

27th Annual ATC/TAIK Conference

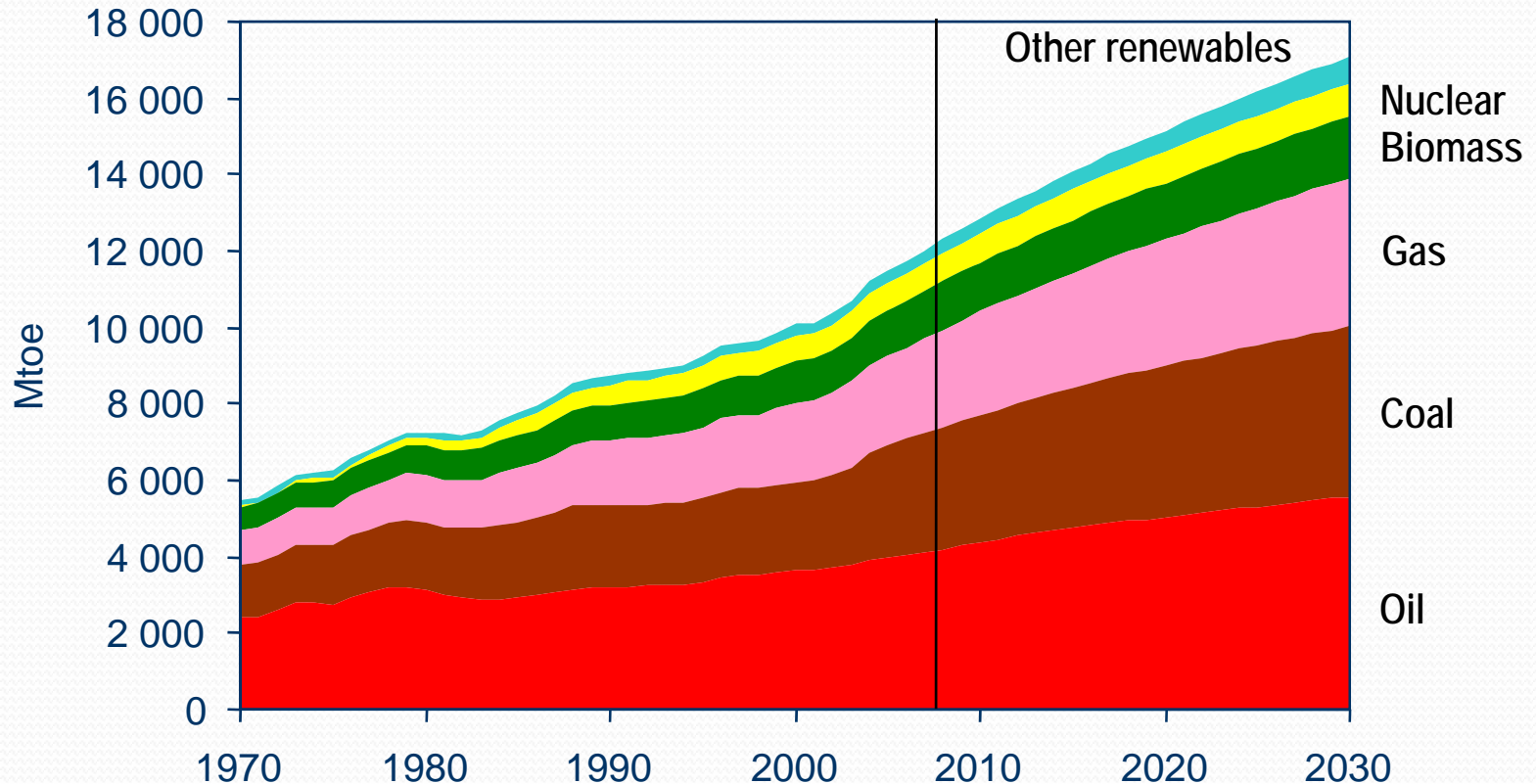
April 15, 2008

ENERGY SECURITY
&
GLOBAL WARMING

Budak Dilli,
General Directorate of Energy Affairs
Ministry of Energy and Natural Resources-
Turkey

WORLD OUTLOOK

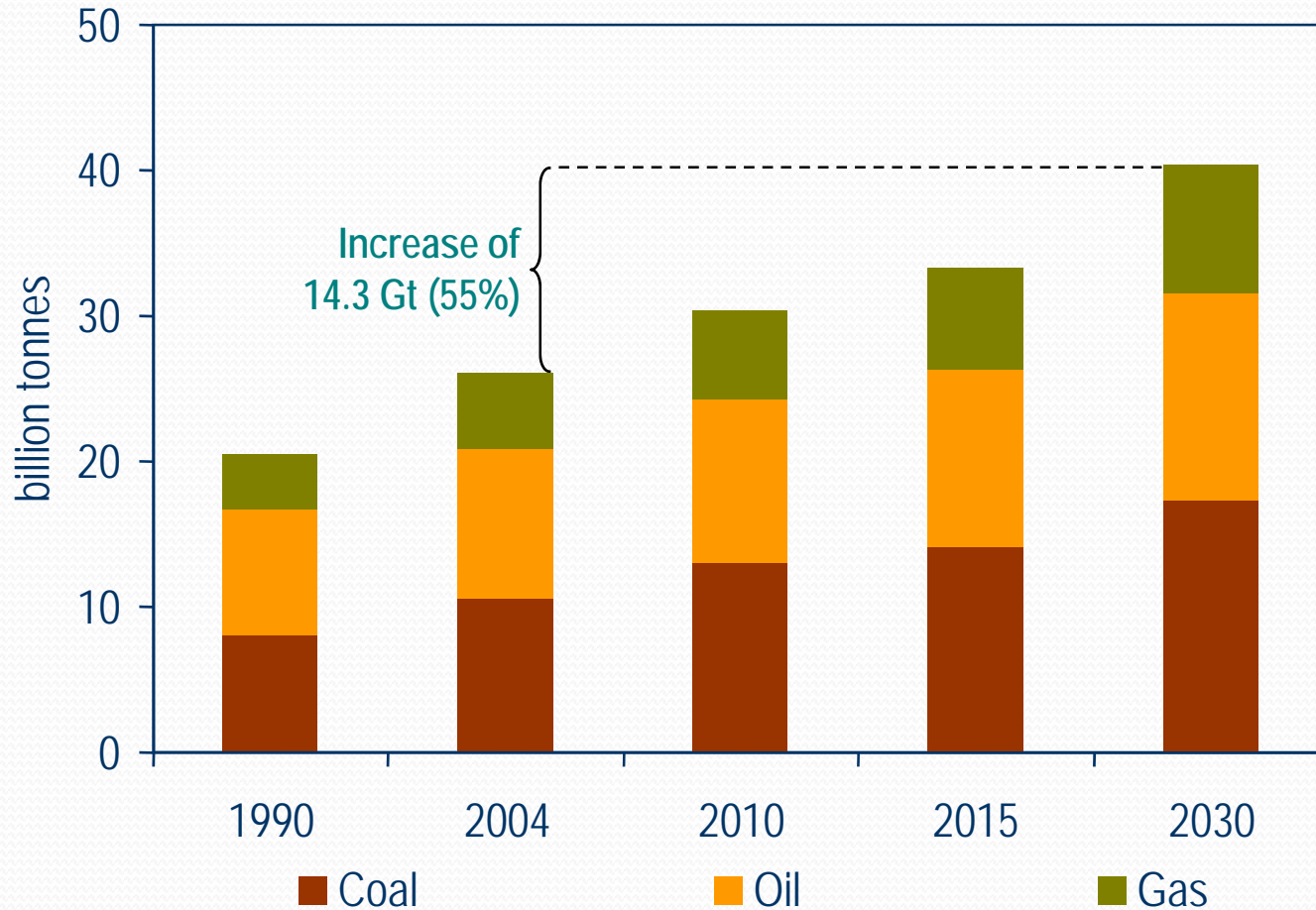
The Reference Scenario: World Primary Energy Demand



Global demand grows by more than half over the next quarter of a century, with coal use rising most in absolute terms (IEA-WEO 2006)

WORLD OUTLOOK

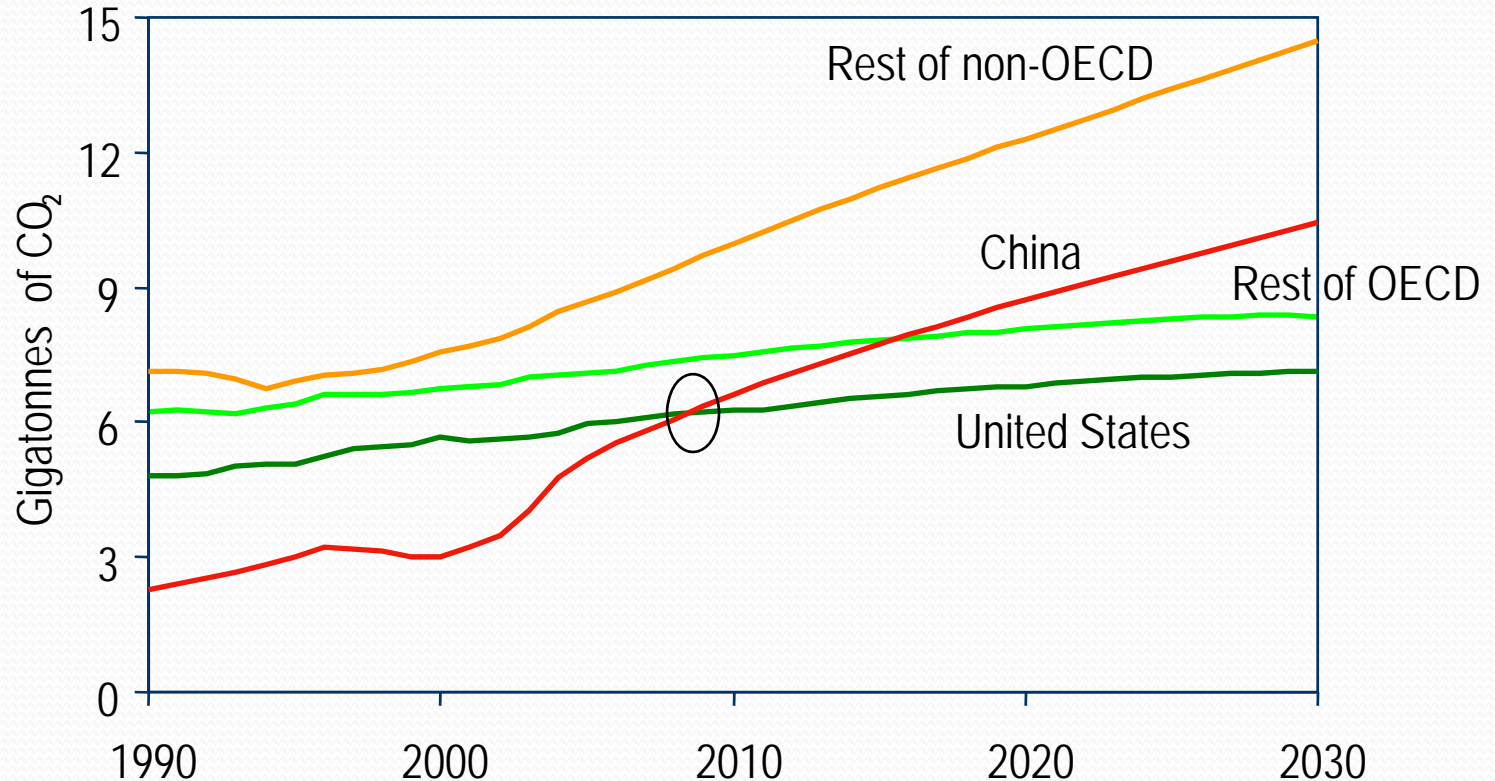
Reference Scenario: Energy-Related CO₂ Emissions by Fuel



Half of the projected increase in emissions comes from new power stations, mainly using coal & mainly located in China & India

WORLD OUTLOOK

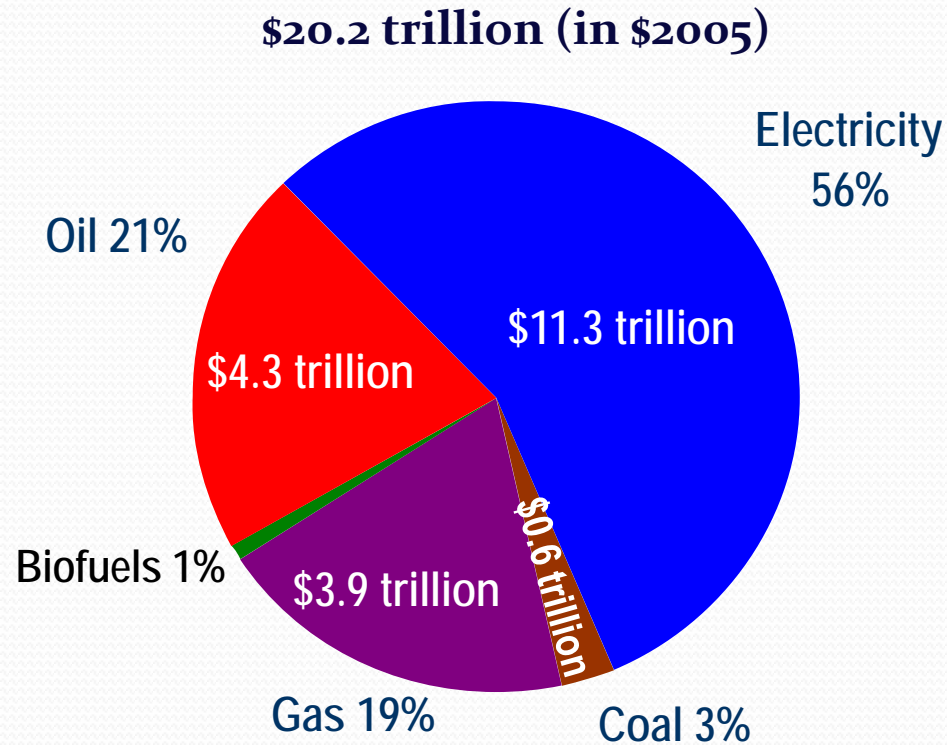
Reference Scenario: Energy-Related CO₂ emissions by Region



China overtakes the US as the world's biggest emitter before 2010, though its per capita emissions reach just 60% of those of the OECD in 2030 (IEA)

WORLD OUTLOOK

Reference Scenario: Cumulative Investment, 2005-2030



Investment needs exceed \$20 trillion – \$3 trillion more than previously projected, mainly because of higher unit costs

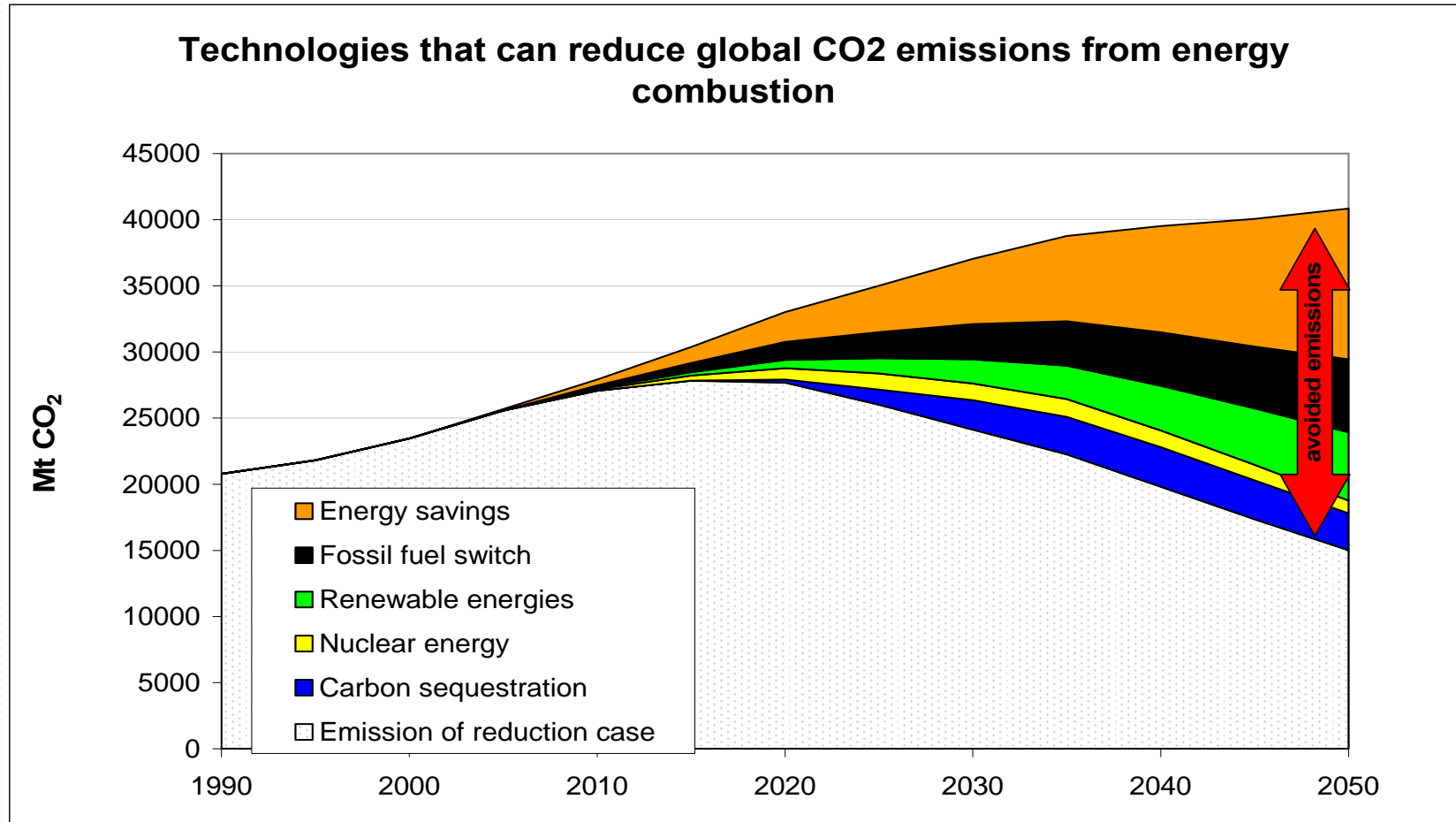
WORLD OUTLOOK- SUMMARY

- **TWO ALTERNATIVES:**
 - **UNDER-INVESTED, VULNERABLE AND DIRTY,**
 - **ADEQUATELY-INVESTED, COMPETITIVE AND CLEAN**

CHALLENGES:

- TO HAVE SUFFICIENT ENERGY TO COPE WITH THE INCREASING DEMAND IN AN ENVIRONMENTALLY SUSTAINABLE MANNER.
- THE ENERGY RELATED EMISSIONS IS NOT A LOCAL OR NATIONAL PROBLEM: *CLIMATE CHANGE*
- THE PROBLEMS OF DEVELOPING COUNTRIES:
 - FASTER INCREASE, MORE ENERGY NEED, MORE EMISSIONS, EVEN MORE FINANCE NEEDED FOR EMISSION REDUCTION

Emission Reduction



YES, BUT THE COST OF EMISSION REDUCTION ???

WHAT DEVELOPMENTS WILL MAKE THE DIFFERENCE ?

- EFFICIENCY
- MORE RENEWABLE ENERGY
- CLEAN COAL TECHNOLOGIES
- HYDROGEN
- NUCLEAR

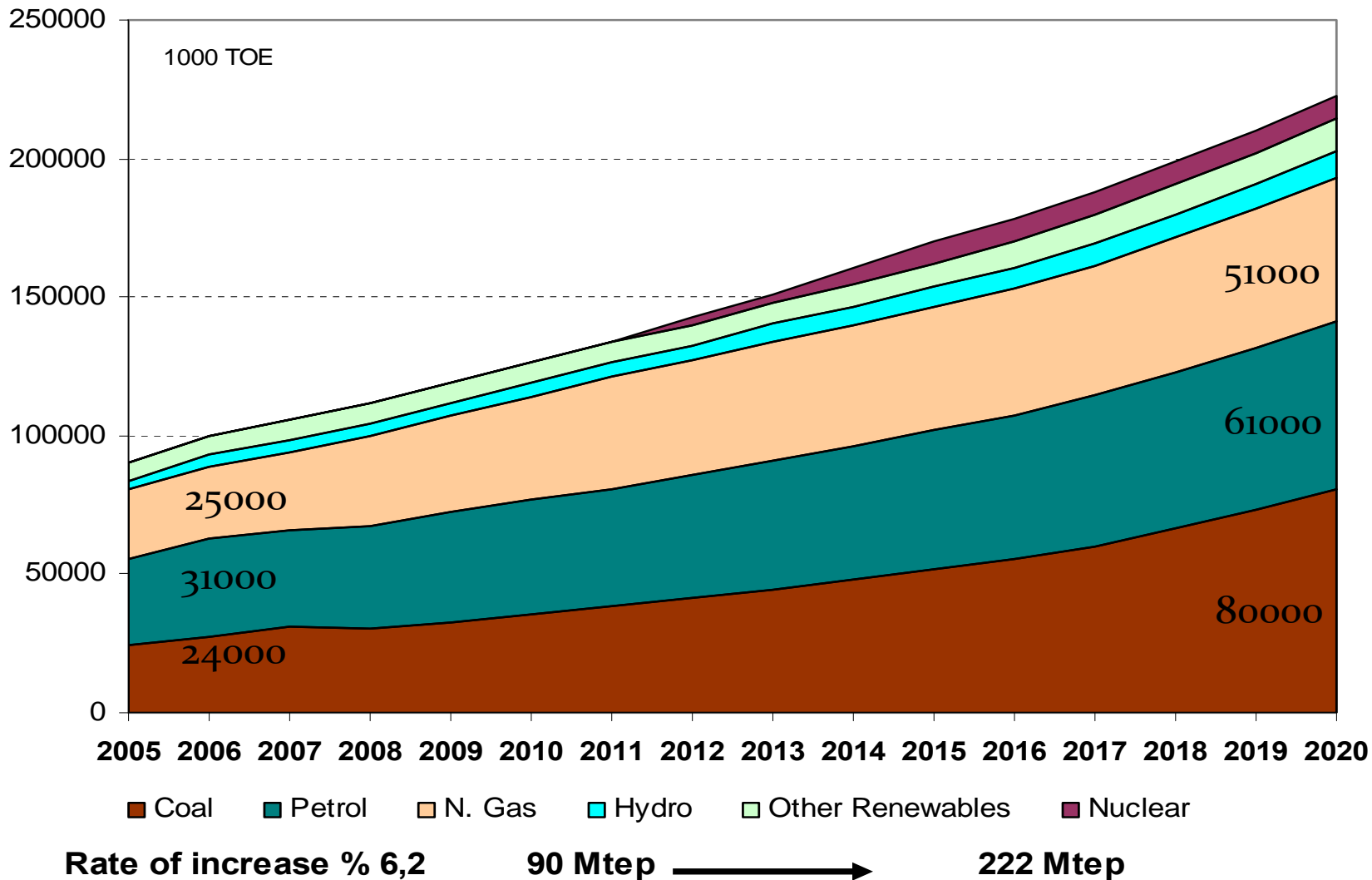
TURKEY:

Main Characteristics Of Energy Sector

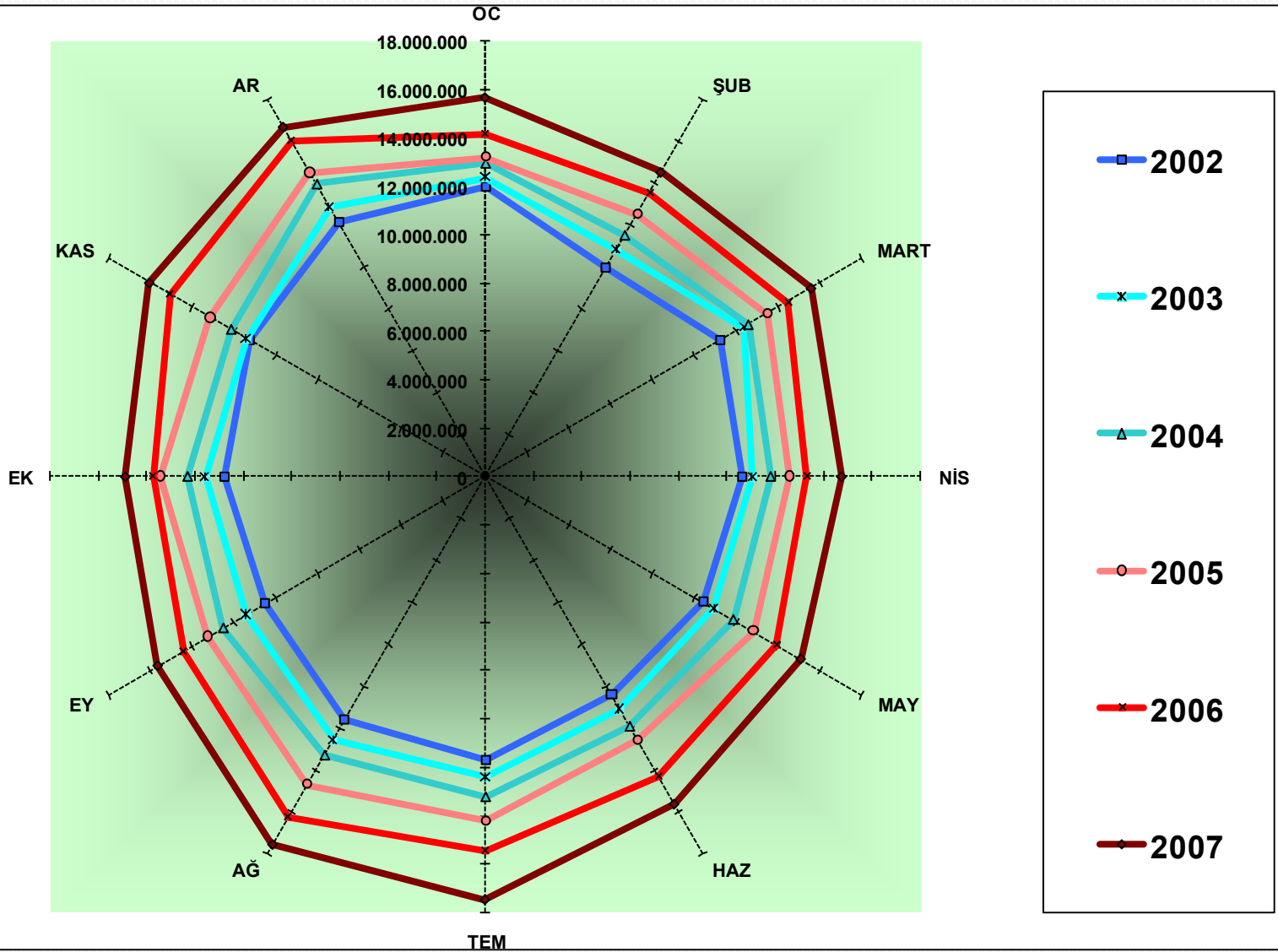
- High demand increase rate
- High investment requirement
- Import Dependency
- High Energy Intensity
- Low Efficiency

- High efficiency gain potential
- Considerable potential of renewable sources
- Emerging Market

TURKEY - Primary Energy Demand Projection

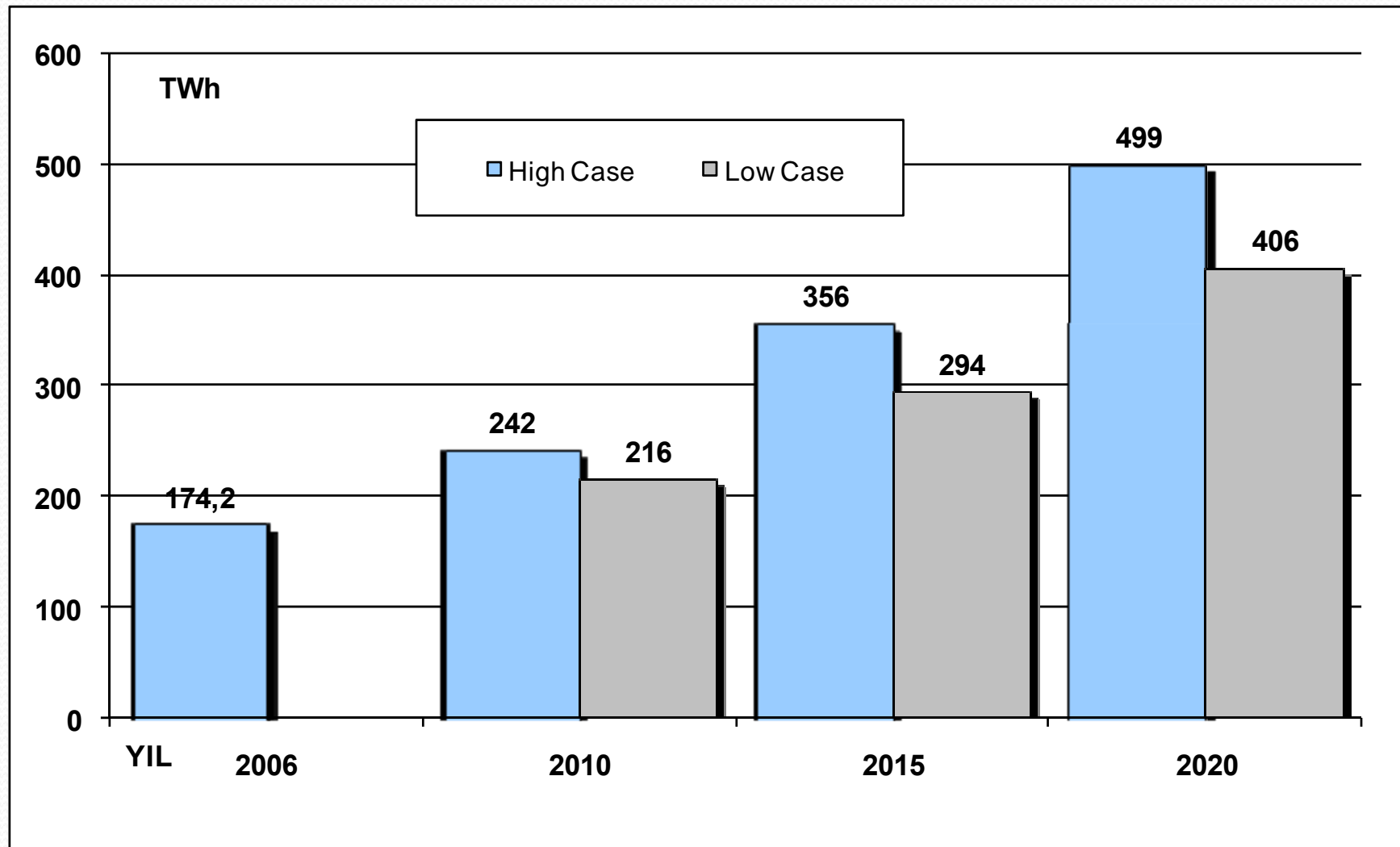


INCREASING CONSUMPTION



TURKEY-

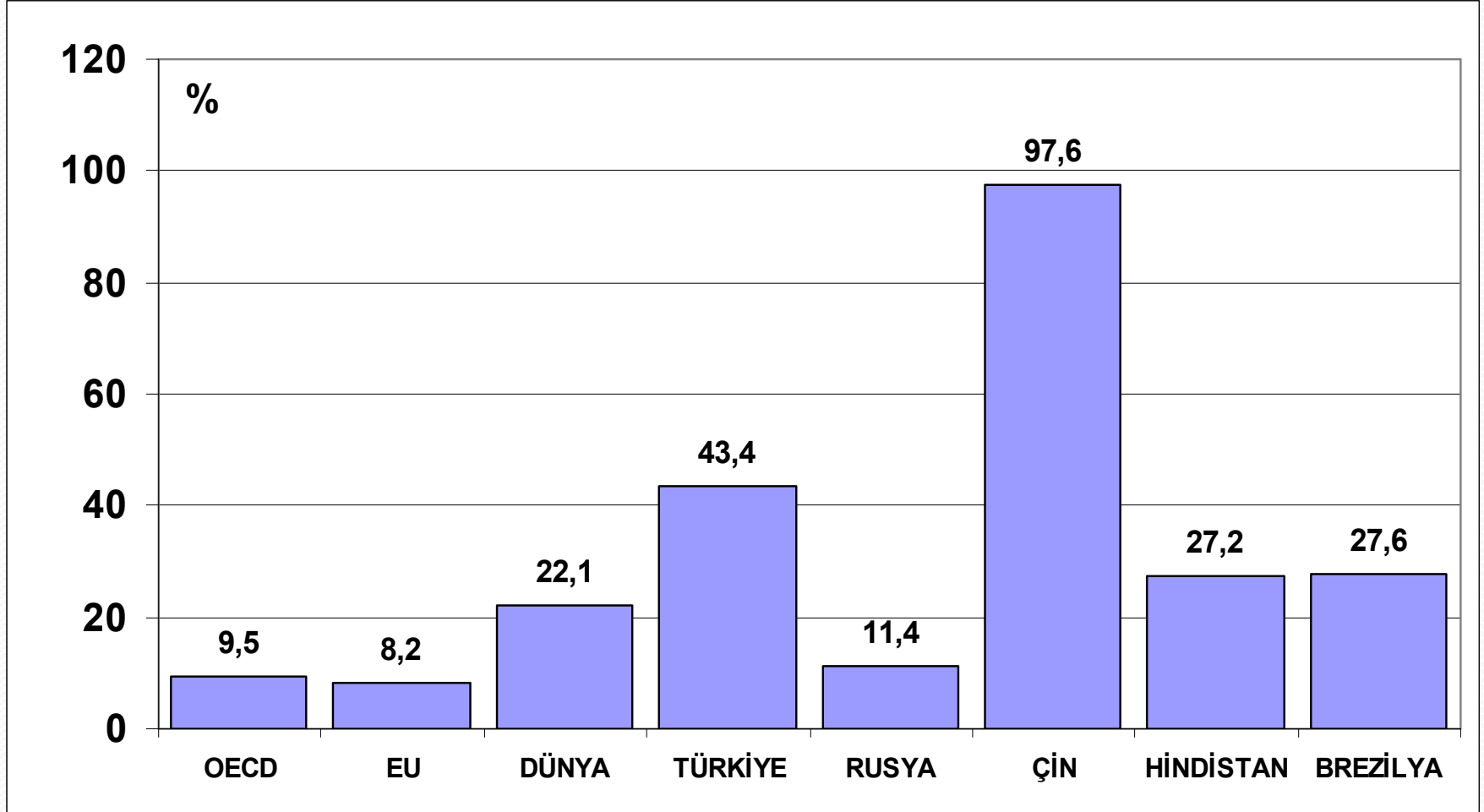
Electrical Energy Demand Projection (2006-2020)



TURKEY:

ELECTRICITY CONSUMPTION COMPARISON

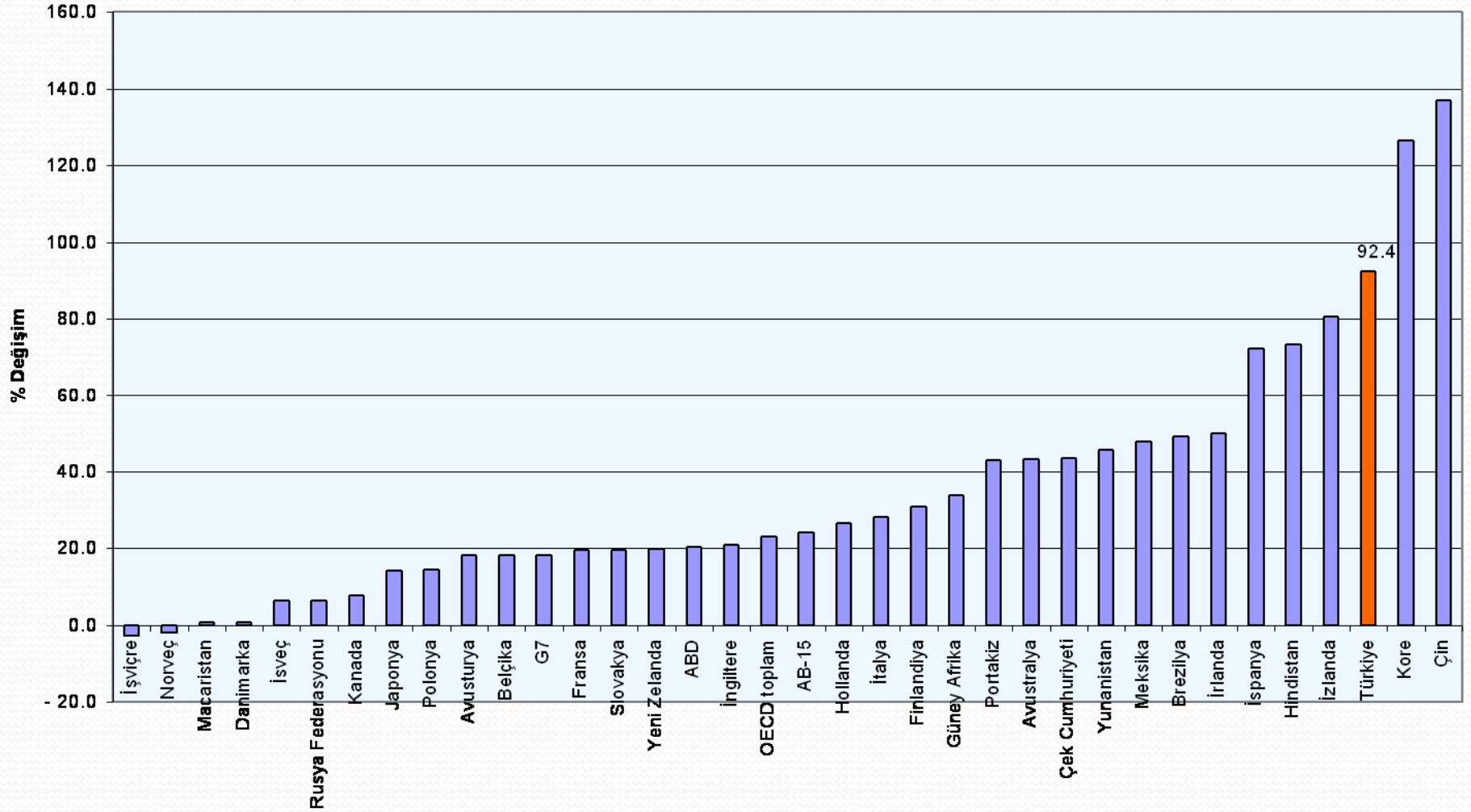
(2001-2006)



(Kaynak: IEA)

Enerji İşleri Genel Müdürlüğü

1994-2004 % INCREASE IN ELECTRICAL ENERGY CONSUMPTION



Electricity

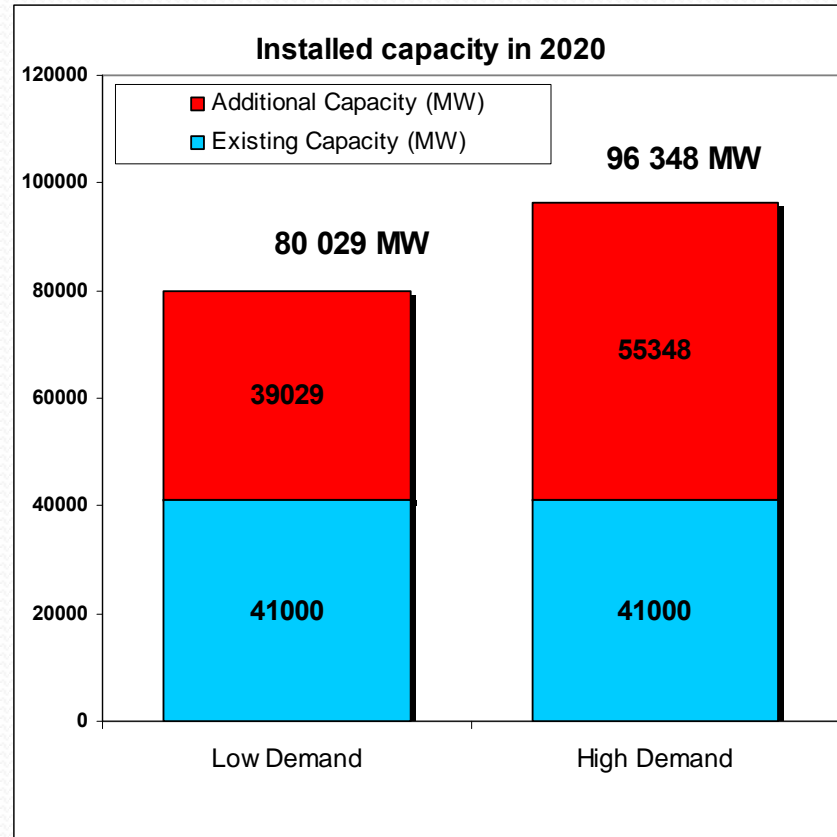
New capacity requirement (2020)

High scenario

- ~ 56.000 MW additional capacity need

Low scenario

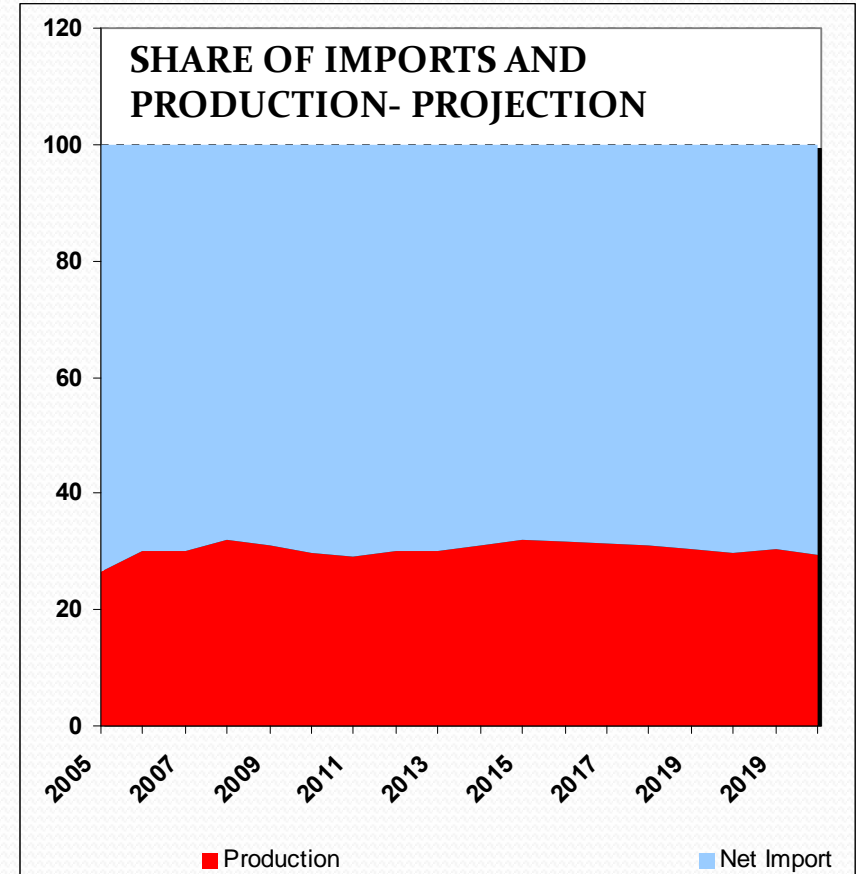
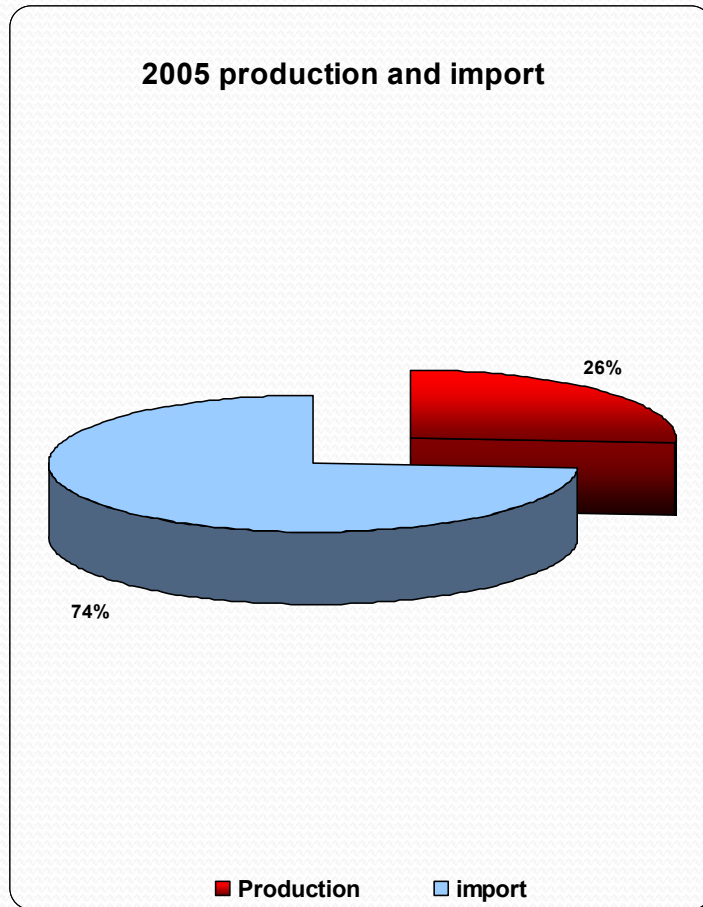
- ~ 40.000 MW additional capacity need



Investments in Energy Sector

- Estimation up to 2020:
 - Power Generation, Transmission, Distribution
~105 Billion \$
 - Natural Gas.....2,5 Billion \$
 - Coal.....5 Billion \$
 - Petroleum.....16 Billion \$
- New Power plants, rehabilitation, Pipelines, Natural gas storage...

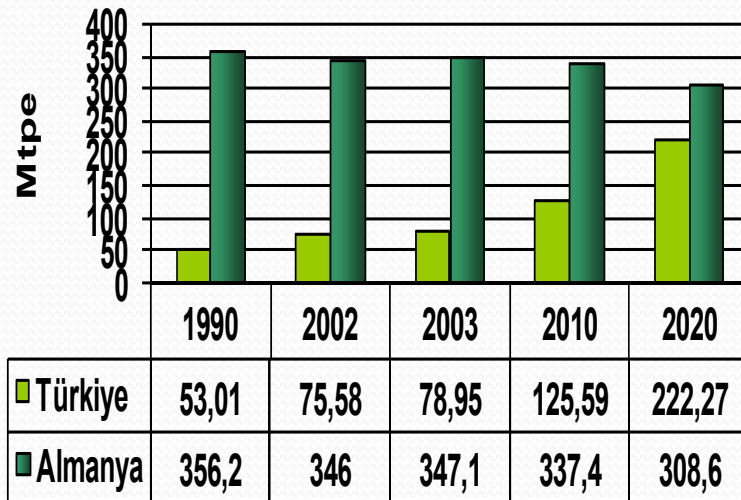
Import Dependency



Business As Usual Case

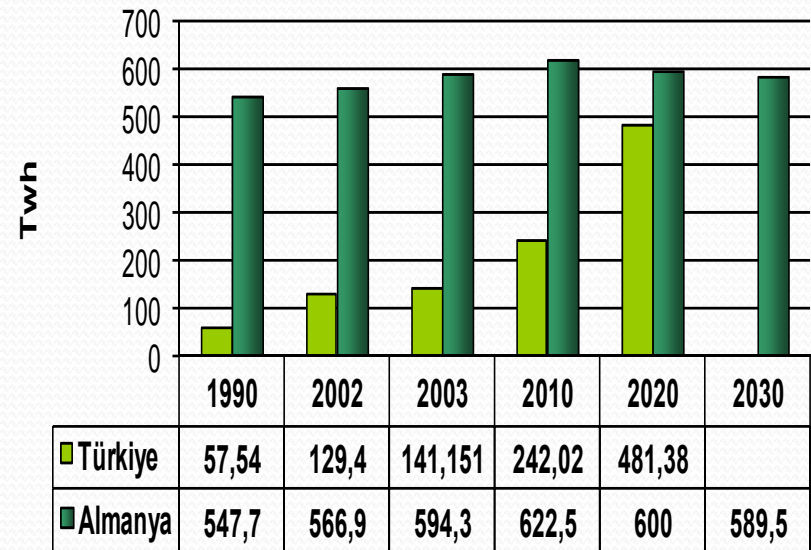
Energy consumption- Some Comparisons

Germany- Turkey Primary Energy Consumption
(1990-2020) (IEA)



Germany-Turkey Electric Generation(1990-2030)

kaynak:iea

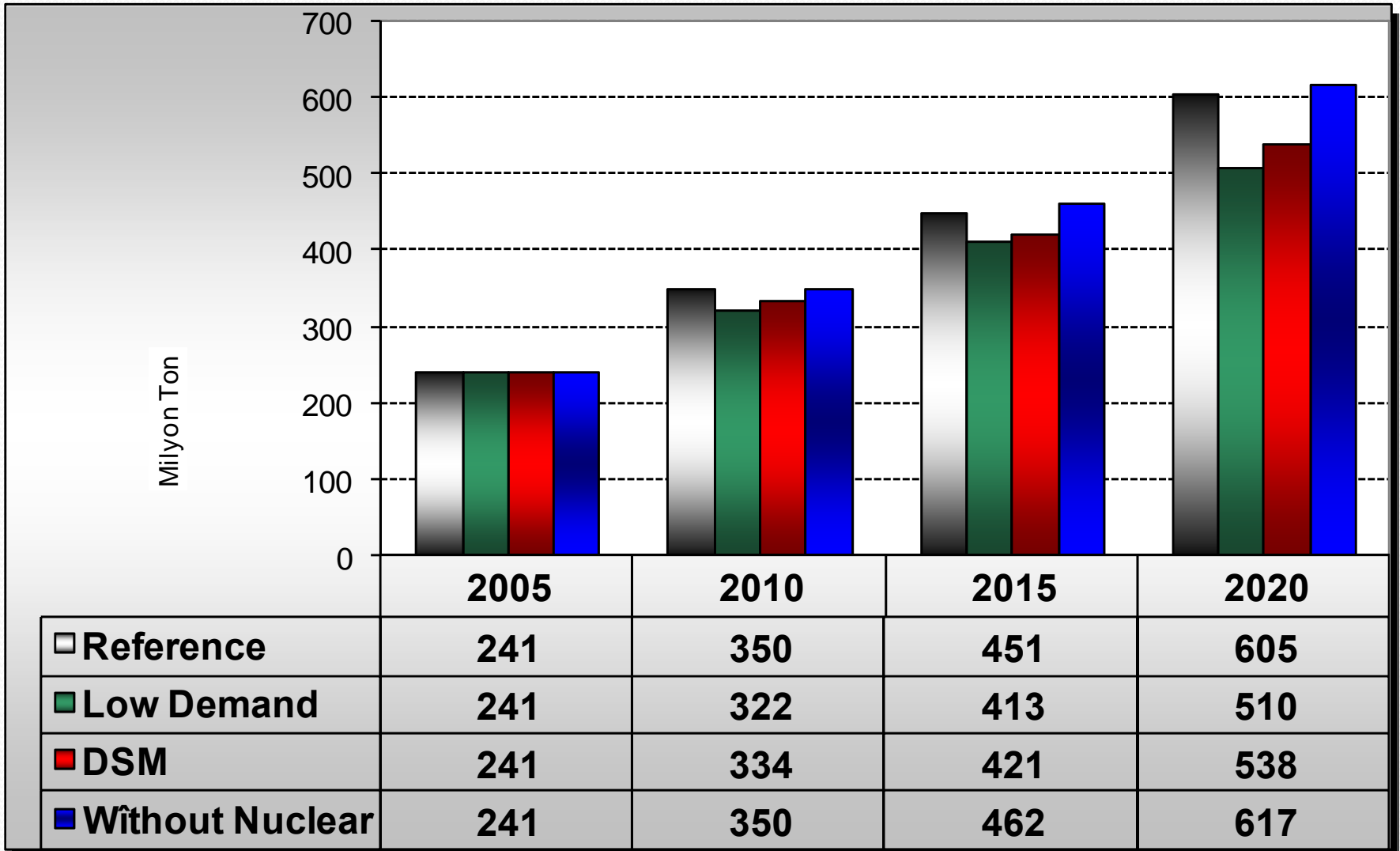


ENERGY AND EMISSIONS:

	GROSS CONSUMPTION	Emission (million ton CO ