From a practical standpoint, a RES producer would only resort to the (guaranteed) feed-in price if and when the feed-in price is higher than the price at which it can sell its output through bilateral contracts, or at the market (which is driven by the relative forces of supply and demand).



Environmental Policy Related to Energy

## Background

The rapid development of all spheres of economics and human activity has led to an increasingly negative impact on the environment, including the inefficient usage of natural resources. Turkey is interested in finding solutions to the problems regarding environmental protection and rational use of natural resources. In support of Turkey's environmental protection goals, a number of important laws, legal documents and state programs have been developed and approved in order to improve the ecological situation in the country.

The country's main environmental problems are waste water pollution, including trans-boundary pollution; emission of harmful substances and greenhouse gases from industrial plants and vehicles; improper disposal of solid municipal and industrial wastes, including hazardous wastes; depletion of biodiversity; and decline in forest resources and fauna. As Turkey improves its economic performance, integrating environmental concerns into sector policies remains a key challenge for the future in order to mitigate negative environmental impacts from high-impact economic sectors, including fuel combustion industries, transportation, and buildings and services. As most energy in Turkey is generated from burning hydrocarbons, a reduction in emissions might be possible through gains in efficiency, energy saving, and the use of alternative energy sources in addition to gas and coal which have been the main sources in the power sector for a long time.

The Turkish Government pursues a policy aimed at mitigating the consequences of climate change. Its efforts include the adoption of the Climate Change Action Plan and the Climate Change Adaptation Strategy, as well as the Kyoto Protocol within the framework of the United Nations Framework Convention on Climate Change ratified in 2009, after becoming a party of UNFCCC in 2004. Its Climate Change Programme (CCP) focuses on the following areas: greenhouse gas (GHG) emission and removal inventory, climate change impact, vulnerability and adaptation, GHG mitigation, and carbon financing. The "fifth" national communication on climate change was submitted to the UNFCCC in 2013. This is the second national communication, with the first submitted to the UNFCCC in 2007.

Environmental protection has improved in recent years. First of all, the areas of forests increased from 27.2% to 27.6% from 2004 to 2012. In addition, 4.1% of the forests are protected, which corresponds to 1.1% of the country area, whereas the total share of all protected areas is 8.36%.

## Administrative Structure

MEU was established on 29 June 2011 according to Decree #644 of the President of the Republic of Turkey. It was previously under two separate bodies, namely the Ministry of Public Works and Settlement and the Ministry of Environment and Forestry. MEU is now the central executive body with environment-related responsibilities for formulating and implementing environmental policy, developing environmental protection measures, screening projects for potential adverse environmental impacts, formulating and implementing global climate change policy, monitoring implementation of environmental legislation and imposing sanctions, and administering a pollution permit system. The Climate Change and Air Management Department under General Directorate of Environmental Management within MEU is a focal point of climate change of Turkey, dealing with climate change-related international obligations, including greenhouse gases (GHG) inventory, ozone layer protection and preparing national communications for the United Nations Framework Convention on Climate Change (UNFCCC). In terms of their legal and political mandate and their capacity, environmental institutions in Turkey have become stronger than they were a decade ago with the establishment of MEU.

As the national focal point of climate change issues in Turkey, the Ministry of Environment and Urbanization carries out the coordination role on all the fields related to climate change. Besides this, before becoming a party to the UNFCCC, an institutional structuring took place in Turkey and, with the Prime Ministerial Circular No. 2001/2, the Coordination Board on Climate Change (CBCC) was established. After being restructured in 2013, the CBCC was renamed as the Coordination Board on Climate Change and Air Management, members of which are denoted below:

- Ministry of Environment and Urbanization (Coordinator)
- Ministry of European Union
- Ministry of Science, Industry and Technology
- Ministry of Foreign Affairs
- Ministry of Economy
- Ministry of Energy and Natural Resources
- Ministry of Food, Agriculture and Livestock
- Ministry of Internal Affairs
- Ministry of Development
- Ministry of Finance
- Ministry of National Education
- Ministry of Forestry and Water Works
- Ministry of Health
- Ministry of Transportation, Maritime Affairs and Communication
- Undersecretariat of Treasury
- Turkish Union of Chambers and Commodity Exchanges (TOBB)
- Turkish Industry and Business Association (TUSIAD)
- Independent Industrialists' and Businessmen's Association (MUSIAD)

## Policy

Turkey's National Environmental Action Plan (NEAP), published in 1998, marked the nation's first major strategic effort to promote environmental protection. The NEAP identified key environmental threats including severe pollution from industrial sources, overfishing, deteriorating water quality, agricultural lands damaged by pollution, salinization, desertification, erosion and deteriorating irrigation systems, loss of biodiversity, loss of forest cover and poor coastal zone management.

