

The Future Prospects of the Turkish Energy Policy

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The Future Prospects of the Turkish Energy Policy

- Turkish Economy
- Primary Energy Demand of Turkey
- Turkish Energy Strategy towards 2023
- Sectoral Breakdown: Electricity
- Sectoral Breakdown: Nat. Gas & Lignit
- Sectoral Breakdown: Renewables
- Sectoral Breakdown: Nuclear
- Critical Evaluation of the Turkish Energy Strategy and Conclusions

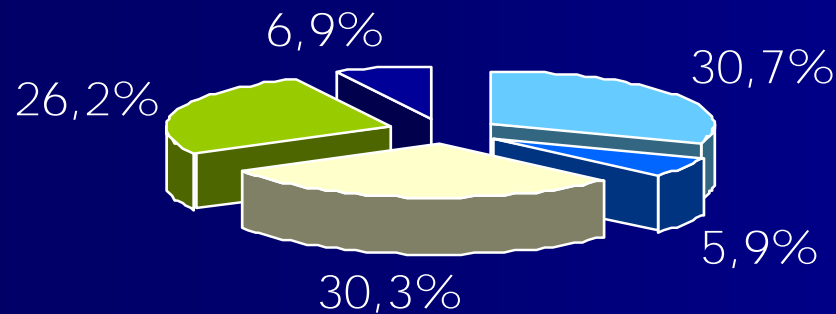
Turkish Economy

- Population: 79,8 Millionen
- GDP(Bill USD): 859.0(2015), 857.3 (2016)
- GDP growth(%): 6.1(2015), 2.9(2016)
- Per capita income(USD): 10.743 (2016),
- 6. largest economy in Europe
- 17. largest economy of the world
- Trade volume (Bill USD): 400(2014), 351(2015), 345(2016)
- Consumer price index: 8,17(2014), 8,81(2015), 8,53 (2016)

Primary Energy Mix of Turkey

(2015: 129.2 Mil. toe)

Source: MENR



Turkish Energy Strategy towards 2023

- Utilization of indigenous and renewable energy resources
- Diversification of energy supplying countries
- Reduction of energy intensity by 20%
- Introduction of nuclear energy into the energy mix

Sectoral Breakdown: Electricity Sector

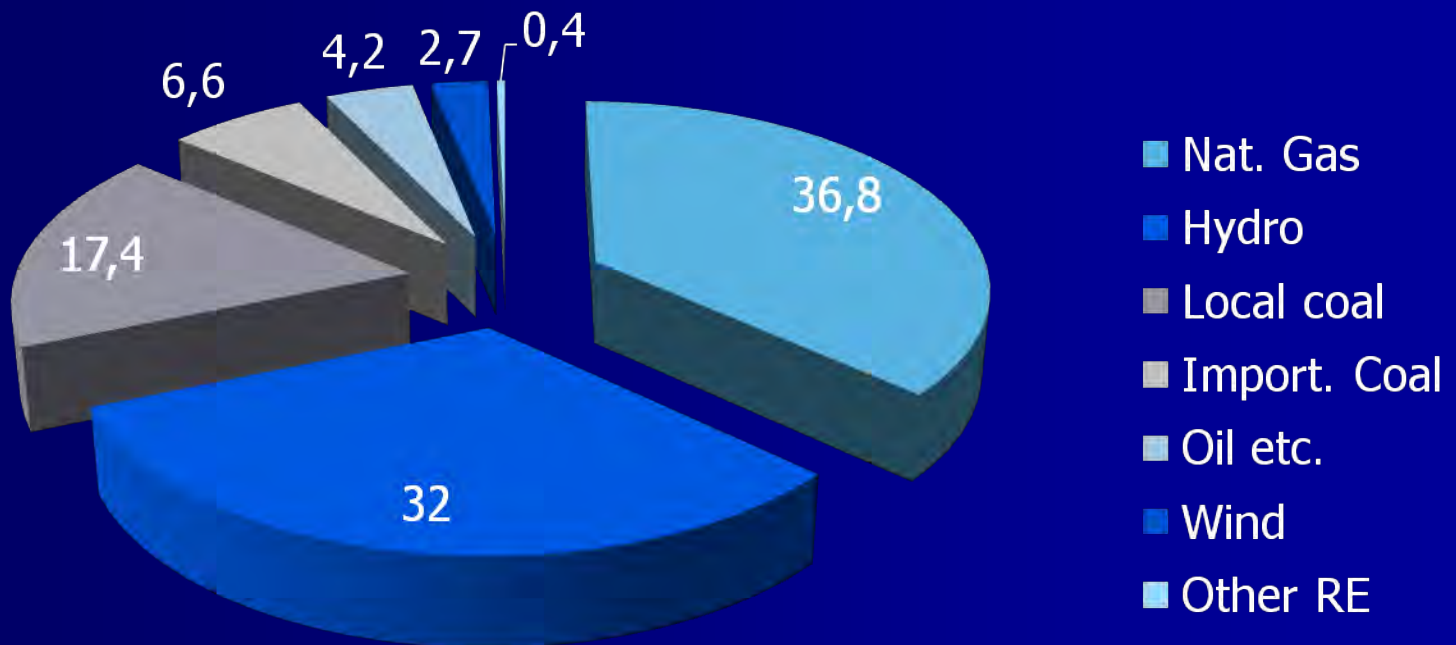
Demand increase 1980-1999: ~8,5; 2000-2009: ~5,1

