



TURKISH
COGEN AND CLEAN
ENERGY TECHN.
ASSOCIATION

THE EUROPEAN COGENERATION REVIEW

COUNTRY REPORT

TURKEY 2013

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November 2013

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1. COUNTRY OVERVIEW

Located in southeast Europe and southwest Asia, Turkey has a population of about 75.0 million and a surface area of (app.) 800.000km².

TURKEY is a rapidly growing economy. Over the past decade, its GDP has increased (average) 6%. Thus, Turkey was the 2nd country of the fastest growing countries in the economy around the world. The unemployment rate was 8,5% in 2012, while per capita GDP is 10,300 USD. As it is in all developing economies, services constitute 63% of GDP in 2012, industry 26% including construction, textiles, vehicle manufacturing, food processing. The agriculture accounts 11% of GDP.

As of 2012, Turkey is 17th largest economy in the world. Geographically located in the same region, which owns 72 % of the world gas and oil reserve , in particular those in the Middle East, Caspian Basin and Central Asia, Turkey forms a natural energy corridor between energy producing countries and big consumer markets. Turkey, by taking advantage from its geographical situation, runs to be a regional energy trading hub.

Due to the lack and poor quality of primary resources, Turkey is highly dependent on imported energy. According to the Ministry of Energy, import dependency was above 72% in 2012. This is underpinned by the dependency on natural gas imports which account for nearly 43% of total electricity production.

To secure the supply of electricity in longer term, the government is putting out to tender the construction of nuclear power plants. In May 2010, Russia and Turkey signed an agreement that Russian ROSATOM would build, own, and operate a power plant at Akkuyu, comprising of four units, 1,200 MWe each. The first reactor is expected to enter into service in 2020. The second NPP is decided to be built in Sinop. The Memorandum of Understanding is signed with Japan last week.

Turkey is the one of the fastest growing countries from medium to long term growth in energy demand, among OECD countries. It has a young and urbanising population and energy use per capita is still comparatively low (app. 1.58 Toe/capita in 2012). Therefore, ensuring sufficient energy supply to a fast growing economy, remains the government's main energy policy concern.

TURKEY's total primary energy supply (TPES) was 115 millions tonnes of oil equivalent (Mtoe) in 2012. Turkey depends on import of 72% if its energy sources, including oil, natural gas and high grade coal because, the indigenous production constitutes only 28% of the total energy demand.

Insufficient energy sources, high energy prices, power quality problems, dirty air and global climate change, force Turkey, to develop the energy saving policies to the maximum extent possible, CHP is a proven technology and is one of the most cost-effective sources, Turkey needs CHP now, more than ever.

2. PAST DEVELOPMENT OF CHP

- Up to year 1984, Power related investments and operations were under the monopoly of Turkish Electricity Authority (TEK).
- Either the quality of electricity (frequency, voltage, availability, accessibility etc.) and supply was controlled by TEK.
- Industrial and/or residential consumers had to satisfy with the available and accessible electricity.
- In 1984, Law No:3096 was enacted by the Turkish Parliament. First time in Turkish power history, the subject law was giving the right of build, right of operation and right of ownership of the power generating facilities. (Autoproducers)
- The title of the related regulation was “Regulation for autoproduction of Electricity”
- Thus, first cogeneration plant was built in 1992 (Yalova Elyaf – 4 MW).
- At that time, natural gas network was only available in Marmara Region (almost 1/6th of Turkey). Therefore, the number of the new cogen plants were limited.
- After year 1995, gas network was enlarged by Botas and new cogen plants were built.
- As of year 2012 natural gas is accessible almost in 80 cities in Turkey

The total capacity of CHP plants has reached to 8.300 MW (at the end of first period of 2013). Turkey’s total installed capacity reached 60.000 MW and the produced electricity was 240 TWh by the end of 2012. The numbers show that the share of installed capacity of CHP, in the total capacity, is 14%.

