

BETTER WP5 - EU-Turkey cooperation case study

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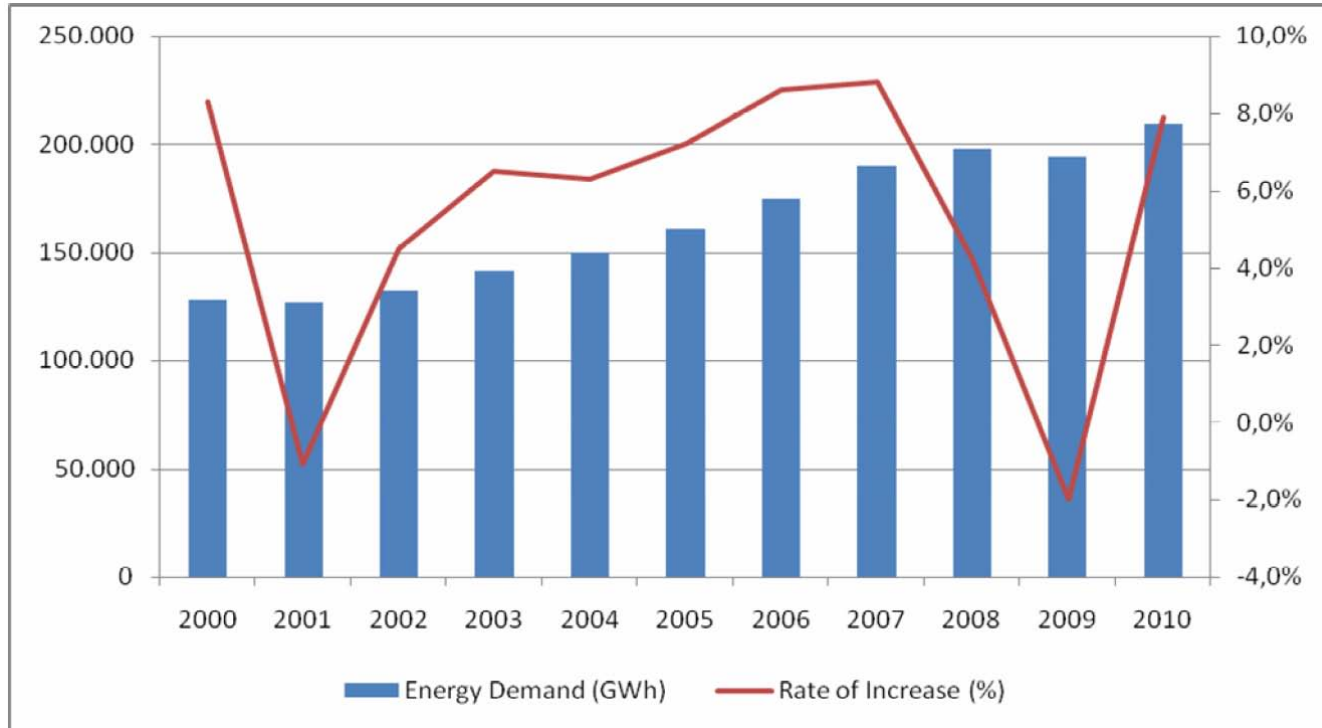
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WP Coordinator: TU WIEN

Involved Partners: NTUA, JR , UNDP, CIEMAT, ECN

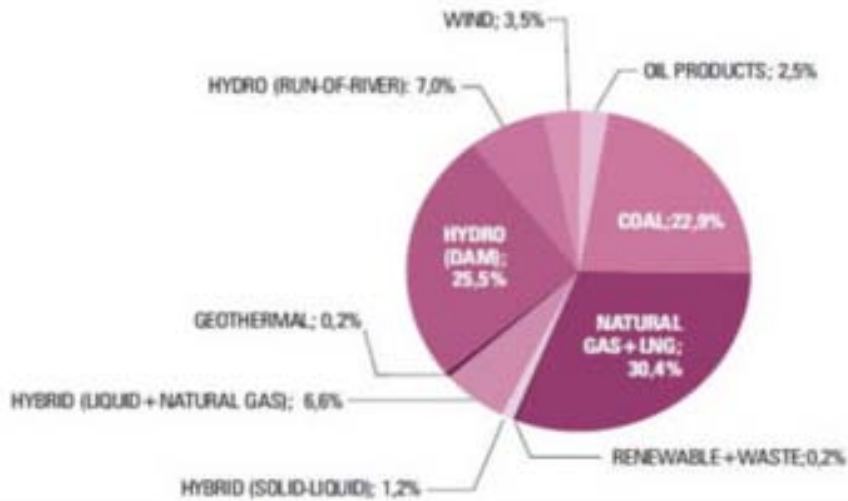
Development of Electricity Energy Demand by Years (GWh)