Yıl	Kurulu Güç MW	Artış %	Tüketim GWh	Artış %
2005	38.844	5,5	160,794	7,2
2010	48.590	8,5	209,494	7,9
2014	69.520	4,4	257.220	4,4
2015	73.147	5,2	265.724	3,3
2016	78.497	7,3	278.346	4,8

Composition of the Installed Power

49.523 MW Early 2011

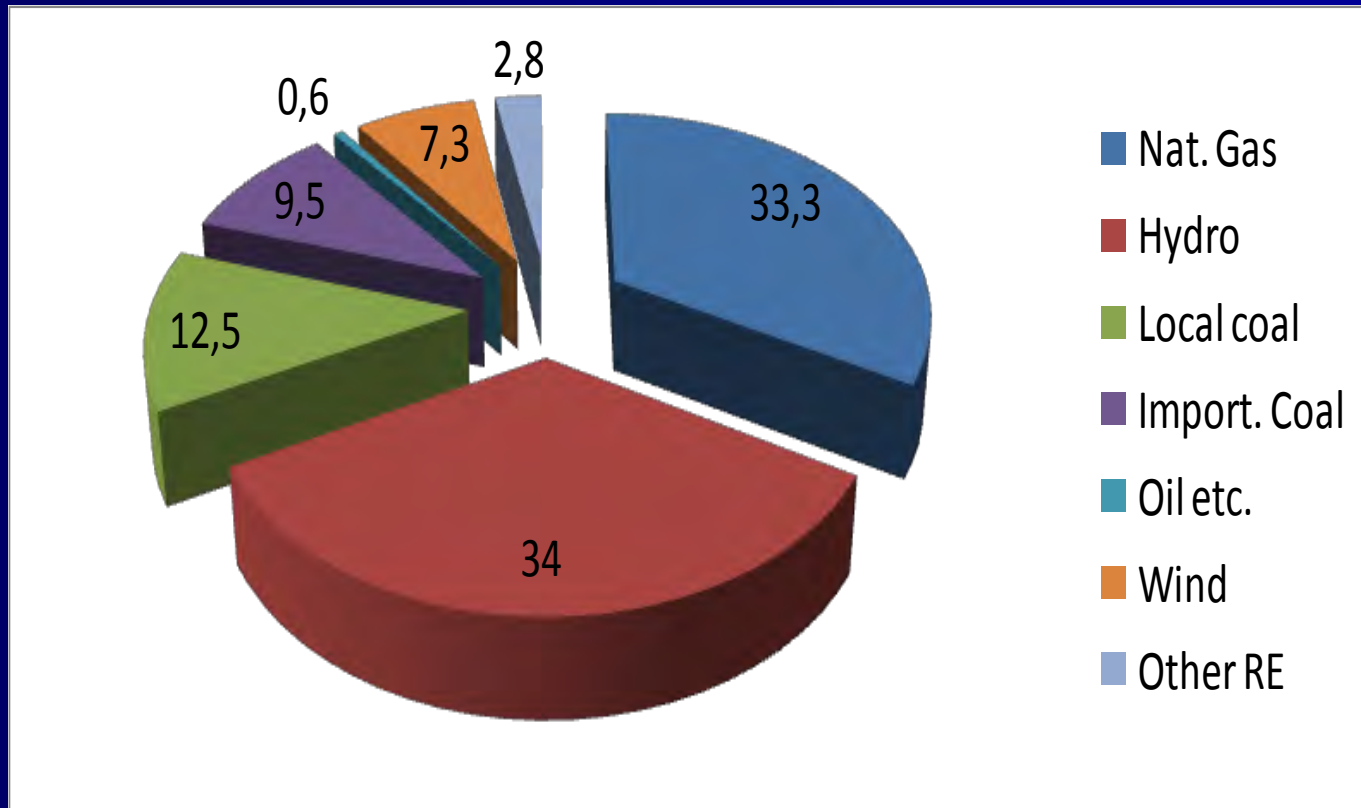
Source: TEİAŞ, EPDK



Composition of the Installed Power

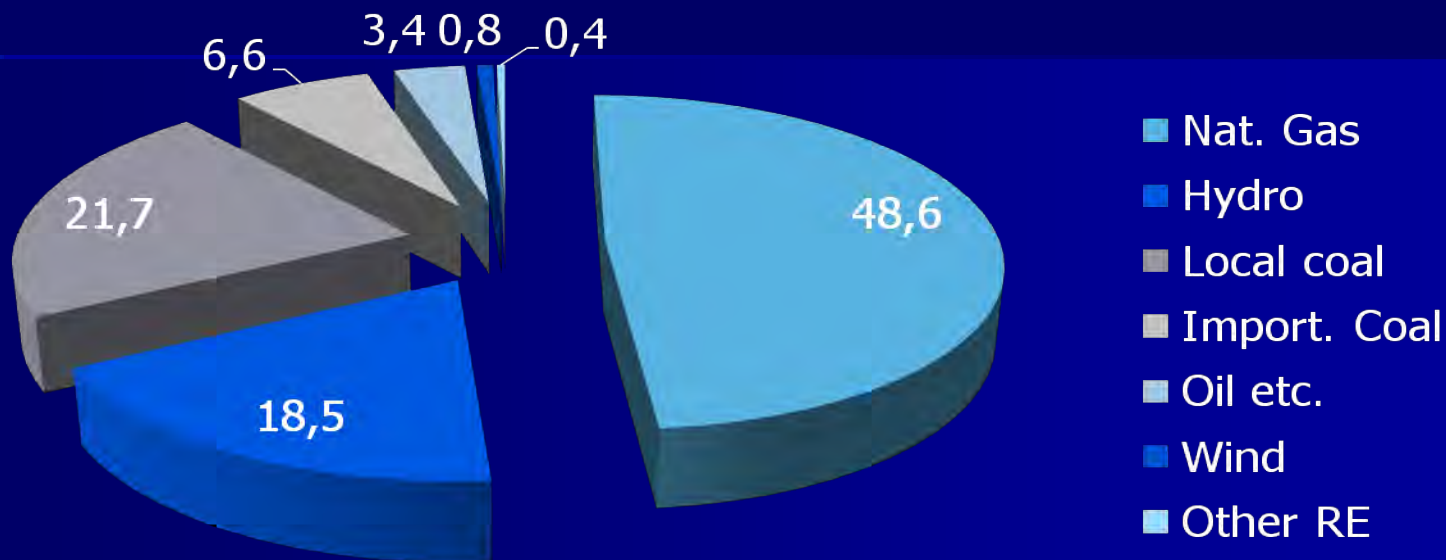
78.497 MW End of 2016