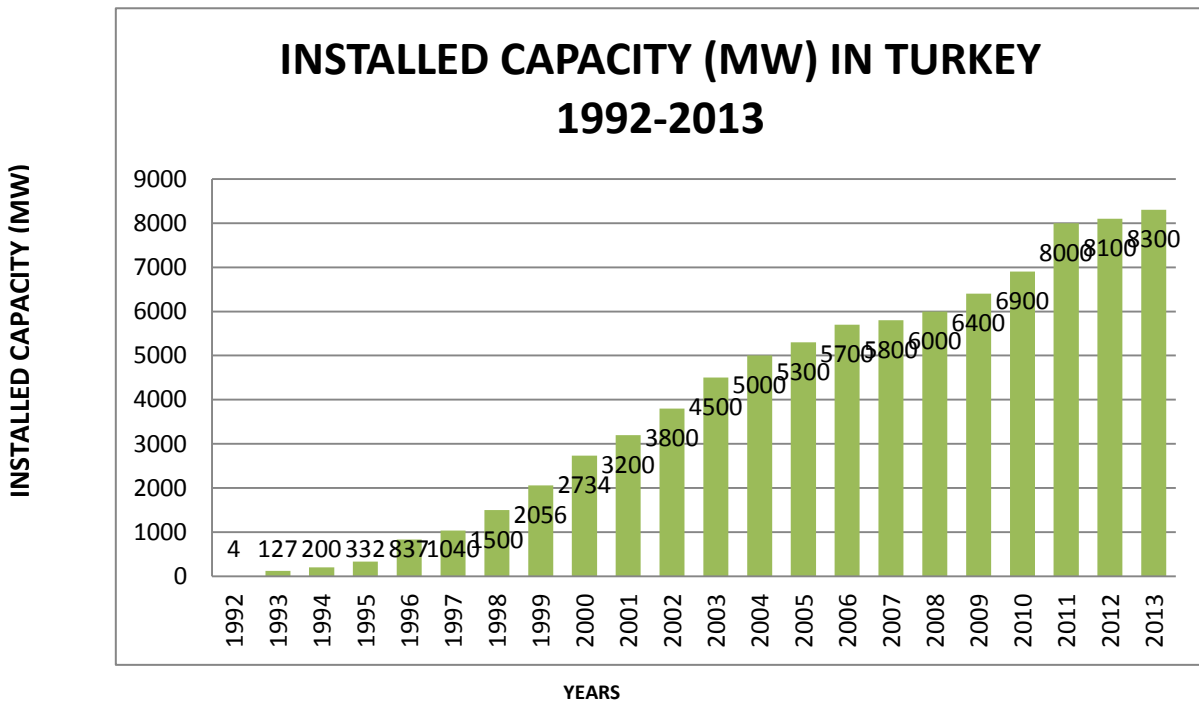


Figure 1. Development of Cogeneration Capacity in Turkey between 1992 – 2013

As you can realize at this figure, after 2004, the natural gas prices were rising up so fast that, the capacity rise in CHP is started to develop slowly.

The Figure – 2 indicates, how natural gas prices were fluctuated from March 2004 to November 2012:

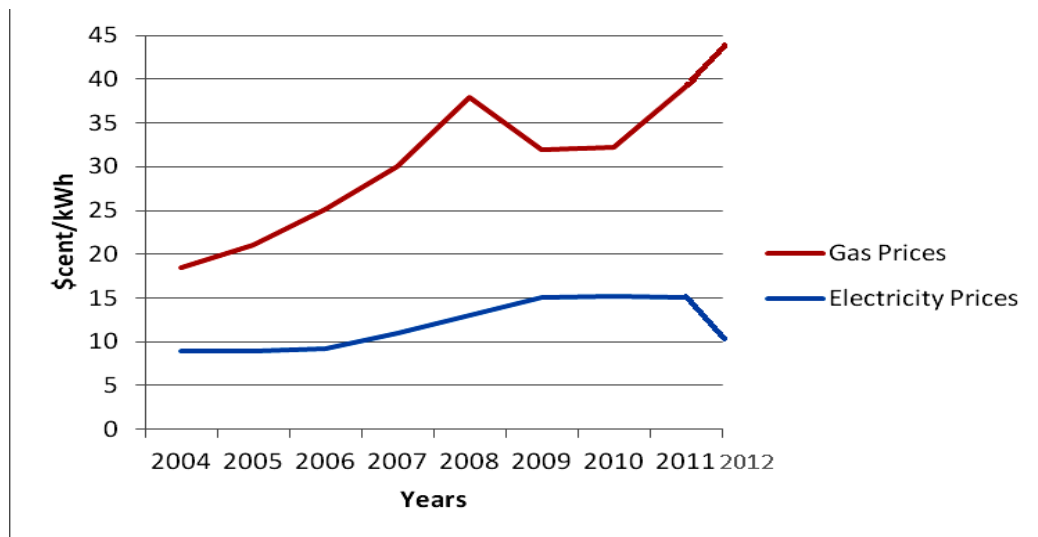


Figure 2. Change of Natural Gas and Electricity Prices from March 2004 to November 2012

2.1. CHP by Sector

The Textile, Iron and Steel Industries, Chemical Plants Ceramic Industry and Paper Mills are target sectors in Turkey for the implementation of cogeneration systems. On the other hand, Organized Industrial Zones and Custom Free Zones are best combination of Industrial facilities where Cogeneration or Combined cogeneration design and technology can be implemented successfully.

— Upon process type:

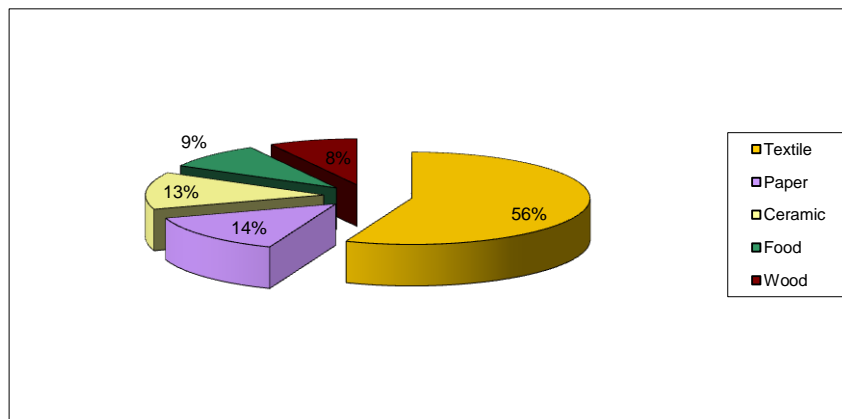


Figure 3. CHP by sector

3. RECENT LEGISLATIVE CHANGES IN TURKEY

From our last year report on (Country Report 2012), 3 major changes have been made in the legislation of Energy Market.

1- The revision of the old Electricity Directive, numbered 4628 (2001), new draft (numbered 6446) has been enacted from Turkish parliament in March 2013. Now, this Law is into force.

2- The second change was in fact in the subject draft, but since this change is very important for Turkish cogeneration environment, we underline it separately: That in the cancellation of former Autoproduction system and replacing it with production license. However, all right of the former Autoproducers shall be kept. New cogeneration applications shall be made to EMRA(Electricity Market Regulatory Authority) only to get “production license”.

3- The third important change in the law numbered 6446, is the license exempted production of electricity. From now on, eligible consumers can build their own electricity generation facilities without getting any license from EMRA. This regulation has been published in Official Gazette dated

2nd of October 2013. According to this regulation, the following generation facilities are to be exempted from license:

- a) Emergency groups,
- b) Renewable energy generation facilities up to 1 MW installed capacity (Renewables mean, wind, solar, geothermal, biomass, biogas).
- c) Cogeneration facilities which have high cycle efficiency (Efficiency limit will be set by Ministry of Energy later)
- d) Micro cogeneration units
- e) "Waste to energy" facilities

The applications of this kind of facilities will be made to the regional electricity distribution system. If the system capacity is big enough, the new facilities can sell the surplus electricity to the grid with the official (YEKDEM) feed-in-tariff. As of today, the official YEKDEM (renewable based) feed-in-tarif is indicated at the table below.

Surplus electricity will be purchased by the regional electricity distribution company for 10 years duration with the above mentioned tariffs, provided that subject production units are going to be in operation earlier than 2015.