After joining the UNFCCC, the First National Communication was published in January 2007. After that, the second, third and fourth communications have been skipped and the Fifth National Communication under UNFCCC was issued in June 2013. The Communication includes the policies and principles of the Turkish government regarding climate change, GHG emissions, the carbon market, impacts and contributions of main sectors in Turkey to these topics (including energy), and actions and strategies taken and adopted by the government.

Following the First National Communication, within the framework of protecting global climate and sustainable development, the National Climate Change Strategy Document, approved by

the Higher Planning Council Decision dated May 03, 2010 and numbered 2010/8, has been issued. This document identifies the priority activities to be carried out in sectors for mitigating climate change, as well as urgent measures for adapting to climate change. Based on the National Strategy, Turkey's Climate Change Action Plan (2011), indicating the short-, medium- and long-term objectives for the main sectors contributing to climate change in order to adapt to and mitigate climate change, has been published. According to the Strategy Document and the Action Plan, the country's goals regarding climate change are:

- to integrate policies and measures for mitigating and adapting to climate change into national development plans and facilitate the related activities
- to limit and control the growth rate of the national GHG emissions aligned with sustainable development principles
- to increase national awareness and participation about the climate change adaptation and mitigation processes and to increase the country's capacity to reduce the impacts of global climate change, by complying with global strategies and goals
- to increase the financial resources and to develop R&D activities regarding cleaner and improved EE technologies that protect the environment

### **Environmental Legislation and Implementation**

The basis for environmental legislation is provided by the Constitution, which defines living in a healthy and clean environment as a right of the country's citizens. The main environment-related law safeguarding this right is the Law on Environment adopted in 1983.

The Law on Environment (1999) describes, in general terms:

- the rights and duties of the state, local authorities, individuals and public organizations
- acceptable uses of nature and natural resources
- the development of cadasters (inventories) and monitoring of environmental and natural resources

The legal foundations for the use of economic instruments for environmental protection and the main principles guiding environmental expenditure can be found in the Law on Environment. Articles 17, 18 and 19 establish the legal basis for the introduction of a number of financial mechanisms to protect the environment, including payments for the use of natural resources, payments and charges for environmental pollution, economic incentives, funds for environmental protection, grants, and the use of international funds allocated for environmental protection. Resources from fines are earmarked for the financing of environmental protection measures.

The Regulation on the Control of Used Oils (2004), the Regulation on the Protection of Waters against Nitrate Originated Pollution (2004), the Regulation on the Control of Industrial Air Pollution (2004), the Regulation on the Control of Soil Pollution (2005), the Regulation on Greenhouse Gas Emissions (2012), and similar regulations provide more focused but still general guidance on specific environmental problems. Taken as a whole, the laws recognize a number of important legal and regulatory principles, including: the "polluter pays" principle; the advantages of using economic incentives and market-oriented policy tools to regulate the environmental activities of enterprises; and the need for more specific laws to implement the goals of environmental policies.

The Law brings significant payments and charges for those who are polluting the environment. The owners of motor vehicles, facilities and firms (both subject to and not subject to permission) have to pay the amounts specified in the Law if they do not have the necessary documents, and twice as much if their emission levels don't comply with the standards. If the violations are around environmentally sensitive areas or at a time or a place with a highly significant amount of pollution, they have to pay twice the penalty defined above. Similar charges are applied for land and sea vehicles disposing above-standard wastes and polluting nature. Furthermore, projects violating the Environmental Impact Assessment Regulation are fined with a significant penalty. These fines are applied in order to guide people and enterprises towards environmental protection and reduce pollution. However, the system of pollution charges remains unreformed since 2006, and is largely ineffective as a policy instrument.

The legislative framework continues to require further development, especially with regard to implementing legislation. Continued attention is required in order to implement existing strategies and plans to further enhance monitoring and enforcement. Turkey faces difficulties with implementation and enforcement legislation due to limited awareness of and attention to the environmental issues.

### **International and Regional Agreements/Protocols**

MEU puts special emphasis on broadening ties with international organizations and donor countries for tackling environmental challenges. Hence, cooperation with UNDP, IAED, UNEP, NATO, OSCE, GEF, OECD, EU, Economic Cooperation Organization, World Bank, Asian Bank, World Wildlife Foundation and other organizations are continuing. Further, bilateral ties are being made with developed countries based on relevant agreements.

Joining international conventions in the area of protection of the environment is also an important priority for Turkey. To this end, the Republic of Turkey have joined 7 conventions to date, such as the Convention on Biological Diversity, the Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, the UN Convention to Combat Desertification, and the Convention on the International Trade in Endangered Species.

#### **Kyoto Protocol**

Turkey, being a member of OECD, was listed in Annex 1 and also Annex 2 of the UNFCCC together with the developed countries. Turkey didn't ratify the UNFCCC. Following the decision 26/CP.7 adopted at the 7th Conference of the UNFCCC held in Marrakech in 2001 which "recognized the special conditions of Turkey, accepted that Turkey remains an Annex I Party of UNFCCC, in a position that is different to that of other Annex I countries and Turkey will be removed from Annex II", Turkey became a party to the UNFCCC on 24 May 2004. Turkey joined the Kyoto Protocol in 26 August 2009 as a Non-Annex B country. The Fifth National Communication to the UNFCCC secretariat was prepared by the General Directorate of Environment Management (Climate Change and Air Management Department) under MEU with the backing of the UNDP/GEF in June 2013. It includes a greenhouse gas inventory for the years from 1990 to 2009, climate change scenarios and adaptation measures.

Since the Kyoto Protocol took effect in 2009, the interest in GHG emission removal projects has risen in Turkey. A number of GHG reduction projects have been prepared in various sectors, but data about the projects is available only for the energy sector. All projects in this area have been carried out in the Voluntary Carbon Market of Turkey since 2005. As of September 2012,

the number of GHG reduction projects by energy type and their reduction rates are provided in the table below.

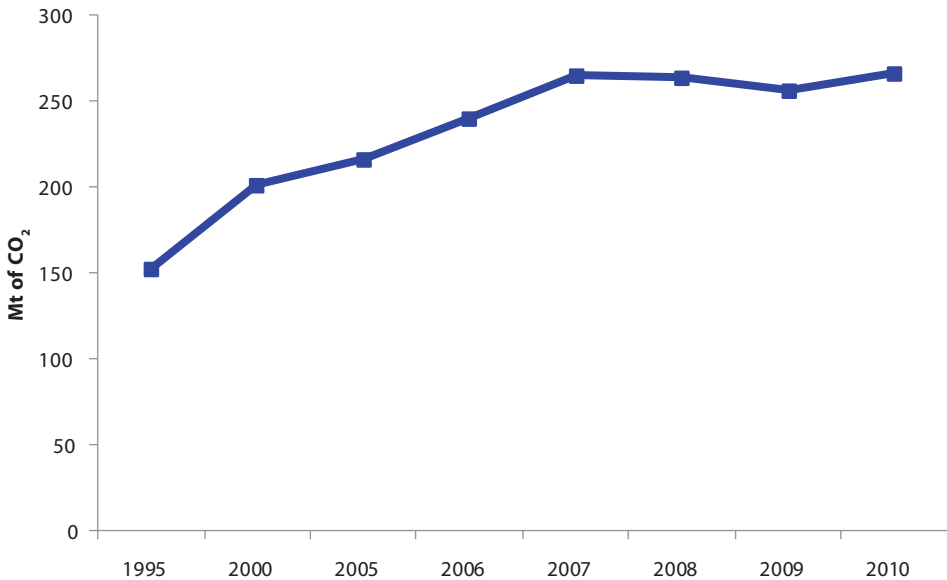
**Table 9\_GHG Reduction Projects in the Voluntary Carbon Market**

Sector	Number of Project Proposals	GHG reduction rate, thousand tonnes/year CO <sub>2</sub> eq.
Hydro	124	7181.7
Wind	64	5603.5
Biogas	6	514.8
Geothermal	6	405.3
Waste	13	2473.1
Energy Efficiency	5	151.4
<b>Total</b>	<b>218</b>	<b>16329.8</b>

Source\_General Directorate of Renewable Energy, MENR, 2013

GHG reduction has not taken place in the country yet. Due to the growth in industrial activities and consumption since 1990, the level of GHG emissions released into the atmosphere from stationary and mobile sources has increased. However, with the help of the GHG reduction projects especially in the area of energy, the increase in the CO<sub>2</sub> emitted has slowed down in the last 5 years, and even reversed a little in 2008 and 2009. While the level of pollution equated to 152.66 million tonnes of CO<sub>2</sub> in 1990, in 2010 this figure accounted for 265.88 million tonnes of CO<sub>2</sub>.

**Figure 40\_CO<sub>2</sub> emissions in Turkey over time**



Source\_IEA, 2013, based on the sector approach



The main sources of CO<sub>2</sub> emissions in Turkey are the energy and industrial sectors. CO<sub>2</sub> emissions come from the burning of fuel for the production of electricity, manufacturing and construction, and transport activities. In the industrial operations and materials use sector, the largest source is mineral materials production, with a great share of CO<sub>2</sub> emissions and halocarbon and SF<sub>6</sub> usage.

In general, there is potential for greater GHG reduction in Turkey. Replacement of fossil fuels by other sources, particularly alternative energy sources, could lead to a considerable reduction of emissions.





Assessment of Progress

## Overall Assessment

Privatisation in the power and gas sector continues. Power distribution company privatisation is complete and generation privatisation is ongoing. The privatisation of generation assets has been preceded by a large-scale rehabilitation of power plants, and this process is expected to continue after privatisation. Moreover, most gas distribution companies are privatised as well. The eligible customer limit has been lowered to 4.5 GWh in 2014. Also, due to the distribution company privatisations, a process is now in place to reduce theft and losses on average from 14.6% in 2011 to around 12.1% with separate targets for each distribution company.

The main objective of the Government of Turkey in the field of energy has been to become less dependent on imports, which currently amount to 82%, for meeting energy demand. To meet this objective, the Power Strategy Document was published in 2009. This document sets as targets for 2023: to achieve 30% of power generation from RES, and to reduce the share in power generation of natural gas below 30%.

It is a concern that Turkey's energy dependence on foreign imports is very high. Investments in RES and EE should be accelerated in order to reduce this dependence, which is also a burden on the budget balance of Turkey. This could be stimulated with an effective commitment to an energy efficiency policy. That policy is best delivered through well-crafted energy efficiency programmes and measures that meet the priority needs of Turkey.

The General Directorate of Renewable Energy (GDRE) is an active government organisation dealing with both energy efficiency and renewable energy. GDRE undertakes numerous activities, such as assessments of the renewable energy potential in Turkey, various trainings in energy efficiency, and energy efficiency subsidisation programmes, even though the funds have been limited at around €10 million.

While the introduction of energy efficiency poses challenges, it is expected to bring benefits and to contribute to mitigating risks. The in-depth review PEEREA process is designed to assist these outcomes.

## Legislative Framework, Policy and Measures to Promote Energy Efficiency

Under the "European Union – Turkey Progress Report 2013", which was concluded as part of the EU accession policy, Turkey's efforts focus in particular on the following areas: security of supply, internal energy market, renewable energy, energy efficiency, and nuclear safety and radiation protection.

The progress report concludes: "Good progress has been made in the area of energy. Liberalisation of the electricity sector and the level of alignment with the Electricity Directive are advanced. However, a functioning competitive market and progress in legislative alignment in the natural gas sector are still lacking. Progress in the renewable energy sector needs to be speeded up, namely through streamlined administrative procedures. Further efforts are needed in the areas of energy efficiency and nuclear energy, in particular on alignment with relevant EU Directives. Overall, Turkey is at a rather advanced level of alignment in the field of energy."

## Financing Energy Efficiency

The report has listed various financing schemes for energy efficiency. In the private sector Sekerbank provides energy efficiency credits, whereas development investment bank TSKB has the largest number of financed projects in the field of energy efficiency and the largest portfolio in Turkey.

International Financial Institutions have set up large funds for energy efficiency and renewable energy investments. The size of these funds is over \$3 billion. Currently, the government does not treat energy efficiency projects as a special category of investments.

### **Institutional Arrangements**

Next to GDRE there are various stakeholders active in energy efficiency in Turkey, namely the Ministries of Environment, Transport, Housing, and Industry, IFIs, professional and sector associations, universities, research centres, private consultancies and NGOs. However, the efforts of all stakeholders are generally not fully coordinated. Moreover, these stakeholders could be more proactive in proposing and encouraging the government to adopt more progressive policies and programmes.

### **Energy Pricing and Taxation**

Concerning energy pricing, Turkey is well on track. The introduction of the Automatic Pricing Mechanism (APM) in early 2008 has considerably improved the cost reflectiveness of energy prices. Nevertheless, the actual import costs are not always directly reflected in consumer prices as dictated by the APM. Hence, the APM is not always implemented as planned, which leads to temporary price subsidisation.

There are no effective tax incentives to encourage energy efficiency in Turkey. Indeed, existing energy taxes are designed with the purpose of collecting revenue and environmental protection does not appear to play a significant role in the Turkish tax system.

### **Energy Efficiency and the Environment**

The government is commended for their work on the EE strategy paper of 2012. This paper has set out seven strategic goals, which are further subdivided into concrete actions and timelines.

Energy-related environmental policies are mainly focused on supply side issues and enforcement provisions of pollution standards need to be further strengthened. Even though energy efficiency improvements and environmental protection are interlinked, the limited financial support of the Ministry of Energy and Natural Resources has been inadequate in supporting energy efficiency projects.

The energy efficiency potentials in the building, transport and industry sectors are identified based on a report by the World Bank (2011) and complemented by GDRE. This shows a total saving potential of 16.5 Mtoe with respect to the situation in 2009.

There are ongoing efforts in high-efficiency cogeneration (8,300 MW installed capacity in 2013), whereas district heating is less common. An example is the 180 MW power plant in Esenkent-Istanbul which delivers heat to 9,000 homes.

### **RES**

The assessment of the RES potential in Turkey showed that there is already 25,857 MW RES installed capacity by end January 2014, mainly hydro followed by wind. There is extensive potential for RES in Turkey, estimated at 720 TWh/year, which is three times the gross demand in Turkey of 242 TWh in 2012. The largest potential is for solar (both PV and CSP), namely 380 TWh/year; this is followed by hydro (both dam and river types) at 198 TWh/year, whereas the economic wind potential is estimated at 126 TWh/year. Bioenergy and geothermal power would both add another 16 TWh/year.

The availability of dam hydro can be used to balance the intermittent output of wind and solar. Moreover, the output of thermal power plants could be considerably reduced by developing this RES potential, which could make the GDP growth more sustainable.

A transmission grid plan has been formulated by TEIAS which shows that the target of 20 GW wind by 2023 can be safely integrated in the grid by undertaking the necessary investments.



Annex I

## Basic economic and primary energy data<sup>4</sup>

**Table 10** \_Energy balance, ktoe

Indicators	1995	2000	2002	2004	2006	2007	2008	2009	2010	2011	2012
Total Primary Energy Production	26,482	25,857	24,115	24,115	26,348	27,273	28,979	30,280	32,225	32,064	31,117
Net imports	38,253	52,227	54,367	63,422	75,764	82,120	79,503	75,769	81,020	88,524	95,442
Exports	1,682	1,330	3,117	5,308	6,750	6,328	6,982	5,521	7,113	8,369	7,927
Total Primary Energy Supply (TPES)	61,545	76,348	74,248	80,858	93,035	100,005	98,502	97,661	105,133	112,459	115,701
Total Final Consumption (TFC)	47,601	57,846	57,235	63,163	72,466	76,484	74,384	73,165	77,609	81,458	N.A.

**Table 11** \_Total primary energy supply structure, ktoe

Products	1995	2000	2002	2004	2006	2007	2008	2009	2010	2011	2012
Coal and coal products	16,616	22,905	19,608	22,377	26,448	29,385	29,461	29,758	32,034	33,925	35,067
Crude, NGL and feedstocks	26,983	23,850	26,017	25,789	26,329	25,478	23,564	16,425	19,466	20,621	21,114
Petroleum products	1,445	6,553	3,567	3,256	4,052	5,225	5,990	12,692	10,652	9,798	10,131
Natural gas	5,785	12,634	14,731	18,704	25,965	30,415	30,184	28,908	31,386	36,778	37,251
Nuclear							-	-	-	-	-
Hydro	3,057	2,656	2,897	3,963	3,805	3,083	2,861	3,092	4,454	4,501	4,976
Geothermal	511	684	820	891	978	1,048	1,150	1,624	1,966	2,059	2,265
Solar/wind/other	143	265	322	380	413	450	493	557	683	1,036	954
Combustible renewables and waste	7,065	6,513	6,016	5,557	5,187	5,055	4,828	4,667	4,558	3,661	3,695
Electricity	-60	288	271	-59	-143	-134	-29	-63	-67	78	247
Other fuel products											
Total Primary Energy Supply	61,545	76,348	74,248	80,858	93,035	100,005	98,502	97,661	105,133	112,459	115,701

<sup>4</sup> Ministry Statistics used when available and IEA statistics, electronic version, 2011 for missing data. There are some small differences between these two sources of statistics.



**Table 12** Total final energy consumption, ktoe

Products	1995	2000	2002	2004	2006	2007	2008	2009	2010	2011
Coal and coal products	6,431	10,845	9,513	11,409	12,680	13,979	12,776	12,809	14,116	13,094
Petroleum products	25,414	26,125	25,573	25,851	27,672	27,948	27,445	28,604	28,389	28,229
Natural gas	2,787	4,910	5,983	8,451	12,551	14,053	13,233	11,247	13,134	17,666
Geothermal	437	618	730	811	898	914	1,011	1,249	1,391	1,463
Solar/wind/other	143	262	318	375	402	420	420	300	302	441
Combustible renewables and waste	6,788	6,455	5,972	5,530	5,144	4,997	4,770	4,582	4,440	3,546
Electricity	5,601	8,245	8,732	10,287	12,160	13,140	13,710	13,314	14,610	15,805
Heat	0	386	415	450	959	1,033	1,019	1,060	1,226	1,216
Other	0	0	0	0	0	0	0	0	0	0
Total Final Consumption	47,601	57,846	57,235	63,163	72,466	76,484	74,384	73,165	77,609	81,458

**Table 13** Basic energy-related indicators

Indicators	1995	2000	2002	2004	2006	2007	2008	2009	2010	2011	2012
Population (million)	59.76	64.25	66.01	67.72	69.40	70.22	71.10	72.05	73.00	73.95	74.98
GDP (billion 2005 \$)	315.9	386.6	387.0	445.6	516.3	540.4	544.0	517.7	565.1	614.7	628.4
GDP (billion 2005 \$ PPP)	510.9	625.3	626.0	720.7	835.1	874.1	879.8	837.4	914.1	994.3	1016.5
Primary Energy Intensity (TPES/GDP) (toe per thousand 2005 \$)	0.195	0.198	0.192	0.182	0.180	0.185	0.181	0.189	0.186	0.183	0.184
Primary Energy Intensity (TPES/GDP PPP) (toe per thousand 2005 \$ PPP)	0.121	0.122	0.119	0.112	0.111	0.114	0.112	0.117	0.115	0.113	0.114
TPES/Population (toe per capita)	1.030	1.188	1.125	1.194	1.341	1.424	1.386	1.356	1.440	1.521	1.543
Electricity Consumption/GDP (kWh per 2005 \$)	0.227	0.270	0.281	0.285	0.290	0.302	0.314	0.319	0.319	0.322	0.334
Electricity Consumption / Population (kWh per capita)	1,201	1,627	1,646	1,872	2,159	2,327	2,400	2,291	2,469	2,677	2,801
Energy-related CO <sub>2</sub> Emissions (Mt)	51	74	70	73	89	105	113	111	111	-	-

**Table 14** Electricity generation, *GWh*

Products	1995	2000	2002	2004	2006	2007	2008	2009	2010	2011	2012
Coal and coal products	28,047	38,187	32,149	34,448	46,650	53,431	57,716	55,684	55,047	66,217	68,013
Petroleum products	5,772	9,311	10,744	7,670	4,340	6,526	7,519	4,804	2,180	904	1,638
Natural gas	16,579	46,216	52,497	62,241	80,691	95,025	98,685	96,095	98,144	104,048	104,506
Hydro	35,541	30,879	33,683	46,084	44,244	35,851	33,270	35,958	51,796	52,338	57,865
Geothermal	86	76	105	93	94	156	162	436	668	694	899
Solar/wind/other	0	33	48	58	127	355	847	1,495	2,916	4,723	5,861
Combustible renewables and waste	222	220	174	104	153	214	219	340	457	469	715
Total electricity generation	86,247	124,922	129,400	150,698	176,299	191,558	198,418	194,812	211,208	229,393	239,497

**Table 15** Heat production, *TJ*

Products	1995	2000	2002	2004	2006	2007	2008	2009	2010	2011	2012
Coal and coal products	0	22	1	0	17	19	14	13	21	25	72
Petroleum products and natural gas	0	365	414	450	942	1,013	1,002	1,043	1,200	1,182	1,210
Hydro	0	0	0	0	0	0	0	0	0	0	0
Solar/wind/other	0	0	0	0	0	0	0	0	0	0	0
Combustible renewables and waste	0	0	0	0	0	1	3	4	5	9	26
Total heat production	0	387	415	450	959	1,034	1,020	1,060	1,226	1,216	1,309

**Table 16** Total final energy consumption by sector, *ktoe*

Sectors	1995	2000	2002	2004	2006	2007	2008	2009	2010	2011
Residential	16,044	17,594	16,654	18,077	19,892	20,725	22,603	21,402	22,453	23,528
Industry sector	12,257	19,741	18,740	21,342	23,432	23,668	18,014	18,605	22,583	24,957
Commercial and public services	1,107	2,315	2,879	4,096	5,824	6,416	7,634	6,493	5,693	6,449
Transport sector	11,704	11,758	11,799	12,003	14,004	15,952	15,067	14,938	14,631	14,849
Other	2,661	2,917	3,187	3,263	3,539	3,886	5,696	4,874	5,050	5,479
Non-energy use	3,828	3,521	3,977	4,382	5,775	5,837	5,369	6,853	7,200	6,196
Total final consumption	47,601	57,846	57,235	63,163	72,466	76,484	74,384	73,165	77,609	81,458



Annex II

## Energy end use

**Table 17**\_Final energy consumption of the residential sector, *ktoe*

Energy products	1995	2000	2002	2004	2006	2007	2008	2009	2010	2011
Coal and coal products	2,451	2,015	1,730	2,405	2,488	2,750	4,930	5,898	6,465	5,786
Electricity	1,246	2,054	2,026	2,375	2,964	3,137	3,404	3,367	3,561	3,807
Natural gas	1,123	2,694	3,117	3,896	6,181	6,901	6,524	4,396	4,847	7,225
Heat	0	0	0	0	0	0	0	0	0	0
Petroleum products	3,895	3,592	2,880	2,806	1,956	1,745	1,686	1,616	1,452	1,275
Combustible renewables and waste	6,788	6,455	5,972	5,530	5,125	4,984	4,755	4,576	4,434	3,530
Other	542	783	929	1,065	1,179	1,208	1,305	1,549	1,694	1,904
Total residential sector	16,044	17,594	16,654	18,077	19,892	20,725	22,603	21,402	22,453	23,528

**Table 18**\_Final energy consumption of the service sector, *ktoe*

Energy products	1995	2000	2002	2004	2006	2007	2008	2009	2010	2011
Coal and coal products	0	0	0	0	0	0	1,061	834	272	278
Electricity	1,107	1,897	2,137	2,522	3,040	3,350	3,504	3,589	3,880	4,131
Natural gas	0	417	742	1,574	2,784	3,066	3,069	2,069	1,541	2,040
Heat	0	0	0	0	0	0	0	0	0	0
Oil products	0	0	0	0	0	0	0	0	0	0
Combustible renewables and waste	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Total services sector	1,107	2,315	2,879	4,096	5,824	6,416	7,634	6,493	5,693	6,449

**Table 19**\_Final energy consumption of the industry sector, *ktoe*

Energy products	1995	2000	2002	2004	2006	2007	2008	2009	2010	2011
Coal and coal products	3977	8828.9	7783.2	9003.9	10192	11229	6120.9	5943.3	7287.2	6938.6
Electricity	3,074	3,964	4,203	4,992	5,707	6,145	6,220	5,881	6,636	7,366
Natural gas	1,041	1,666	1,671	2,447	3,338	3,717	3,194	4,388	6,309	7,877
Heat	0	0	0	0	0	0	0	0	0	0
Petroleum products	4,127	4,799	4,548	4,329	3,115	1,419	1,334	1,333	1,125	1,559
Combustible renewables and waste	0	0	0	0	0	0	0	0	0	0
Other fuel products	38	97	119	121	121	126	126	0	0	0
Total industrial sector	7,018	3,274	1,989	1,845	1,571	1,896	1,274	1,493	953	798

**Table 20** Energy consumption of the industry sector by subsector, *ktoe*

Subsectors	1995	2000	2002	2004	2006	2007	2008	2009	2010	2011
Iron and Steel	2,333	2,340	2,186	2,361	2,519	2,977	3,334	2,972	3,920	4,659
Chemical and Petrochemical	1,083	1,355	1,413	2,284	2,296	1,702	1,071	1,209	1,428	2,033
Non-Metallic Minerals	808	1,047	910	1,138	1,228	1,356	2,099	2,066	2,210	2,290
Non-Ferrous Metals	536	704	716	891	1,047	1,008	356	636	710	857
Transport Equipment	13	24	25	52	36	28	40	55	39	251
Food and Tobacco	895	1,167	1,030	1,076	1,108	1,228	1,020	1,101	1,477	1,982
Mining and Quarrying	77	59	49	60	97	113	121	117	216	213
Machinery	151	245	234	246	258	283	444	380	480	528
Construction	1,345	1,308	1,178	1,876	2,195	2,319	3,039	2,311	2,604	3,163
Textile and Leather	1,016	1,373	1,588	1,674	1,617	1,564	1,172	1,469	1,724	1,799
Paper, Pulp and Printing	290	408	368	377	392	383	364	363	345	426
Wood and Wood Products	190	57	54	70	89	120	140	472	472	211
Non-specified/Other	3,520	9,655	8,990	9,236	10,551	10,589	4,815	5,454	6,957	6,545





Annex III

## **Organizations met by the review team**

Association of Energy Management (EYODER)

Association of Thermal Insulation, Waterproofing, Sound Insulation and Fireproofing Material Producers, Suppliers and Applicators (IZODER)

Baskent Electricity Distribution Company (ENERJISA)

Energy Market Regulatory Authority

European Bank for Reconstruction and Development (EBRD)

General Directorate of Electricity Generation

General Directorate of Electricity Generation (EUAS)

General Directorate of Renewable Energy (GDRE)

Industrial Development Bank of Turkey (TSKB)

Ministry of Energy and Natural Resources, General Directorate of Foreign Affairs and EU

Ministry of Environment and Urbanization (MEU)

Ministry of Environment and Urbanization, General Directorate of Environment Management

Ministry of Science, Industry and Technology (MSIT)

Ministry of Transport, Maritime Affairs and Communication (MTMAC)

Schneider Electric Turkey

Scientific and Technological Research Council of Turkey (TÜBİTAK)

Sekerbank

Sisecam

Small and Medium Enterprises Development Organization (KOSGEB)

Turkish Cement Manufacturers' Association

Turkish Cogeneration and Clean Energy Technologies Association (TURKOTED)

Turkish Development Bank (TKB)

Turkish Electricity Distribution Company (TEDAS)

Turkish Electricity Transmission Company (TEIAS)

Turkish Sustainable Energy Financing Facility (TURSEFF)

Turkish Technology Development Foundation (TTGV)

White Goods Manufacturers' Association of Turkey





Annex IV

## List of abbreviations

Abbreviation	Full name
\$	US Dollar
ACG	Azeri–Chirag–Guneshli
AFD	French Development Agency
APM	Automatic Pricing Mechanism
BOO	Build, Operate and Own
BOT	Build, Operate and Transfer
BOTAS	Turkish Petroleum and Gas Transmission Pipeline Company
BSR	Balancing and Settlement Regulation
BTC	Baku–Tbilisi–Ceyhan pipeline
CAGR	Compound Annual Growth Rate
CCGT	Combined Cycle Gas Turbine
DAM	Day-ahead Market
DSI	State Water Works
EBRD	European Bank for Reconstruction and Development
EE	Energy Efficiency
EECB	Energy Efficiency Coordination Board
EIB	European Investment Bank
EHV	Extra High Voltage
EML	Turkish Electricity Market Law
EMRA	Energy Market Regulatory Authority (for Electricity, Petroleum and Natural Gas)
EPDK	EMRA's acronym in Turkish
EU	European Union
EUAS	Electricity Generation Co.
FIT	Feed-in Tariff
GDP	Gross Domestic Product
HPP	Hydroelectric Power Plant
IEA	International Energy Agency
IMF	International Monetary Fund
IPP	Independent Power Producer
KfW	German Development Bank
KOSGEB	Small and Medium Enterprises Development Organization
KPI	Key Performance Indicator
LPG	Liquefied Petroleum Gas

MCP	Market Clearing Price
MENR	Ministry of Energy and Natural Resources
MEU	Ministry of Environment and Urbanisation
MSIT	Ministry of Science, Industry and Technology
MTA	Mining Research and Study Institute
NATO	North Atlantic Treaty Organization
NG	Natural Gas
OECD	Organization for Economic Cooperation and Development
OIB	Turkey's privatisation administration
OSCE	Organization for Security and Cooperation in Europe
PMUM	Market Financial Settlement Centre
PPA	Power Purchase Agreement
PV	Photo Voltaic (solar)
RES	Renewable Energy Source
SIP	System Imbalance Price
SMP	System Marginal Price
SOCAR	State Oil Company of the Azerbaijan Republic
TANAP	Trans-Anatolian Pipeline
TCMB	Central Bank of Turkey
TEAS	Turkish Electricity Corporation
TEDAS	Turkish Electricity Distribution Co.
TEIAS	Turkish Electricity Transmission Co.
TEK	Turkish Electricity Authority
TETAS	Turkish Electricity Trading and Contracting Co.
TKB	Development Bank of Turkey
TKI	Turkish Lignite Co.
TOR	Transfer of Operational Rights (modality for transferring to the private sector the operation of state-owned assets and used for generation and distribution)
TOROTOSAF	Average wholesale price transferred to regulated end-users. It is a weighted average of TETAS pass-through costs, balancing market, self-generation by suppliers, renewable purchases and free bilateral contracts
TPAO	(state-owned) Turkish Petroleum Company
TPP	Thermal Power Plant
TSE	Turkish Standards Institute
TSKB	Industrial Development Bank of Turkey

TSO	Transmission System Operator
TTGV	Technology Development Foundation of Turkey
TTK	Turkish Hardcoal Co.
TUoS	Transmission Use of System
Units	kWh: thousand watt-hours
	MW: megawatt
	Mtoe: million tonnes of oil equivalent
	toe: tonnes of oil equivalent
	TWh: 1012 watt-hours
WB	World Bank
WHO	World Health Organization
WPP	Wind Power Plant
WTO	World Trade Organization



Annex V

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Boulevard de la Woluwe, 56  
B-1200 Brussels, Belgium  
Tel.: +32-2-775-98-00 · Fax: +32-2-775-98-01  
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