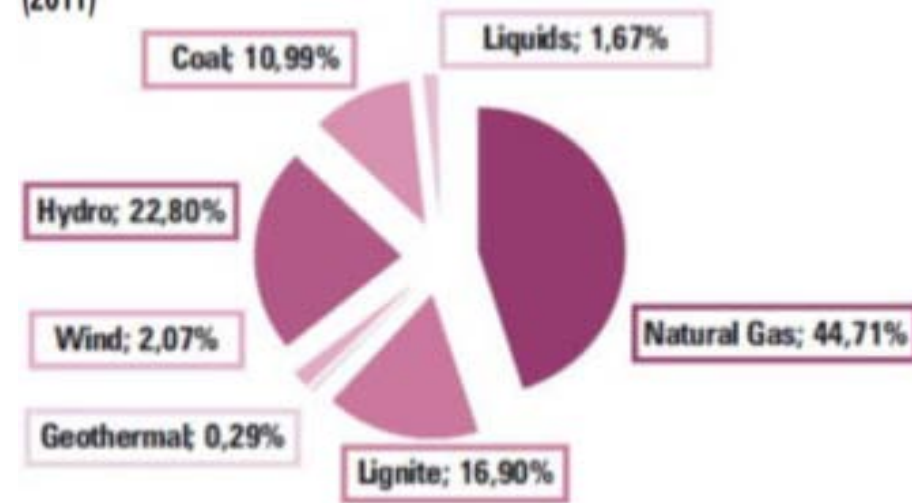
7% growth of electricity demand
means a doubling of demand in 10 years

Present Power Generation Structure

BREAKDOWN OF INSTALLED CAPACITY



**POWER GENERATION
(2011)**



Source: Energy Market Regulatory Authority (EMRA)

Hydro

- Currently the hydro capacity of Turkey is 14.5 GW and the annual production about 45.5 TWh/a (→140TWh 2023)
- Mostly from big dams and reservoirs
- This is similar to Sweden a very large European hydropower producer
- Potential to provide balancing power to Europe!

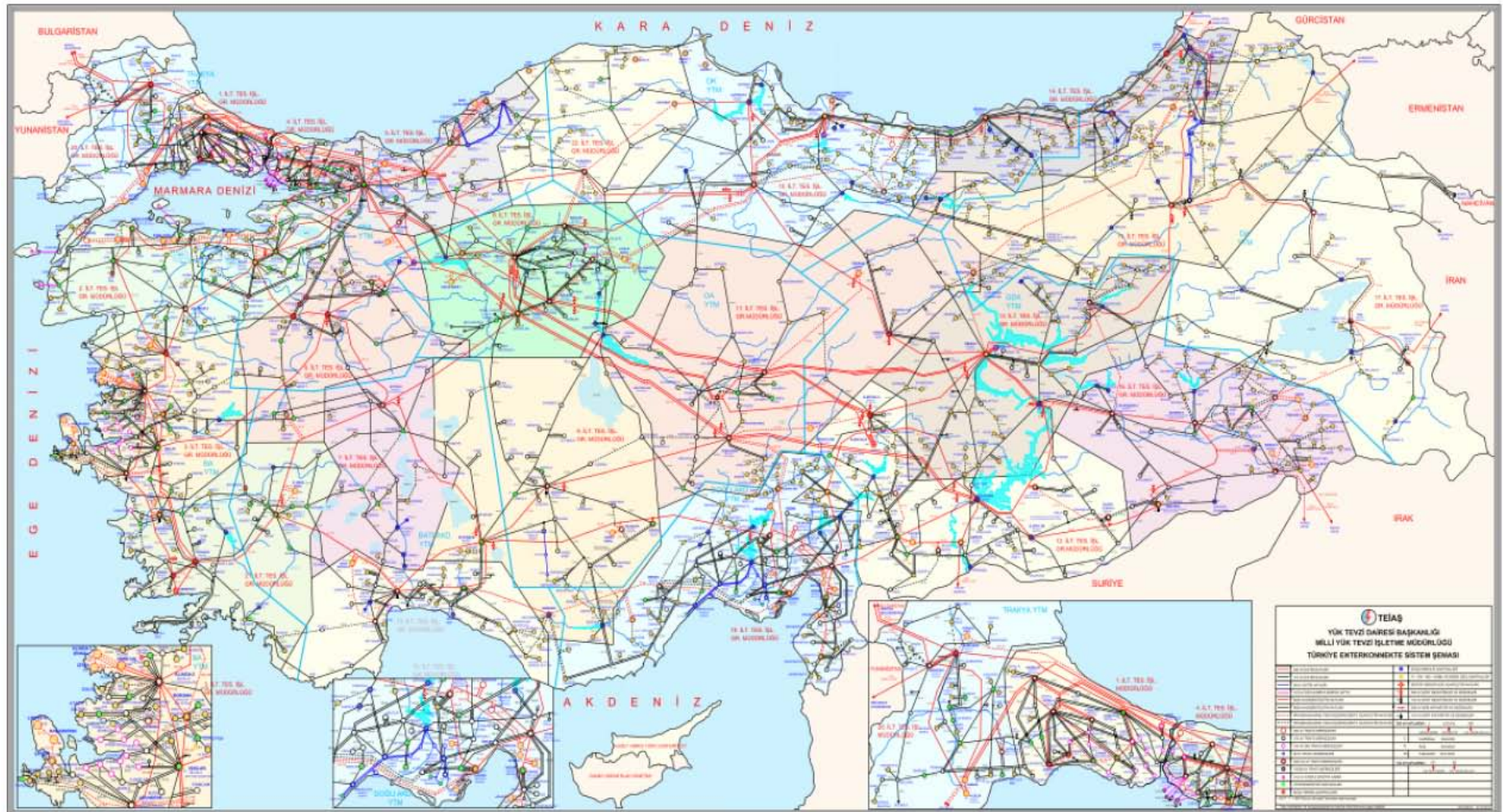
Balancing Power Provision- Planned Pumped Hydro

Projektname	Ort	Inst. Leistung (MW)	Gepl. Durchfl. (m ³ /s)	Fallhöhe (m)
Kargı PHEs	Ankara	1000	238	496
Sarıyar PHEs	Ankara	1000	270	434
Gökçekaya PHEs	Eskişehir	1600	193	962
İznic-I PHEs	Bursa	1500	687	255
İznic-II PHEs	Bursa	500	221	263
Yalova PHEs	Yalova	500	147	400
Demirköprü PHEs	Manisa	300	166	213
Adıgüzel PHEs	Denizli	1000	484	242
Burdur Gölü PHEs	Burdur	1000	316	370
Eğridir Gölü PHEs	Isparta	1000	175	672
Karacaören-II	Burdur	1000	190	615
Oymapınar PHEs	Antalya	500	156	372
Aslantaş PHEs	Osmaniye	500	379	154
Bayramhacılı	Kayseri	1000	720	161
Yamula PHEs	Kayseri	500	228	260
Hasan Uğurlu	Samsun	1000	204	570

Source: Tutus, Pasin:
 Pompa Depolamalı
 Hidroelektrik Santraller,
http://www.dektmk.org.tr/pdf/enerji_kongresi_10/aylatutus.pdf

3rd Phase Test Transmission Grid Synchronous Operation ENTSO-E Turkey

Via two 400-kV lines to the Bulgarian system and by one 400-kV line to the Greek system.



Vision for 2023 – Targets of the Turkish ministry until 2023

The primary aim of Turkey is to realize its own energy security.