Schedule I	
Type of Production Facility Based on Renewable Energy Resources	Prices Applicable (US Dollar cent/kWh)
a. Hydroelectric production facility	7.3
b. Wind power based production facility	7.3
c. Geothermal power based production facility	10.5
d. Biomass based production facility (including landfill gas)	13.3
e. Solar power based production facility	13.3

Table 1 Feed – in Tariffs for Electricity Production based on Renewable Energy Resources

The most important part of this regulation for cogeneration environment is the efficiency level to be set up by Ministry of Energy. As TURKOTED, we have already submitted a draft of definition which is prepared in line with EU Energy Efficiency Directive, just to keep cogeneration efficiency value at a

reasonable limit. Otherwise, existing lowest cogeneration efficiency level for cogeneration facilities is 80%. This ratio is very high. This wrong understanding should be changed with an official definition, similar to the former Formula which is in Energy Efficiency Directive. Our aim is to share the same understanding with EU Community in the definition of high efficiency cogeneration systems.

Since the privilege of autoproduction is lifted, new CHP operators cannot get advantage of free distribution systems operation fee for electricity to be generated by CHP facilities.

4. INCENTIVES FOR COGENERATION

High efficiency cogeneration systems can benefit from the following incentives:

- Connection to the grid will be in priority,
- High efficiency CHP facilities don't need to provide license from EMRA (Energy Market Regulatory Authority),
- All micro cogeneration units don't need to provide license. But their connection to grid is still under discussion. Because new private owners of the electricity distribution system may prefer to deal with big customers,
- If biomass power based design covers the "made in Turkey" cogeneration system, 0.4 US\$cent/kWh for steam or gas turbine 2.0 US\$cent/kWh, for internal combustion engine or stirling engine 0.9 US\$cent/kWh bonus are to be added at the top of feed-in tariffs.

5. BARRIERS TO COGENERATION

- Energy distribution company (TEDAŞ) or state energy whole sale company (TETAŞ) is not obliged to buy surplus electricity from CHP facilities. Instead cogeneration producer can sell the surplus electricity in free electricity market.
- For some cases, the requirement that new lines obligation to the distribution center can make grid connection very expensive.

6. ACCESSIBILITY TO THE NATURAL GAS

The main energy source (fuel) for any cogen plant is the natural gas. 85% of the total gas consumption is supplied by Botas. Botas transmits the gas to the RMS station of city gas distribution systems. So, gas can accessible at each corner of Turkey.

6.1. Legal Framework of Natural Gas

Natural gas Market Law (Nr. 4646) is still in force in Turkey.

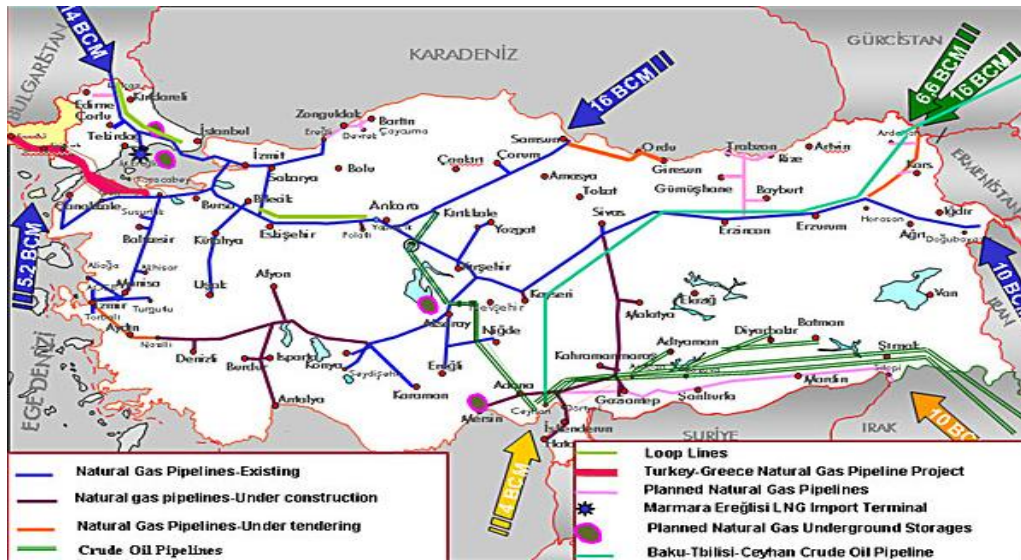
According to subject law:

- Botas constructs the gas transmission network to make gas accessible in all corners of the country. Operation of these pipelines will be fulfilled by Botas. Only 15% of the total gas consumption will be supplied by gas supporting companies.
- Market share of Botas shall be gradually reduced in such a manner that, in 2009 Market share of Botas should not exceed 20% of the country's total, but this target has not been reached yet.

Gas purchasing responsibility of Botaş is still going on.

- The subject gas market law (which is in force) is so far from meeting the existing market requirements.

However, new draft of Law which aims to restructure this situation in on the way of Turkish Parliament.



Map 1. Oil and Natural gas Import Gates and Transit Transportation Map

6.2. Gas Prices

- Since all “Gas Purchasing Contracts” have been signed and operated by public gas concern Botas, Botas is dictating gas wholesale and retail prices in Turkey. Only, some IPP operators can purchase gas from private gas companies.
- Due to this monopolistic policy, gas prices have been increased 260 percent (based on TL) in last 9 years (from 2004 to 2013).

6.3. Executive Summary of Natural Gas Situation

- Public gas concern Botas dominates the gas market,
- Gas price to IPP operators is higher than EU average (app. 12 \$/MM Btu).
- The free gas market has not been established yet,
- Although gas is accessible everywhere, Botas does not guarantee to meet demand of new CCGTs and Cogeneration plants,
- Fast increase of gas demand is forcing Botas and licensed gas importers (private) to search the new gas suppliers,
- The construction of new LNG degasification terminals and underground storage is unavailable.

7. ELECTRICITY MARKET

Turkey's Economy, Energy & Power



Figure 4. Projection of Turkey's Economy, Energy and Power Development up to 2022

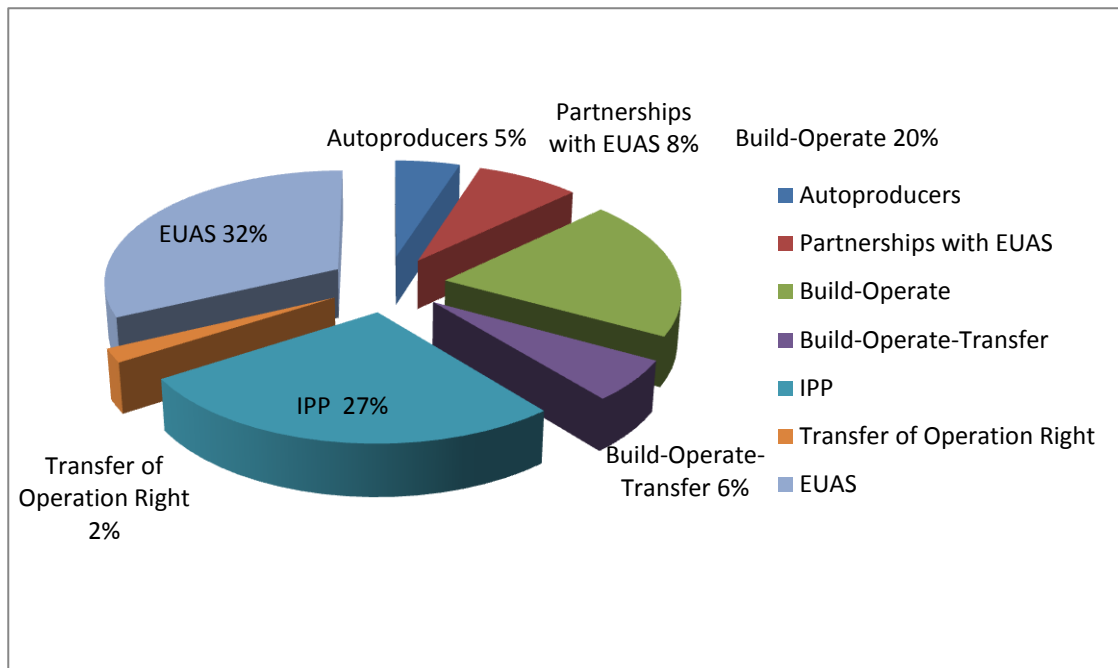


Figure 5. Electricity Production Percentages upon Producing Groups in 2011

In 2011, 44.7% of the electricity generation was from natural gas, 28.8% from hydraulic resources, 16.9% from lignite, 10% from imported coal 1.5% from fuel-oil, 2.1% from wind and 1.97% from other sources.