Source: TEİAŞ, EPDK



Breakdown of Electricity Generation by Resources

2010: 210,2 TWh (Source: TEİAŞ, EPDK)



2016: 273,4 TWh

Nat. Gas:	32,1%
Hydro:	24,6%
Wind+Solar+ Geothermal:	7,8%
Coal:	33,8%

Electricity Sector Gross Demand Scenarios (TWh)

Source: TEİAŞ, EPDK

Growth	2020	2030
High 5%	433,8	886,9
Low 4,2%	405,5	735,3

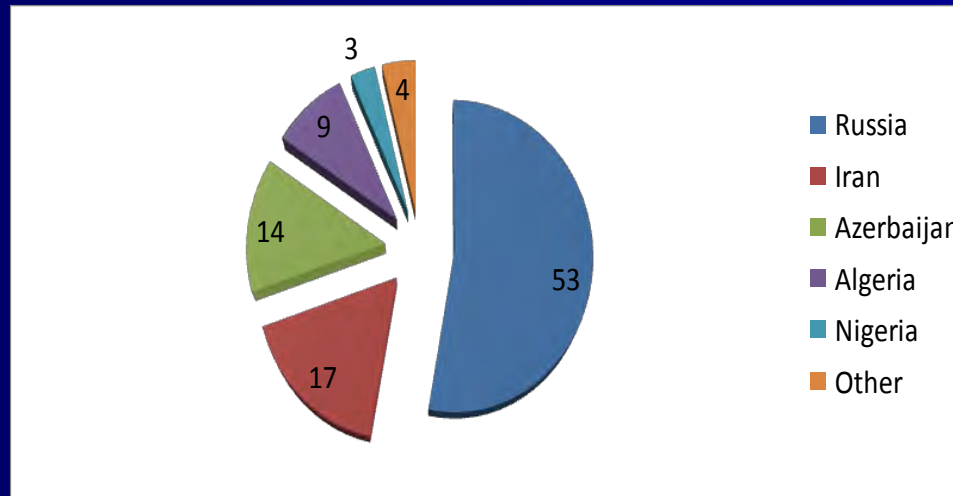
Per capita consumption: 2800 kWh/a (still too low)

If the strategy fails, up to 60 bcm additional gas may be needed

The scenario proved unrealistic

Sectoral Breakdown: Natural Gas Imports of Turkey 2016

(Import: 46,4 bcm, Export: 0,7 bcm Production: 0,4 bcm)



- Demand growth 1990-2009: 13,5% in average
- Imports 2014: 49,3 bcm, 2015: 48,4 bcm
- Underground storage: New target 10% of consumption by 2019
- Dec 2016: 1. LNG floating storage and regas unit (FSRU) commissioned
- Diversification of suppliers & additional volumes
- Market liberalization

Sectoral Breakdown: Lignit

(Source: ETKB, Thousand t/year)



- 120 milyar TWh/a electricity generation potential , utilization until 2023
- 2010: 8079 MW installed capacity(37% in operation
- 2016: 9055 MW installed capacity
- 11,5 bill t rezerve
- Support for the private sector needed
- An "Afşin-Elbistan basin low" needed

Sectoral Breakdown: Hydro

Source: ETKB, EPDK

140 TWh/a potential

Early 2011: 15.835 MW installed capacity (37% in operation)

End of 2016: 26.681 MW installed capacity

2023: 100% utilization target

Strong NGO opposition



Sectoral Breakdown: Wind

2007: 27 MW

2008: 433 MW

2009: 800 MW

2010: 1.329 MW

2011: 1.729 MW

2012: 2.261

2013: 2.760 MW

2014: 3630 MW

2015: 4365 MW

2016: 5751 MW

2023: 20.000 MW ?



Sectoral Breakdown: Geothermal

Source: EPDK

Electricity:

2002: 15 MWe

2011 –March: 94,2 MWe in operation, 157,8 MWe under development

2023 Target: 600 Mwe

End 2016: 820,9 MWe



Sectoral Breakdown: Solar



2014: 40,2 MW

2015: 248,8 MW

2016: 832,5 MW

Sectoral Breakdown: Nuclear

Source: Rosatom, MENR

Akkuyu Nuclear Power Plant

Technical

Reactor design: NPP 2006 (VER-1200), 4 x 1200 MW

Construction period: 2012-2022 ?

Legal steps

12 May 2010: IGA has been signed

IGA has been ratified in both parliaments

13 Dec 2010: Project company has been formed

12 Dec 2013: Updated site report approved

01 Jan 2014 Environmental impact assesment approved

25 Jun 2015 Preliminary Generation license issued

29 Jun 2015 Contract for off-**shore structures signed**

09 Feb 2017 Design parameters approved

Commercial terms

Operating period: 60 years

CAPEX: 20 bill USD

Payback period: 18 years

Contract period: 15 years for 50% of the generated electricity

Fixed price: 12.35 US cents/kWh

Sectoral Breakdown: Nuclear

Source: MENR

Sinop Nuclear Power Plant Project

Reactor Design: ATMEA-1 (4x1120)

Installed capacity: 4480 MW

Operational period: 60 years

CAPEX: 20 bill US \$

Project sponsors: Mitsubishi Heavy Ind, Itochu, Engie, EÜAŞ

Oct 2013: IGA agreement with Japan signed

Project site review to be ready Dec 2017

Feasibility studies to be ready Mar 2018

Construction start: 2023 ?

Iğneada (?) Nuclear Power Plant Project

Reactor Design: 2 x AP 1000, 2 x CAP 1400

Project sponsors: SNPTC, Westinghouse

Critical Evaluation of the Turkish Energy Strategy towards 2023

My conclusions from 2011:

Lignite: utilization of 120 TWh/a generation capacity (13.000 MW additional) until 2023 is not realistic; up to 4.000 MW may be realized

Hydro: utilization of 140 TWh/a generation capacity (~40-45.000 MW) until 2023 is not realistic; up to 110 TWh/a in total may be utilized

Wind: 20.000 MW until 2023 is not realistic; up to 15.000 MW may be realized

Nuclear: 5% of the electricity generation from nuclear in 2020 is not realistic; up to 3% may be realized

Energy Efficiency: Legislation in place, but incentives are not sufficient

Turkey will need additional gas supplies to meet the demand in 2023.

Energy Strategy 2015-2019

RE Source	Base Year 2013	2015	2017	2019
Hydrolic	22.289	25.000	27.700	32.000
Wind	2.759	5.600	9.500	10.000
Geotherm	311	360	420	700
Solar	-	300	1.800	3.000
Biomass	237	380	540	700

- A very comprehensive and wide ranging report
- More realistic compared with 2023 target
- Unexpected developments of 2016 makes it difficult to realize

Thank you

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