



Renewable Energy in Turkish Electricity Market

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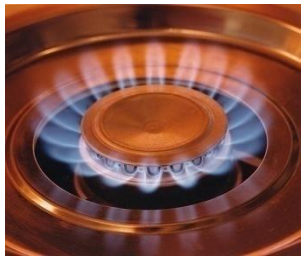
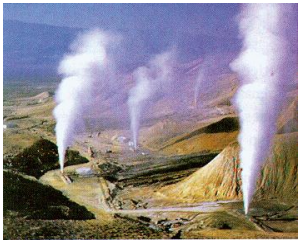
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*Development and Integration of Renewable Energy
Sources in the Black Sea region
7 March 2011, Istanbul, Turkey*

- **EMRA**
- **Electricity Market Information**
 - Market Structure, Balance and Settlement Mechanism,
 - Transmission and Distribution Zones, Interconnections
 - Strategies, Installed Capacity, Generation and Consumption
- **Renewable Energy**
 - Regulation of Renewables
 - Reasons for interest, incentive mechanisms
 - Integration of Renewables
 - Private Sector Applications
 - Capacity Projection

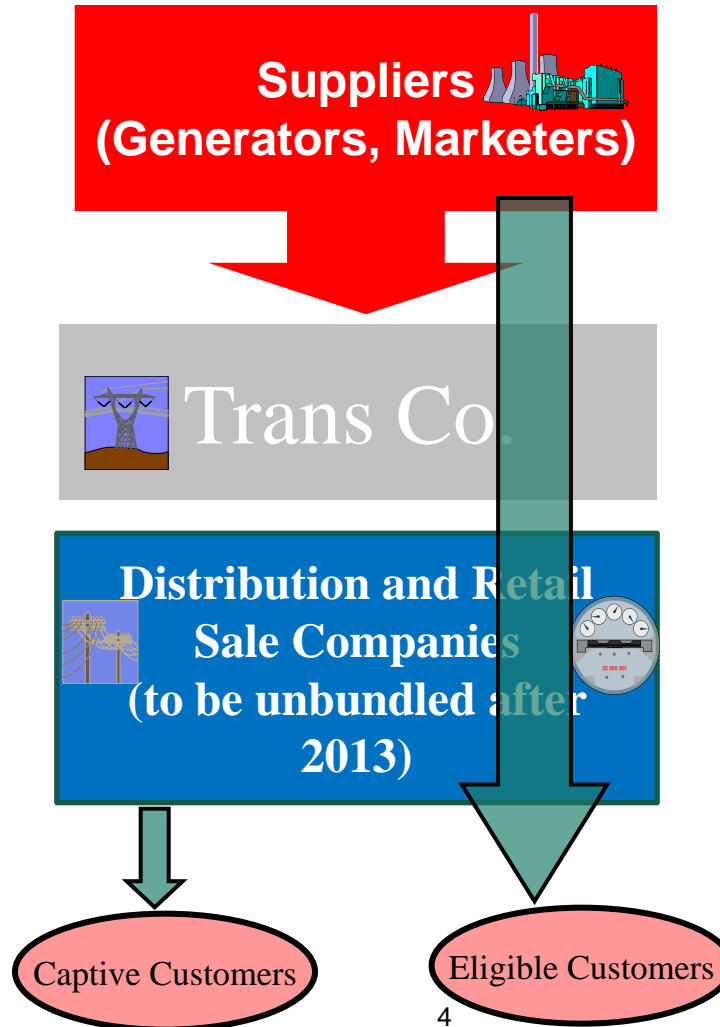
Energy Market Regulatory Authority (EMRA)

- Sole regulator of Electricity, Gas, Petroleum and LPG markets,
- An autonomous authority
- Issues secondary legislation
- Controls entry to and exit from markets
- Approves tariffs
- Monitors, supervises and audits markets & market players
- Main objective is to provide;
 - Financially viable, stable and competitive energy market
 - Sustainable energy at good quality and low cost, in a reliable and environment friendly manner



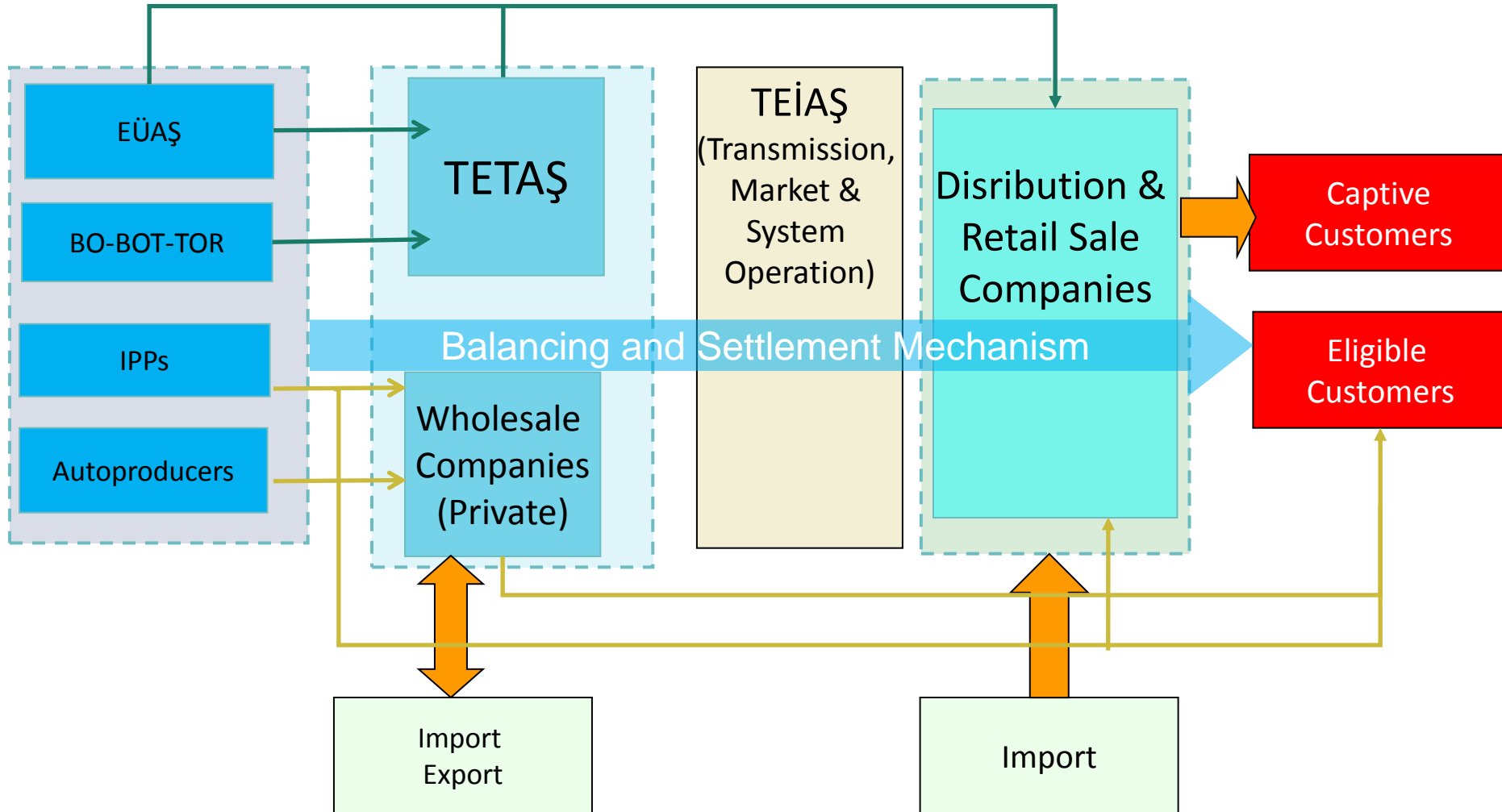
Market Structure (1)

- TransCo (TEİAŞ) operates the balancing market that allows buyers to adjust their schedules by buying and selling electricity.
- As of December 2009, day ahead planning and real-time balancing are operated with hourly settlement.
- Market of **bilateral contracts** with **residual power pool**, where the imbalances are settled on the basis of marginal prices (started on 1 August 2006).
- The eligibility threshold for 2011 is 30.000 kWh. Market opening rate is **78 %**.

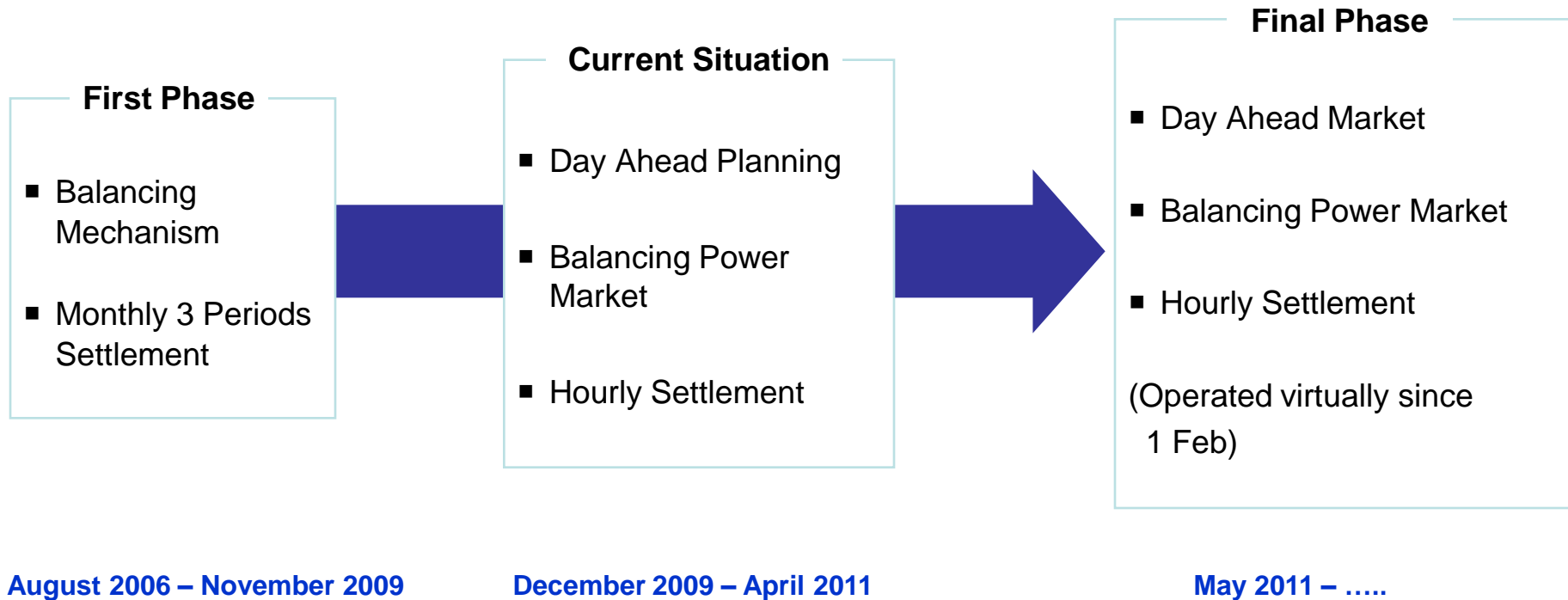


- Regulated tariffs are **transmission, distribution, retail sale** to captive consumers, **retail services** and **wholesale price** of the state-owned Turkish Electricity Trading and Contracting (TETAŞ).
- Regulated third party access.
- The distribution sector is split into **21 regions**. The privatization process commenced in May 2008.
- All of the privatization tenders have been completed. 12 regions are operated by private companies and remaining ones will be transferred to private sector this year.

Market Structure (2)

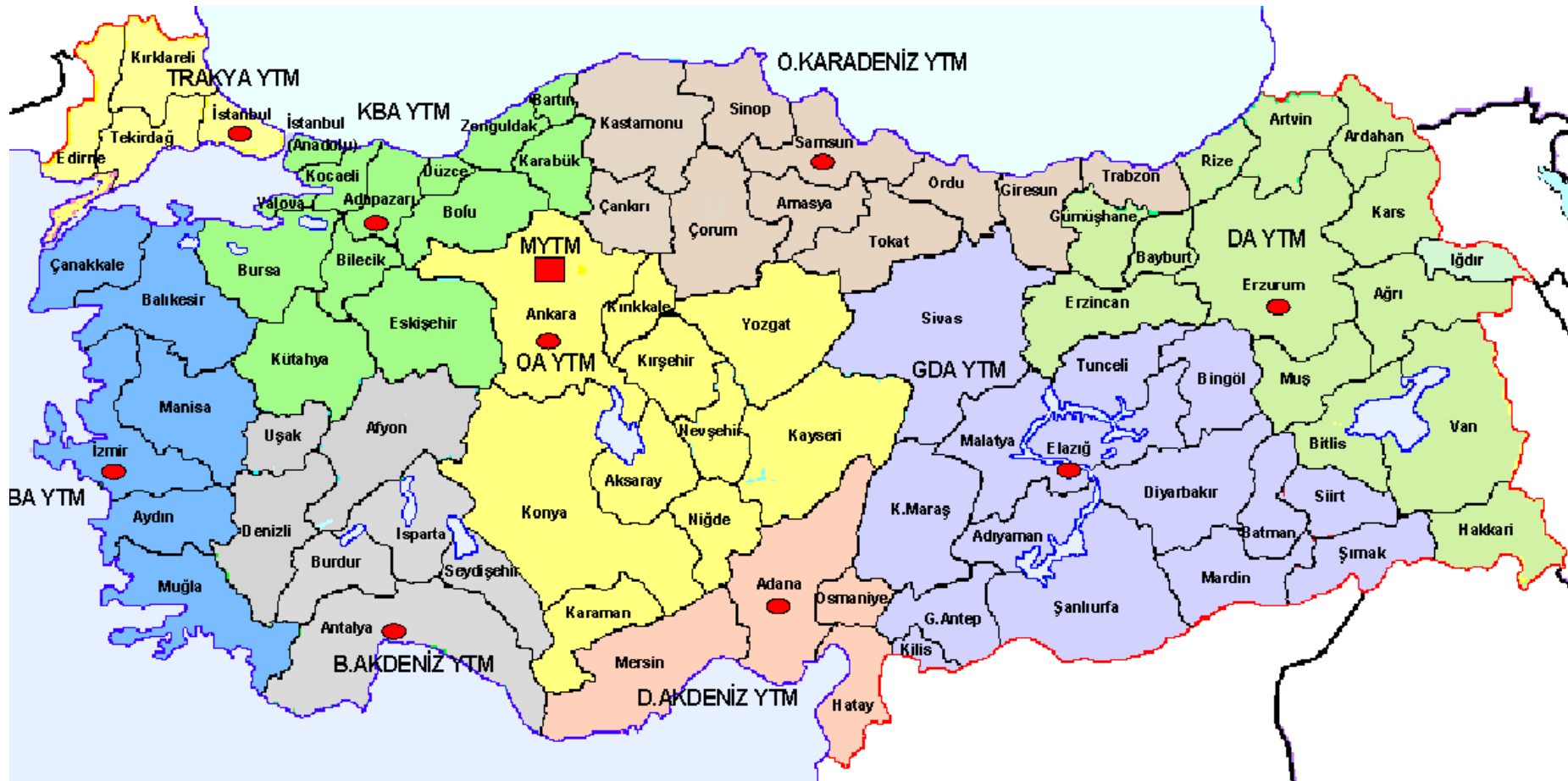


The Balancing & Settlement Mechanism

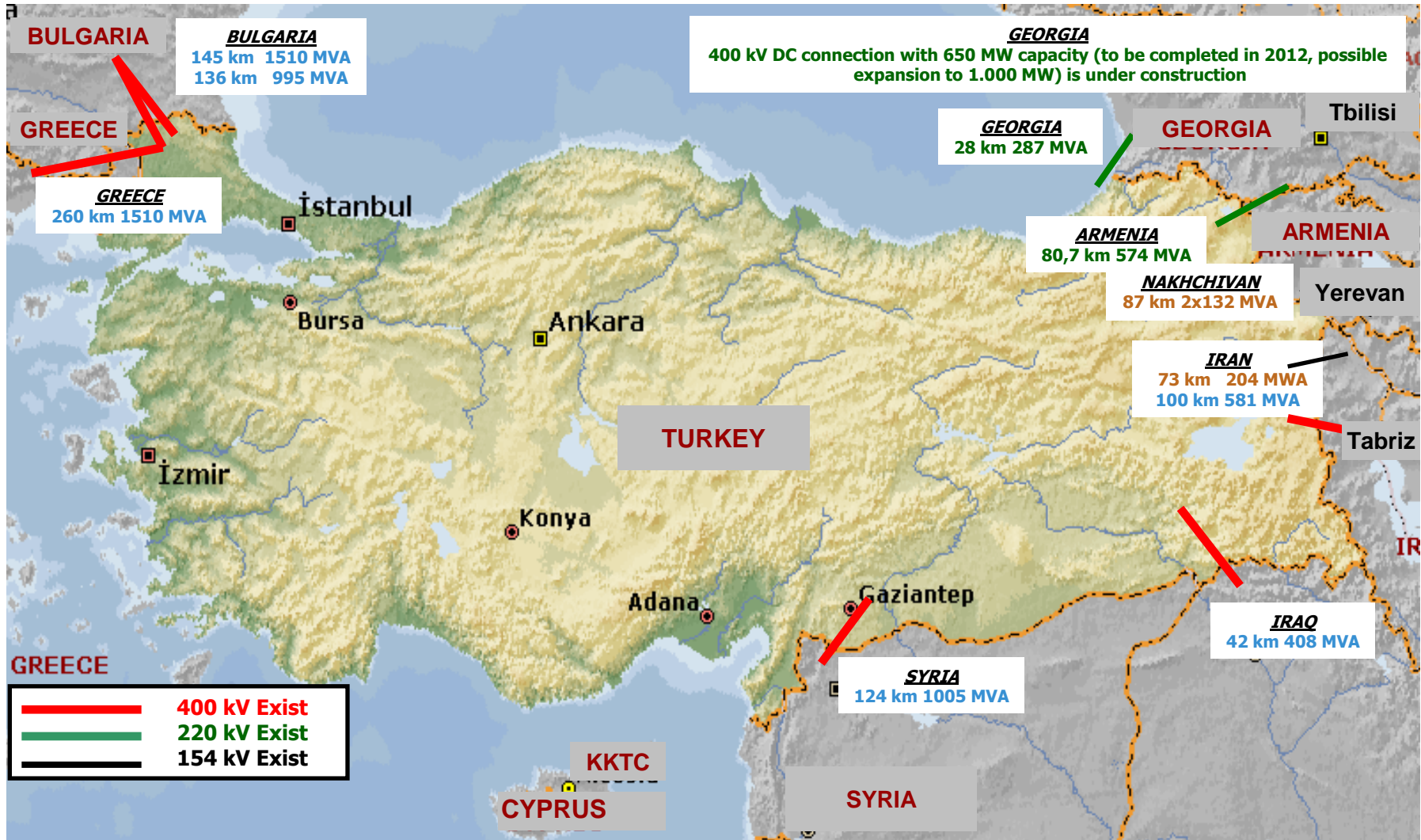


Transmission Zones

The Operation and Control of Electricity System is done by National Load Dispatch Center (NLDC - in Ankara) and 9 Regional Load Dispatch Centers (RLDCs).



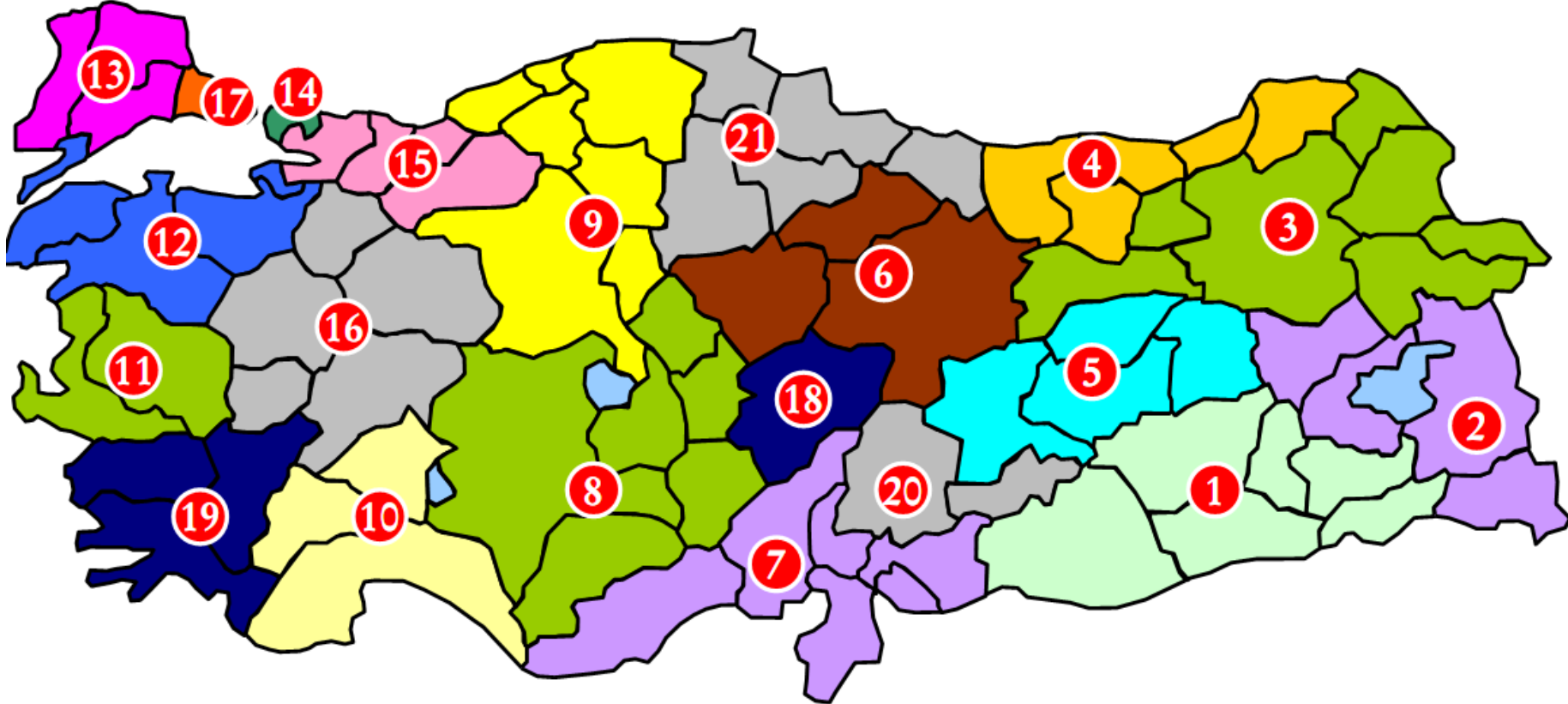
Interconnections



TIME TABLE

Process	Date
Isolated test at Maximum Load Conditions	11-25 January 2010 Has been successfully completed.
Isolated test for Minimum Load Conditions	22 March – 05 April 2010 Has been successfully completed.
Trial Parallel Operation	<ul style="list-style-type: none">• Stabilization Period (No exchange) 18 September 2010• Non-commercial exchange 21 February 2011 (2nd phase will last for two weeks and the evaluation of the results is foreseen to be concluded in mid-March. Decision for 3rd phase will be given on 3 May)• Commercial exchange (11 months)

Distribution Zones



- | | |
|-----------------------------------|--------------------------------------|
| 1. Dicle elektrik Dağıtım A.Ş. | 12. Uludağ Elektrik Dağıtım A.Ş. |
| 2. Vançölü Elektrik Dağıtım A.Ş. | 13. Trakya Elektrik Dağıtım A.Ş. |
| 3. Aras Elektrik Dağıtım A.Ş. | 14. İstanbul Elektrik Dağıtım A.Ş. |
| 4. Çoruh Elektrik Dağıtım A.Ş. | 15. Sakarya Elektrik Dağıtım A.Ş. |
| 5. Fırat Elektrik Dağıtım A.Ş. | 16. Osmangazi Elektrik Dağıtım A.Ş. |
| 6. Çamlıbel Elektrik Dağıtım A.Ş. | 17. Boğaziçi Elektrik Dağıtım A.Ş. |
| 7. Toroslar Elektrik Dağıtım A.Ş. | 18. Kayseri Elektrik Dağıtım A.Ş. |
| 8. Meram Elektrik Dağıtım A.Ş. | 19. Menderes Elektrik Dağıtım A.Ş. |
| 9. Başkent Elektrik Dağıtım A.Ş. | 20. Göksu Elektrik Dağıtım A.Ş. |
| 10. Akdeniz Elektrik Dağıtım A.Ş. | 21. Yeşilırmak Elektrik Dağıtım A.Ş. |
| 11. Gediz Elektrik A.Ş. | |

Strategies in Electricity Market

As per the Electricity Market Strategy Document adopted in 2009 by the High Planning Council:

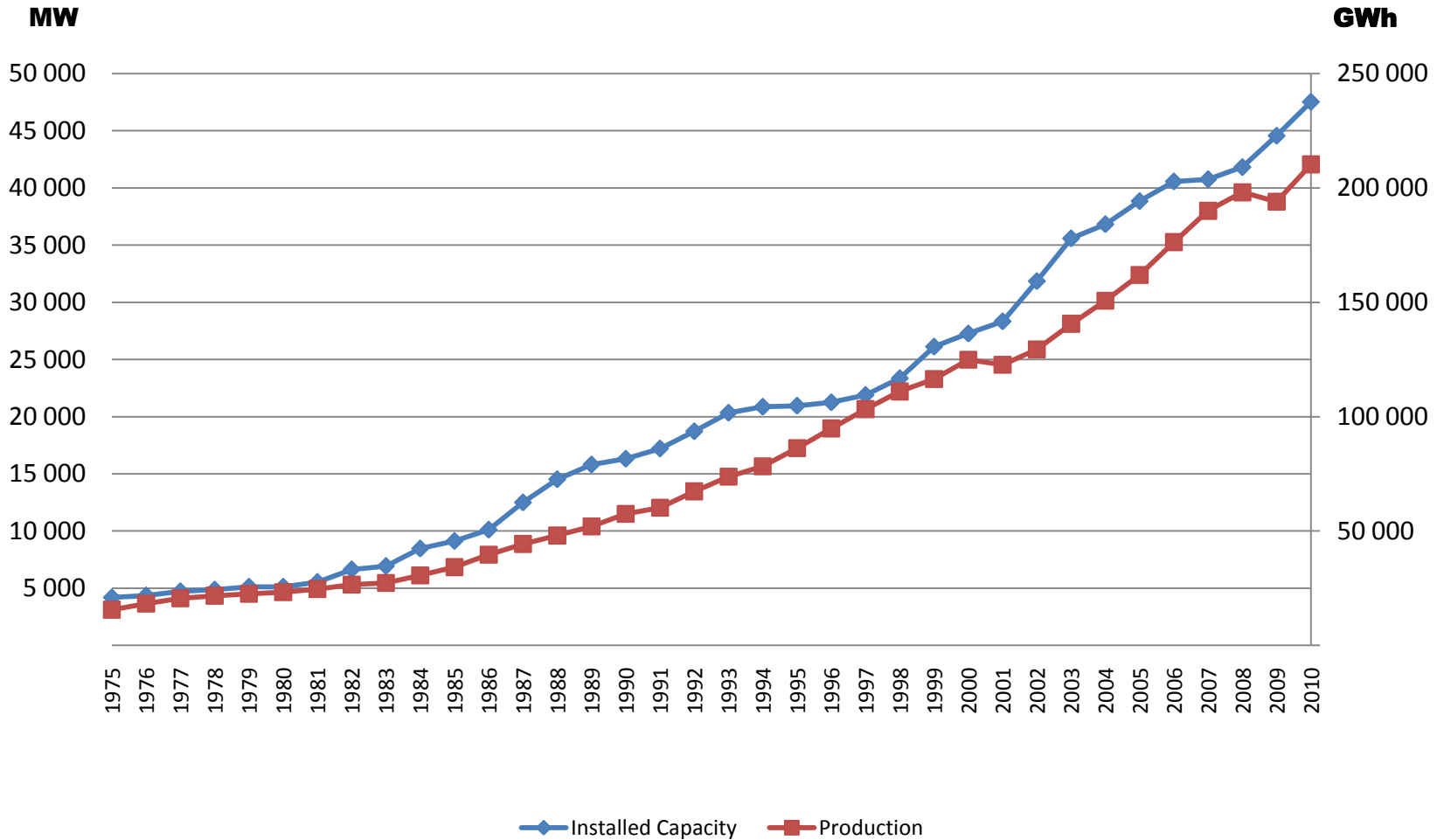
2010	<ul style="list-style-type: none"> Privatization of public generation companies started
2012	<ul style="list-style-type: none"> All non-residential consumers will be eligible
2013	<ul style="list-style-type: none"> Legal unbundling of distribution and retail
2016	<ul style="list-style-type: none"> Fully open market (all consumers will be eligible)
2023	<ul style="list-style-type: none"> Exploitation of known lignite and charcoal reserves Increasing the share of renewable energy resources to at least 30% in total Complete utilisation of technical and economical hydroelectric potential Increasing the installed capacity of wind energy to 20.000 MW Commissioning all of geothermal potential which is 600 MW. The ratio of nuclear power plants within electricity generation, till year 2020, shall be at least 5% and this ratio will be raised in the long-term The ratio of natural gas within electricity generation will be dropped below 30%

Electricity Sector

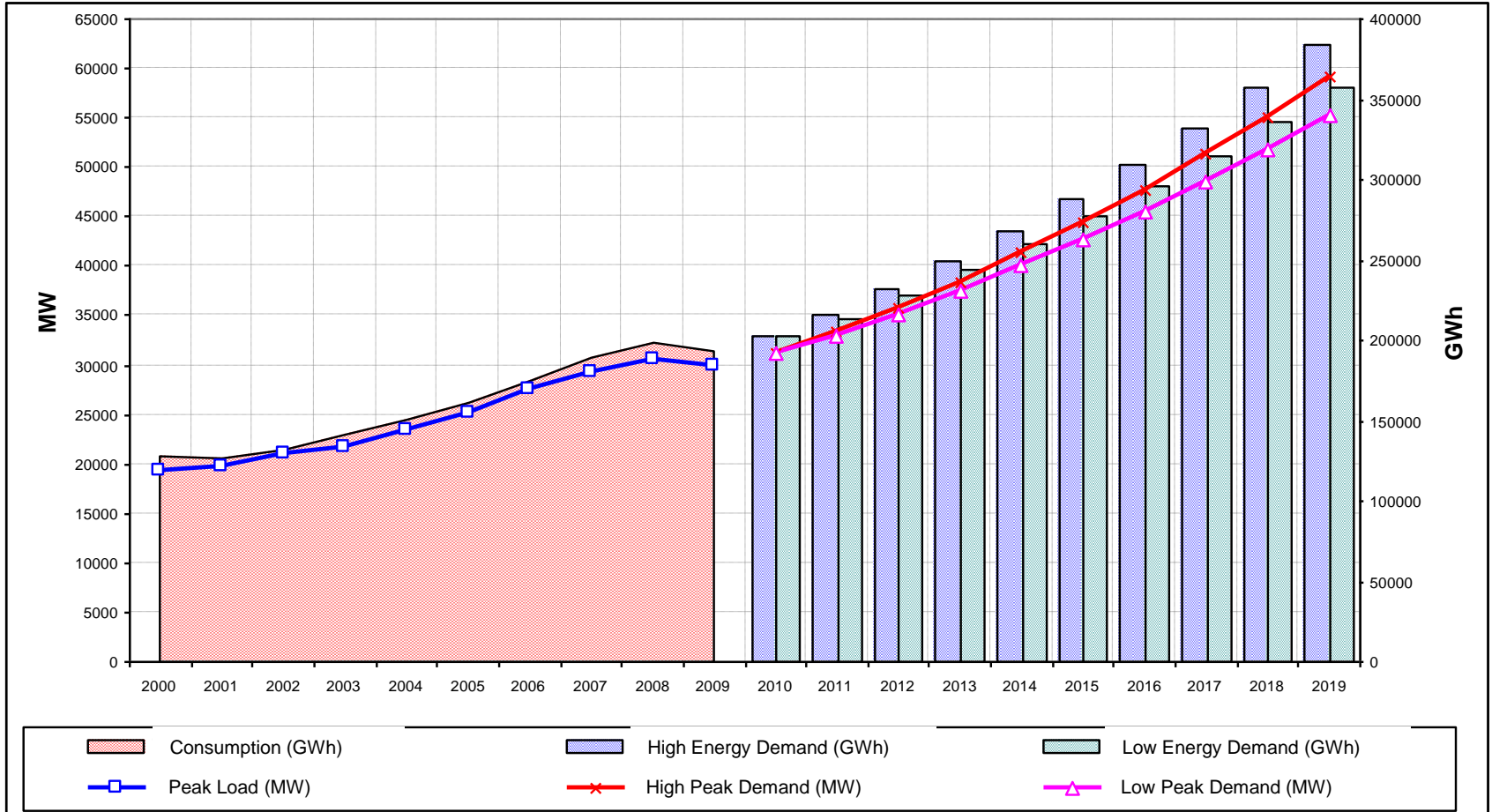
“Main Characteristics”

- **Rapid growth in demand:**
 - investment challenges and opportunities
 - *Per capita consumption is 2,72 GWh/year*
 - *Installed electricity generation capacity has **quadrupled** in the last 25 years.*
- **High level of import dependency:**
 - need for more domestic resources, in particular the renewables
 - diversification of resources

Development of Capacity & Production

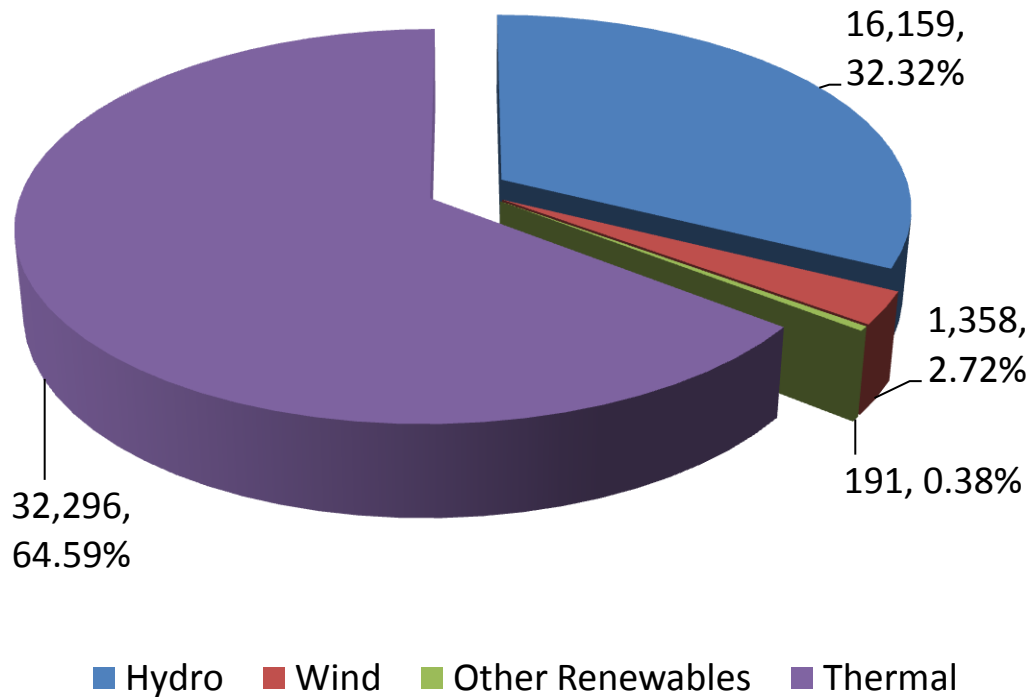


Development of Demand



* Based on 2009 data

Installed Capacity - MW (as of Feb. 2011)



Installed Capacity : 50.004 MW

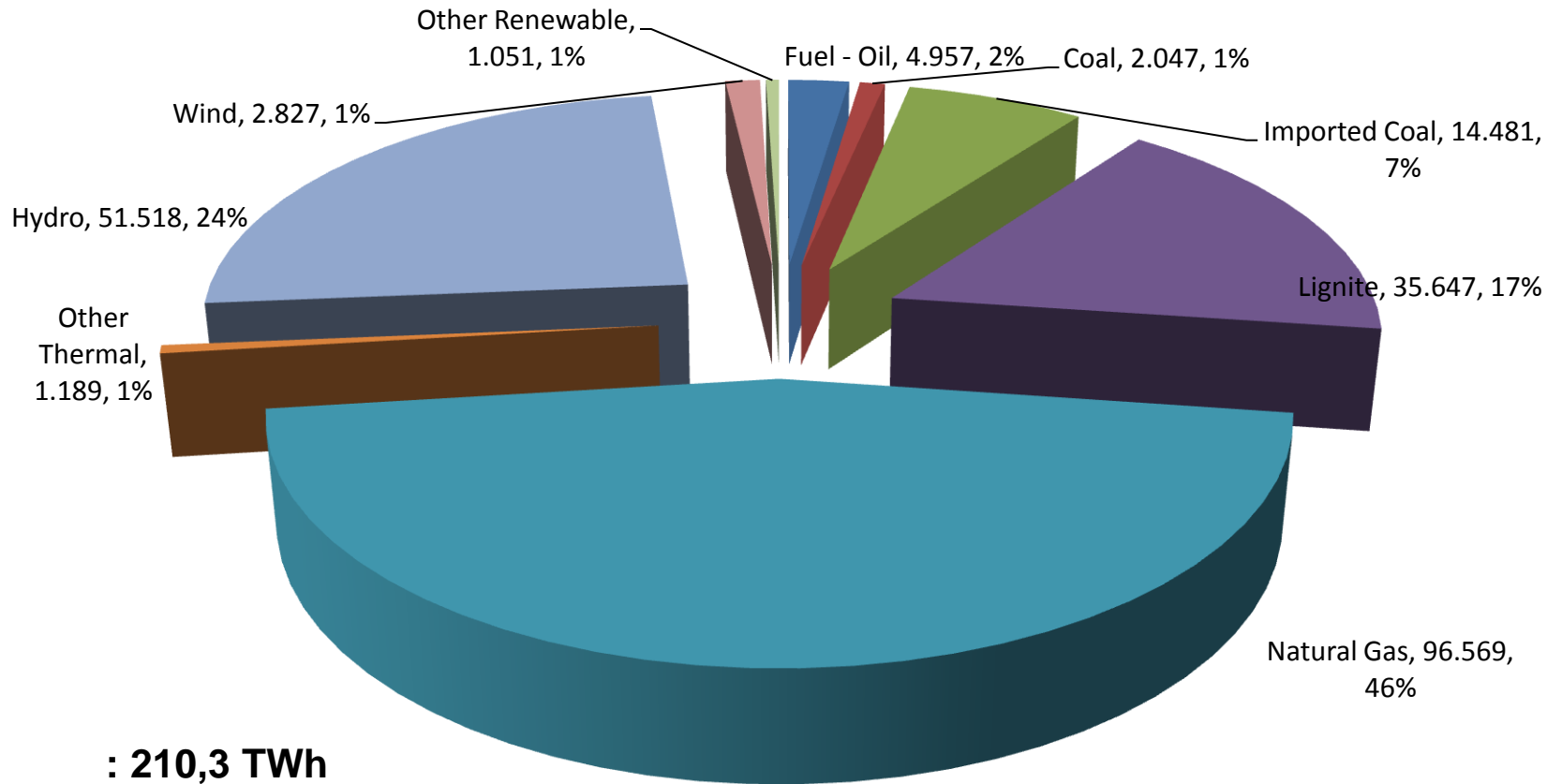
Hydro + Renewable : 35 %

Thermal : 65 %

Yearly Consumption (2010) : 209.4 TWh

Peak Load (2010) : 33.392 MW

2010 Electricity Generation (TWh)



Total : 210,3 TWh

Thermal : 73,7 %

Renewable : 26,3 %

Breakdown of Installed Capacity

	Installed Capacity (MW) – As of Feb. 2011			
	Private	Public	Bot-Bo-Tor	Total
<i>Wind</i>	1.340,6	0,0	17,4	1.358,0
<i>Hydro</i>	3.483,6	11.661,1	1.014,4	16.159,1
<i>Fuel-Oil, Diesel, LPG</i>	794,2	681,0	0,0	1.475,2
<i>Natural Gas</i>	8.047,4	4.082,9	6.231,4	18.361,7
<i>Lignite</i>	58,7	7.461,0	620,0	8.139,7
<i>Coal</i>	2.547,5	300,0	1.320,0	4.167,5
<i>Asphaltite</i>	135,0	0,0	0,0	135,0
<i>Geothermal</i>	94,2	0,0	0,0	94,2
<i>Others</i>	113,7	0,0	0,0	113,7
Total	16.614,9	24.186,1	9.203,2	50.004,2

EU stimulus and fears of supply insecurity led to giving the priority to renewables

- Three 20s principle has been adopted in EU: 20% of the energy from renewables until 2020.
- Kyoto Protocol necessitates clean energy consumption and decrease of CO₂ emission.
- Turkey is dependent on natural gas to a great extent in power production.
- Therefore, many incentive mechanisms for renewable energy has been developed via Energy Market and Renewable Energy Laws.

- Some remarks;
 - In general, renewable energy cannot solve the security of supply (SoS) problem. But it can help.
 - Cost & benefit analysis is very important, especially while determining the scope for incentives.
 - In a liberalized market structure, price signals are one of the most useful tools for reaching the renewable objectives.
 - Market mechanism should comply with the conditions of renewables (e.g. imbalance problems, technical requirements, etc.)

- Some remarks;
 - Plant site and connection capacity (for wind and solar) are extremely valuable (multiple applications for the same site). Therefore, legal background (technical evaluation, selection mechanism, etc.) for granting the right should be ready in advance.
 - Installed capacity projections should be in compliance with the grid expansion plans. Resource planning is very important in terms of having the right plant at the right point.
 - Licensing procedures should be clear.
 - Licensed projects should be monitored closely.
 - Cost of a failed project is high. There should be measures.

- Summary of the regulatory structure in Turkey;
 - Licence applications are open except wind and solar (to opened soon)
 - Licences can be granted up to 49 years.
 - Source contract is required for hydro and biomass.
 - Technical assesment of the hydro and wind (also solar when applications are opened) projects are done by General Directorate of State Hydraulic Works (**DSİ**) and Electrical Power Resources Survey & Development Administration (**EİE**), respectively.

- Summary of the regulatory structure in Turkey;
 - In case of multiple applications (same water source for hydro, plant site or connection point for wind and solar) usage rights are granted by tenders (based on fee/kWh).
 - by Turkish Electricity Transmission Co. (**TEİAŞ**) for wind and solar projects
 - By **DSİ** for hydro projects
 - Plant siting is quite flexible, even agricultural lands can be allocated for power plants based on renewable energy.
 - For obtaining the usage right of the plant site, EMRA completes all of the legal procedures.

Incentive Mechanisms (1)

Incentive Type	Scope
Licensing fee	<ul style="list-style-type: none"> Only 1% of the regular licensing fee is paid. Exemption from the annual license fee for first eight years
Connection to the grid	<ul style="list-style-type: none"> Priority by TEİAŞ and the distribution companies % 85 reduction in system usage fees for 5 years (all plants to be commissioned prior to 31/12/2015 – extension possible)
Exemption from licensing and company establishment obligations	<ul style="list-style-type: none"> For the generators with a max capacity of 500 kW
Purchase obligation	<ul style="list-style-type: none"> In their supply to ineligible consumers, the distribution companies have to procure renewable power in up to 20 % of its consumption
Feed-in tariff	<ul style="list-style-type: none"> For 10 years (all plants to be commissioned prior to 31/12/2015 – extension possible). Different prices for each resource (also additional incentives for domestic production).

Incentive Mechanisms (2)

Incentive Type	Scope
Fees on land-use for PPs to be commissioned prior to 31/12/2015 (extension possible)	<ul style="list-style-type: none"> ▪ If the property in use is in possession of the Treasury, for first 10 years of operation, 85% deduction is applied to fees related to rent, right of access, and usage permission. ▪ 85% deduction is applied to fees related to transportation and transmission infrastructure investments. ▪ Exemption from the special fees like contribution to the development of the woodland villages. ▪ Free usage of state-owned estates located within the reservoir of HPPs holding a RES certificate.

Incentive Mechanisms (3)

Feed – In Tariffs

(10 years for plants to be commissioned until 31/12/2015 – extension possible)

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

Incentive Mechanisms (3)

Feed – In Tariffs

Additional Incentive for Domestic Production - 5 years for plants to be commissioned until 31/12/2015

Schedule II		
Type of Facility	Domestic Production	Domestic Contribution (US Dollar cent/kWh)
A- Hydroelectric production facility	1- Turbine	1.3
	2- Generator and power electronics	1.0
B- Wind power based production facility	1- Wing	0.8
	2- Generator and power electronics	1.0
	3- Turbine tower	0.6
	4- All of the mechanical equipment in rotor and nacelle groups (excluding payments made for the wing group and the generator and power electronics.)	1.3
C- Photovoltaic solar power based production facility	1- PV panel integration and solar structural mechanics production	0.8
	2- PV modules	1.3
	3- Cells forming the PV module	3.5
	4- Invertor	0.6
	5- Material focusing the solar rays onto the PV module	0.5

Incentive Mechanisms (3)

Feed – In Tariffs

Type of Production Facility Based on Renewable Energy Resources	Prices Applicable (US Dollar cent/kWh)		
	Schedule I	Schedule II	Total
a. Hydroelectric Production Facility	7,3	2,3	9,6
b.Wind Power based production Facility	7,3	3,7	11
c. Geothermal power based production facility	10,5	-	10,5
d.Biomass based production facility(including landfill gas)	13,3	-	13,3
e.Solar power based production facility	13,3	6,7	20

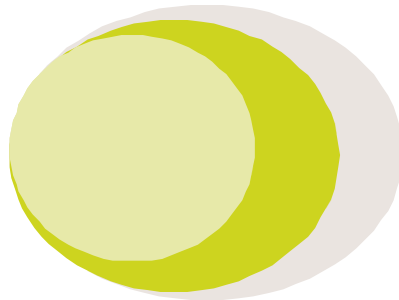
Hydropower

- Installed hydroelectric capacity is 16.200 MW.
Potential: ~ 40.000 GW (129,4 TWh)
- Water Usage Rights Agreement (subject to tender in case of multiple applications for the same source) is a requirement for licensing.
- Majority of private sector licence applications are for new HPPs.
- The HPPs with large reservoir areas are not in scope of promotion.

Integration of Renewables (2)

Wind

- The geology and topography of Turkey makes it attractive for wind energy investments.
- The highest wind-power generation capacity is estimated as 20.000 MW. Currently, installed capacity is 1.358 MW
- Existing applications (multiple) will be licensed after the tenders for the connection capacity (by TEIAS). Others (single) are being licensed.



Economic potential:
88,000 MW
(wind speed > 7.5 m/s)

License granted: 4,014 MW
+
License approved:
1.604 MW

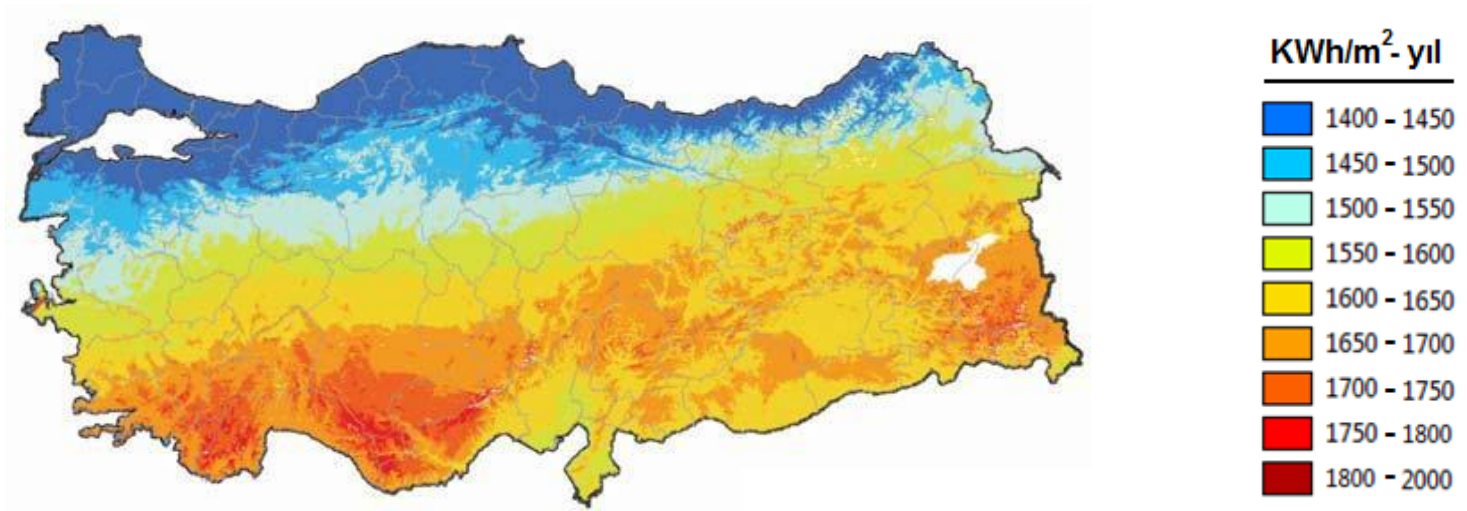
Viable potential:
20.000 MW

Geothermal Power

- Turkey has about 1.000 resources (first in Europe, seventh in the world).
- Out of 600 MW economic power generation potential, 94,2 MW has been realized.
- The exploration, development, ownership rights and economic use are regulated by the Geothermal Resources and Mineral Waters Law 5686.
- Licensing and feed-in tariff issues are in the scope of Electricity Market Law and Renewables Law.

Solar Power

- An area of 4,600 km² is feasible with a technical power generation capacity of 380 GWh/yr (second in Europe).
- Capacity has been limited to 600 MW until 2014 (expansion will be considered later on)
- High feed-in incentive (base: 13,3 \$¢/kWh) for new plants.
- Licesing procedures are being developed.

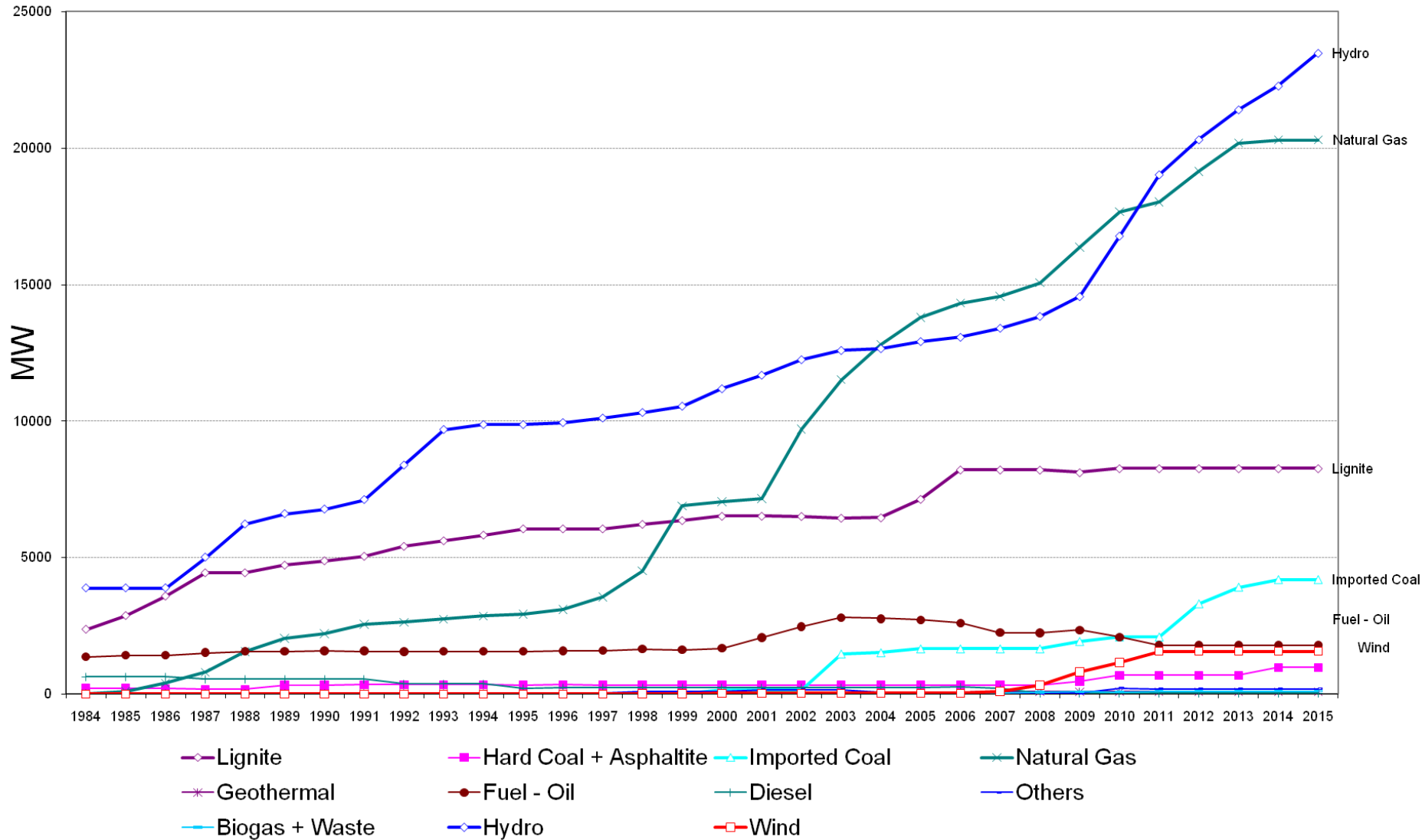


Biomass (LFG, waste, etc.)

- Currently, installed capacity is 96,9 MW.
- Increasing interest, especially for LFG.
- High feed-in incentive (base: 13,3 \$¢/kWh) for new plants.
- Source contract or commitment is required for licensing.

Licence Applications of Private Sector

Capacity (MW) – As of Feb. 2011					
	Applied	Under Assessment	Approved	Licensed	Total
<i>Wind</i>	525,2	28.182,3	1.603,5	4.013,9	34.324,9
<i>Hydro</i>	3.119,5	2.380,1	3.241,4	15.870,7	24.611,7
<i>Fuel-Oil, Diesel, LPG</i>	7,9	0,0	25,3	1.279,8	1.313,0
<i>Natural Gas</i>	16.352,5	7.359,6	3.864,0	13.063,3	40.639,3
<i>Lignite</i>	0,0	37,0	270,0	4.281,2	4.588,2
<i>Coal</i>	6.146,7	5.891,6	900,0	8.964,4	21.902,6
<i>Asphaltite</i>	135,0	0,0	0,0	675,0	810,0
<i>Geothermal</i>	129,9	64,9	25,0	137,1	356,9
<i>Others</i>	11,0	18,9	4,0	145,4	179,3
Total	26.427,8	43.934,3	9.933,2	48.430,7	128.726,0



Thank you for your attention.

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