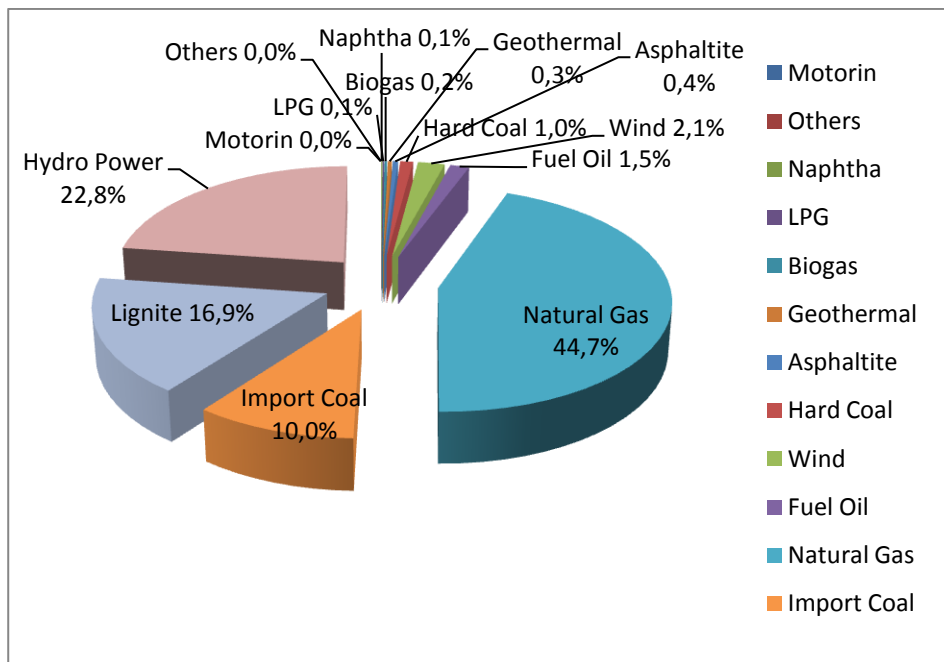


Figure 6. Dispersion of Electricity Generation upon the sources

As of 2012, almost 60% of the electricity is generated by private sector, only 39% was generated by Public Company (EUAS),

Approximately 44% of the electricity was generated by gas firing power plants (including cogenerated electricity),

Imported energy resources are dominating the major part of electricity generation,

8. RENEWABLE POTENTIAL IN TURKEY

8.1. SOLAR ENERGY

The solar energy potential is very high in Turkey. Especially, the southern and southeastern part of Turkey is exposed to sun more than 5000 hours in a year. The following solar map, prepared by MENR shows that, the biggest part of Turkey is exposed to solar energy average 12 to 14 hours per day. Solar energy has been used up to now, only for heating purpose in residential buildings or in the offices. The government issued new incentives for renewable recently. Incentives are not in the form of bouns, but they are in the form of feed-in tariffs. For solar based electricity prouction, only 13.3 USDcent/kWh feed-in tariff accepted. This tariff is not high enough to make solar electricity production (PV) feasible. This feed-in tariff do not encourage the investors for solar power production.

9. RENEWABLE ENERGY SOURCES MARKET

Since Turkey is not self-sufficient in energy production, the maximum utilization of the national resources is becoming the most important strategic target of the Governments. After Turkey's commitment to "Kyoto Obligations" in 2010, renewable energy resources and their investments are being supported with the incentives and the renewable feed-in tariffs which can be seen at Table 1 at the earlier pages , reinforced with 10 years purchasing guarantees.

The Regulation on Renewable Energy Support Mechanism and the Regulation on License-Exempt Generation provide significant regulatory guidance on the implementation of the Renewable Energy Law. In addition, the domestic component price incentives are generally viewed as an important development that could bolster the Turkish renewable energy components sector. On the other hand, the regulations on solar plants are viewed as having somewhat more limited impact due to the strict cap on the portion of installed capacity that can be connected to the grid prior to December 31, 2013.

10. AIR POLLUTION AND GHG CONTROLS

Since 1986, Turkey is an active partner of United Nations Project Development (UNPD). In that respect, Turkey has followed and is following all kind of regulations and change of regulation issued by United Nations for Air Quality Control. In addition, high environmental standards and pollute controls have been put in place in Turkey since 1990.

The applicable Turkish legislation now largely follows the “EU Large Combustion Plants Directive” the most recent coal-fired power plants have been built either with fluidized bed technology or pulverized coal technology equipment with the flue gas desulphurization (FGD). These technologies reduce SO₂&SO₃ emissions. Almost all coal fired plants are completely equipped with FGD plants and electrostatic precipitates.

Privatization of generation segment of the electricity market is considered an important tool to improve productivity and environmental performance of existing plants. In this context, further environmental upgrades will be incorporated into requirement of new owners, as coal-fired plants are privatized.

Turkey stands out among OECD countries unforeseen a large expansion in coal-fired power generation to meet rapid growth in electricity demand. The development of indigenous resources is a priority for the Turkish government. The use of coal creates risk of both local environmental pollution and GHG emissions. Environmental and climate change issues are fully taken into account, when assessing the competitive position of lignite/coal in the power generation mix carbon prices will be an important factor for the tenability of coal/lignite power plants investments.

Today more than 18.000 MW total capacity is composed of combined cycle gas firing power plants and cogeneration facilities. This situation helped a lot to reduce air pollution and GHG in Turkey.

11. DEVELOPMENT OF MICRO COGENERATION

On July 21, 2011, Turkish Parliament enacted “License Exemption for Production of Electricity Legislation” in order to support establishment of power plants producing under 500 kW using renewable energy and introduce a new technology which was called micro-cogeneration with the total capacity 50 kW and under for providing heat and electricity for especially residential buildings. In this Legislation, the recognition of Micro – CHP was included and explained that was a technology which has the installed capacity 50 kW and under for producing both electricity and heat energy together for enlarging to use in the households at the large part. Furthermore, the Micro-CHP users

are exempt to get license from EMRA. According to this legislation, surplus energy, produced by Micro-cogeneration unit, is supplied to the system within scope of the tariff evaluated by distribution companies holding retail licenses. Today, this tariff is applied as the lowest price of feed in tariffs (7.3 \$cent/kWh) for renewable energy sources stated in “Renewable Energy Sources Law Nr: 5627”. Since the date of published legislation, there is not any progress or acceleration in the use and application of Micro-CHP in Turkey. The high price of Micro-CHP units and lack of technical knowledge for connection between building and grid are the main reasons in the slowing development of this technology for investors.

12. CONCLUSION OF TURKEY’S COGENERATION REPORT, 2013

- Cogeneration based investments are slowing down in Turkey. The existing incentives for investment have been cancelled on 2012.
- The legal frame work for autoproduction has been annulled by the new law Nr. 6446. It is replaced with IPP system. However, the rights of old units are preserved.
- Unlicensed power production systems have been enacted. According to the new law (Nr. 6446) high efficiency cogeneration investments will be exempted from the license obligation.
- Notwithstanding high gas prices, CHP undertakings have been developing in shopping malls, hospitals, university&school campus, hotels, holiday resorts very fast in Turkey.
- Turkey needs to enact “Electricity Directive” in order to lower the existing efficiency limit of 80%. Otherwise, only a few CHP facilities can be officially accepted as “high efficient CHP”.
- CHP in district heating or in satellite cities are running slowly. Construction contractors or mass housing investors are hesitating to substitute the “conventional central heating systems” with CHP systems. We need to use European experience gained during last 100 years of operation. We need the support of “Cogen Europe” to provide this experience and transmit to TURKOTED.