Garanti Bank

2015 Electricity Market Report

2015-2025 Projections
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The forecasts presented in this presentation are based on the outcomes of the TGB’s internally developed **Electricity Market Forecast Model**. These outcomes are grounded on a detailed set of assumptions including but not limited to electricity demand growth, installed capacity growth, commodity prices, technical specifications, hydrology, weather conditions, privatizations, legislation, pricing mechanism, and market conditions etc... Different set of assumptions will produce different outcomes from the model.

**Electricity Market Forecast Model** has been developed internally by Garanti Bank project finance department energy team in 2010. Garanti is the first and the only bank in Turkey with a forecast model, which has the capability of forecasting demand, supply, merit order and power plant EBITDAs on an hourly basis. The model is upgraded, calibrated and rerun every year with updated assumptions. The outcomes of the updated model are used to drive Garanti Bank’s strategies in the energy sector and for the financial analysis of the potential projects throughout the year.
Executive Summary

As the largest lender in project finance with a loan book of $13 billion dollars, energy sector forms one of our key market segments. With a total commitment of $11 billion and a current exposure of $6.7 billion, energy projects account nearly half of our project finance portfolio.

At such level of exposure, monitoring the development and the outlook of the energy markets becomes a priority for ensuring the quality of our assets. In line with this we, as Garanti Bank, have been deeply analysing the sector and conducting forecasting studies about the Turkish electricity market since late 2000’s.

This report summarises the 10 key highlights we have outlined from our extensive studies with regards to the historic evolution and the future development of the Turkish electricity market. Each of these conclusions are explained in depth in the following slides together with the underlying factors.

1. Demand is moving to a medium growth phase
2. Supply is growing faster than demand
3. Renewable projects will dominate the financing pipeline
4. Privatizations will have a hidden capacity increase effect
5. Reserve margin (excess capacity) will be increasing
6. Share of natural gas power plants will fall significantly
7. The system will still require CCGTs
8. Lower commodity prices will affect all IPPs (Independent power producers)
9. Oil prices will determine the long-term level of the spot electricity prices
10. Climate change policies will shape the energy markets

We believe that the Turkish electricity market will continue to be a strategic sector for the sponsors and the financiers due to sound fundamentals in the long-term. We will continue our strong support in the financing of energy projects.
Demand is moving to a medium growth phase

- Average demand growth after global crisis fell from 6.9% to 5.1%.
- Last 3 years average decreased further to 3.7%.
- 10 year moving average approaching 5.0%.
- GDP is the most important driver of growth. CAGR after 2009 is 4.4% vs. 6.0% before 2009.
- All important growth drivers indicate that Turkey is moving from a high growth to medium growth phase.

Important Growth Drivers

1. Gross Domestic Product
2. Energy Efficiency
3. Electric Motors
4. Iron & Steel Factories
5. Service Driven Economy
We expect demand increase to levelize around 4.5-5.0% p.a.

**Demand Growth Projection**

**Base Case:**
- L/T demand 2015-2025 CAGR: **4.6%**.
- GDP Assumptions: 2015-**3.25%**, 2016-2025-**4.2%**.

**Downside Scenario:**
- L/T demand 2015-2025 CAGR: **3.5%**.
- GDP Assumptions: 2015-**3.0%**, 2016-2025-**3.5%**.

* Demand figures don’t include loss & theft and internal consumptions. Our actual forecasts include loss & theft and internal consumption.
Supply is growing faster than demand

- 2014 installed capacity reached **69,516MW**.
- Gross capacity increase in 2014 is **6,300MW**.
- **800MW** of old CCGTs were decommissioned.
- Net capacity increase **5,500MW**.
- Installed cap. increased by **40%** over the last 4 years.
- Demand growth over the same period is **22%**.

**All new projects are «merchant»**
- Total installed capacity of the IPPs* exceeded **38,000MW**.
- Share of the IPPs* reached **55%** (2003: 16%).
- Share of state decreased to **31%** (22,000MW).
- Share of contracted plants (BO-BOT-TOR) **14%**.

* Independent power producers
Strong project pipeline for the coming years

Breakdown of Database
(Total: 234.000MW)

- Probable: 25%
- Operating: 30%
- Licenced & Approved: 22%
- Applic. 14%
- Other*: 9%

Licenced, Approved and Applications
(Total: 88.500MW)

- Wind: 6.733 MW (8%)
- Indl. Coal: 11.649 MW (13%)
- Hydro: 15.797 MW (18%)
- CCGT: 34.362 MW (39%)
- Imp. Coal: 18.880 MW (21%)
- Other Renew. 945 MW (1%)

* Other includes cancelled, decommissioned projects
Source: Garanti Bank Electricity Market Forecast Supply Projections

- Capacity projections are based on TGB’s internal database. The projects are evaluated by the feasibility, cash flow profile, location, permitting stage, environmental factors, financing and sponsors’ equity strength.
- The total database comprises of ~1.700 projects with a total installed capacity of 234.000MW.
- 88.500MW of the database form majority of the pipeline for the medium term.
- Project stock consists of 65.000MW thermals. According to Garanti forecasts only around 20% (13.500MW) of these projects will be operational in the next 10 years.
- The realization rate of the renewable projects are expected to be much higher compared to thermals.
Installed capacity will exceed 100,000 MW in 2025

17,790 MW net capacity increase in upcoming 5 years

- Capacity increase in the last 5 years was 24,755 MW. In next 5 years, we expect a 21,600 MW gross increase.
- Uncompetitive power plants are being decommissioned (currently 800 MW). In total 5,800 MW of CCGTs and fuel oil fired power plants are expected to be decommissioned until 2018.
- CCGTs with efficiencies lower than 52% efficiency will be taken out of the system gradually.

Installed capacity will reach 90,000 MW in 2020

Source: Garanti Bank Electricity Market Forecast, Supply Projections

CAPACITY INCREASE 2015-2025
Gross Capacity Increase: 40,500 MW
Net Capacity Increase: 34,700 MW
Renewable projects will dominate the financing pipeline

More than half of the ~40,500 MW capacity has already secured financing.

~19,000 MW still requires financing

- **53%** of the projects in the pipeline have already secured financing and under construction.
- **70%** of the projects requiring financing are renewable projects (13,400 MW).
- Renewable projects can easily secure financing due to hard currency feed-in tariff and available funding.

Source: Garanti Bank Electricity Market Forecast Supply Projections
Local resources to gain momentum

Net decrease in inst. Capacity of Natural Gas Power Plants will be **392 MW**

- Net capacity increase will be **34,700MW** taking into account **5,800MW** to be decommissioned.
- Until 2025 ~**22,500 MW** renewable and **13,500 MW** thermal projects will be installed. (gross)
- Projects utilizing local resources will make up 70% of all projects. (~**28,000 MW**)
- Natural Gas projects to be online are already financed. (~**3,750 MW**)

Gross installed capacity increase ~**40,500 MW**

Source: Garanti Bank Electricity Market Forecast Supply Projections
New thermal power plants to be commissioned until 2020 (>450MW)

Additional Thermal Capacity Projection

- Indigenous Coal: 4,700 MW
- Natural Gas: 3,700 MW
- Total: 8,400 MW

New power plants to be commissioned

1. Zetes 3 / 1.320 MW
2. Cenal / 1.320 MW
3. Habaş / 850 MW
4. Gama / 840 MW
5. Acwa / 798 MW
6. Afşin A Ext. / 688 MW
7. Bandırma II / 600 MW
8. Ciner Kazan / 600 MW
9. Kolin Soma / 510 MW
10. Tufanbeyli / 453 MW
11. Konya Ilgın / 453 MW

Source: TEIAS + Garanti Bank Market Intelligence

- Forecast based on power plants that have secured financing and that are under-construction.
- The total capacity of new thermal power plants will be ~13,500 MW including power plants below 450MW.

* Rehabilitation works of Hamitabat and Ambarlı are not included in the list of new power plants.
Privatizations will have a hidden capacity increase effect

- Tenders of almost all coal power plants have been concluded:
  - Privatized power plants perform significantly better after the take-over.
  - Only the privatization of Çan power plant is left in the vast portfolio.
- Dispute for Afsin A has come to an end in 2014, plant will be operated on a BOT basis.
- Status and performance of each power plant have been analysed separately.
- After rehabilitation and replacement periods, the overall capacity factor is expected to reach 80% (equivalent to a new 3,000 MW CFPP)

Source: EUAŞ + Garanti Bank
Hydro generation has a significant effect on prices

- Hydro projects have a very cycle generation pattern and they have a significant impact on electricity prices.
- 1 percentage-point increase in hydro capacity factor has a $0.1/kWh negative effect on electricity prices. (For example: Cap. Fac. 32% → 33%; electricity prices go down $0.1c)
- **Projection:** Hydros are expected to operate in-line with 10 year average (33% cap. fac.) in the long run.

Source: TEIAS
Reserve margin will be increasing

- Reserve margin is expected to increase until 2018. Competition will intensify.
- Until 2025 reserve margin is not expected to fall below 2014 levels.
- Higher competition will force uncompetitive plants out of the market.

Source: TEIAS + Garanti Bank Electricity Market Forecast Model

Reserve Margin = \( \frac{\text{Hourly Avl. Supply}}{\text{Hourly Demand}} \)
Share of natural gas power plants will fall significantly

Electricity Generation Mix Projection

- Share of Natural Gas will fall down to **15-20%**.
- Share of Renewables will rise up to **35-40%**.

Source: TEIAS + Garanti Bank Electricity Market Forecast Model
The system will still require CCGTs

- Especially during summer and winter peak periods the system will require CCGTs for supply security.
- Marginal power plant hours of CCGTs are increasing over the years. However due to increasing reserve margin and competition between CCGTs’ full capacity dispatch hours and spread margins will be falling.
- In order to maintain supply security, capacity payments similar to ones used in EU countries, could be established.
CCGTs are still the marginal plants on an average day

**24.03.2015 18:00 (AVERAGE DAY)**

**Short-term variable cost < Price < Short-term variable cost of CCGT with 58% eff. of CCGT with 52% eff.**

**In 2014 the spread between gas and coal was 3.6 $c/kwh.**

- Spot market prices are determined hourly, based on the demand and available capacity at that hour.
- Power plants are ordered according to their short-term marginal costs to form the merit order.
- **Marginal plant determines the price.** All power plants to left of demand dispatch and ones to right do not dispatch.
- **Competition** between different types of plants and within the same group of plants determine pricing strategy.
Lower commodity prices will affect all IPPs

**Electricity Pricing Mechanism** *

- Oil price: USD
- BOTAS purchase price: USD
- BOTAS sales price: TL

- Natural Gas Price ($) x $/TL → Natural Gas Price (TL)
- Natural Gas Price (TL) / 9.6 x Efficiency → Electricity Price (TL)

- BOTAS sales price: TL
- Electricity price: TL
- Pass-through reflection of changes in oil prices and $/TL

- Oil Price ($) + $/TL + Merit Order → Electricity Price (TL)

* This pricing mechanism is applicable when CCGT’s are the marginal plants/price makers (~85% of the year)

- Above 90% of the time electricity prices are determined by plants whose fuel costs are in USD (CCGT and imp. coal).
- Price maker power plants will **reflect the changes in their fuel cost** to electricity prices on a pass-through basis.
- Since the fuel costs of price maker power plants are in USD, **if the automatic pricing mechanism is implemented in natural gas prices**, electricity prices will be naturally hedged to a great extent against currency volatility.
Decreasing natural gas prices lowers electricity prices and spreads

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<tbody>
<tr>
<td>NG Price ($)/m3</td>
<td>34.59</td>
<td>32.80</td>
<td>31.17</td>
<td>30.36</td>
<td>30.50</td>
<td>29.85</td>
<td>29.10</td>
<td>27.46</td>
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<tr>
<td>Coal Price ($)/ton</td>
<td>64.23</td>
<td>67.70</td>
<td>66.20</td>
<td>65.10</td>
<td>65.07</td>
<td>63.55</td>
<td>59.98</td>
<td>57.00</td>
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<tr>
<td>(DES ARA, Freight)</td>
<td>6.72</td>
<td>6.38</td>
<td>6.07</td>
<td>5.92</td>
<td>5.95</td>
<td>5.82</td>
<td>5.68</td>
<td>5.37</td>
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<tr>
<td>D58 SMC ($c/kwh)</td>
<td>2.73</td>
<td>2.87</td>
<td>2.81</td>
<td>2.77</td>
<td>2.77</td>
<td>2.71</td>
<td>2.57</td>
<td>2.46</td>
</tr>
<tr>
<td>Diff. Δ ($c/kwh)</td>
<td>3.98</td>
<td>3.51</td>
<td>3.26</td>
<td>3.15</td>
<td>3.18</td>
<td>3.12</td>
<td>3.11</td>
<td>2.91</td>
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As of August 2015 the spread between gas and coal narrowed to 2.9 $c/kwh.

- Since CCGTs are the marginal plants **85%** of the time natural gas prices are the most important determinant of electricity prices.
- **Lower natural gas prices** force CCGTs to **lower their prices** at the same demand level.
- No one benefits from lower natural gas prices unless CCGTs and Coal change place in the merit order. CCGTs can only be more competitive compared to coal if natural gas prices fall **55%** and coal price remains constant.
Day-ahead electricity prices maintain the falling trend

- Electricity prices have been falling mainly due to excess capacity and lower commodity prices.

Source: TEIAS

- 1H2015: 5.2 $c/kWh
- 1H2014: 7.3 $c/kWh
Oil prices will determine the long-term level of spot electricity prices

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<tr>
<td>50 $/bbl</td>
<td>➔</td>
<td>~5.0-5.5 $c/kWh</td>
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<tr>
<td>70 $/bbl</td>
<td>➔</td>
<td>~6.0-6.5 $c/kWh</td>
</tr>
<tr>
<td>80 $/bbl</td>
<td>➔</td>
<td>~6.5-7.0 $c/kWh</td>
</tr>
<tr>
<td>90 $/bbl</td>
<td>➔</td>
<td>~7.0-7.5 $c/kWh</td>
</tr>
</tbody>
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Source: Garanti Bank Electricity Market Forecast Model
* Prices represent projected base load, spot market wholesale prices and are in real terms

• In the long-term the most important determinant of electricity prices, in addition to demand and supply will be the long-term oil prices...

**MAIN ASSUMPTIONS:**
4.6% average annual demand growth; 40.500MW gross capacity increase; 5.800MW decommissioning; 33% average hydro cap. factor; hourly load profile; quarterly, monthly and hourly operating cycle of renewables; import/export levels (1% of overall supply); availability of thermals and planned outage periods; generation privatizations completed; privatized lignite plants rehabilitated; BO-BOT plants to be merchant after 2019; 100% eligible consumer market; share of oil-indexed pricing in natural gas imports to continue; automatic pricing mechanism in natural gas markets to be applied; no carbon tax.
Electricity price sensitivities

10% Decrease of Nat. Gas Prices → 8,5%

1.000 MW Additional Nuclear Power Plants → 2,5%

1% Lower Demand Growth (cumulative imp.) → 7,1%

1.000 MW Additional Wind Power Plants → 1,0%

1.000 MW Additional Coal Power Plants → 2,4%

1.000 MW Additional Solar Power Plants → 1,5%

Source: Garanti Bank Electricity Market Forecast Model
Climate change policies will shape the energy markets

**Governments**

- **COP21**: 21st Conference of Parties meeting will be held between 30 Nov.-11 Dec. (~200 countries)
  - *After 2020* (post-Kyoto) international climate change agreement.

- **2015 G7 Convention**:
  - Decarbonisation of the global economy over the course of this century.

- **US**:
  - Responsible for *14%* of the global emissions.
  - Commitment to reduce CO2 emissions from the power sector to *32% below 2005 levels by 2030*.

- **China**:
  - Responsible for *25%* of the global emissions.
  - *Peak by "around" 2030* and making "best efforts" to do so early.
  - Reduction of emissions per unit of GDP by *60% to 65% from the 2005 level by 2030*.

- **Turkey**:
  - Pledged a reduction of as much as *21% from BAU levels in 2030*.

**Financial Sector**

- **‘Stranded Assets’**: In 2011, Carbon Tracker’s seminal report ‘Unburnable Carbon’ was issued.
  - Between *60-80%* of coal, oil and gas reserves of publicly listed companies are ‘unburnable’.

- **The Trillion Tonne Communique**
- **‘Coal Divestment’**:
  - 2014/Q1 MSCI: Coal Divestment is one of the 2014 ESG Trends to Watch:

- **‘Put a Price on Carbon’**:
  - **TGB**: New Declaration on Carbon Pricing.

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*Source: Carbon Tracker Initiative*
Model Structure - Hourly Electricity Price Projection

**INPUT**
- Operational Projects
- New Investments
- Natural Gas Prices
- Coal Prices
- CAPEX & OPEX by plant type

**OUTPUT**
- Supply & Demand
- Merit Order
- Electricity Prices
- EBITDA

**Extensive Market Research**

**In house Power Plant Database**

**Hourly Demand Projection**

**Hourly Supply Projection**

**Hourly Cost Projection**

**International Resources**
Contact Details

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