- Huge electricity demand growth by 200 TWh till 2023
- 5 billion dollar investments required per year
- 75% privately owned
- Increasing RES generation to 30 % of demand
- Increased utilization of hydro power: From 50TWh to 140TWh
- 20 GW Windpower (1,694 GW in 2010) with will be 18% of demand
- 600 MW geothermal and 3GW Solarpower
- Increased use of domestic coal
- Building of nuclear power plants
- 20% increase in km Grid length expected till 2023.

Renewable energy potential of Turkey

Renewable energy source	Usage kind of energy	Natural potential	Technical potential	Economic potential
Solar energy	Electrical energy (TWh/year)	977,000	6105	305
	Heat (mtoe/year)	80,000	500	25
Hydraulic energy	Electrical energy (TWh/year)	433	216	127.4
Wind energy				
Direct terrestrial	Electrical energy (TWh/year)	400	110	50
Direct maritime	Electrical energy (TWh/year)	–	180	–
Sea wave energy	Electrical energy (TWh/year)	150	18	–
Geothermal energy	Electrical energy (TWh/year)	–	–	1.4
	Heat (MW _t)	31,500	7500	2843
Biomass energy	Fuel (classic) (mtoe/year)	30	10	7
	Fuel (modern) (mtoe/year)	90	40	25

Demirbas 2004: Energy from renewable sources in Turkey: status and future direction.

■ Feed in Tarif for 10 years

The plant type of the generation of energy from renewable resources	The prices that will be applied (USD cent/kWh)
A hydroelectric power plant	7.3
A wind power plant (A wind farm)	7.3
A Geothermal energy plant	10.5
A biomass supplier (including landfill gas)	13.3
A solar energy plant	13.3

■ Additional amounts(for 5 years) for companies with local production components

Plant Type	Locally produced equipments and components	Domestic contribution supplement (USD cent/kWh)	
power	3.Solar Tracking System	0.6	
	4.The mechanical parts of the thermal energy storage system	1.3	
	5.Mechanical parts of the steam production system by collecting the solar beam on the tower	2.4	
	6. Sterling engine	1.3	
	7. The panel integration and structural mechanics of the solar panel	0.6	
	E- Facilities that based on biomass energy	1. Fluidized-bed steam boiler	0.8
		2. Liquid or gas-fired steam boiler	0.4
	3. Gasification and gas cleaning group	0.6	
	4. Steam or gas turbine	2.0	
	5. Internal combustion engine, or Stirling engine	0.9	
	6. Generator and power electronics	0.5	
	7. Cogeneration system	0.4	
F- Facilities that based on geothermal energy	1. Steam or gas turbine	1.3	
	2. Generator and power electronics	0.7	
	3. Steam injector or a vacuum compressor	0.7	

Questions

- What are your experiences to build a project in Turkey as foreign investor
- What obstacles do you expect for using the cooperation mechanisms in practice
- What are the biggest opportunities for investments in Turkey

- In Turkey, the connection to the grid occurs through a bidding procedure. Do you have experience with this procedure?
- Will Grid reinforcement be strong enough for growth and for exporting RES-E?

- Wind and hydropower resources might be needed domestically, Solar potential seems sufficient for export. How do you see this situation?

Thank you for your attention!

Contact

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Vision for 2023 – Targets of the Turkish ministry until 2023

- Annual investments of 5 Billion Dollar
- 125GW installed capacity (54GW in 2010)
- 75% privately owned
- Increasing RES generation to 30 % of demand
- 60.717 km GRID (49.104 km in 2010)
- Eine Kapazität von 158.460 MVA bei Stromverteilungsstationen (von 98.996 MVA im Jahr 2010)
- Decreasing grid losses to 5 % and use of intelligent networks
- 5 Mrd. m3 natural gas storage capacity(2,6 Mrd. m3 in 2010)
- Introduction of Energy Market
- 8 nuclear power plants with 10GW planned (5-10% of demand)
- Errichtung von 4 Kernreaktoren mit einer Kapazität von 5.000 MW
- Construction of 18,5GW Coal power plants.
- Increased utliation of hydro power: From 50TWh to 140TWh
- 20 GW Windpower (1,694 GW in 2010) with will be 18% of demand
- 600 MW geothermal and 3GW Solarpower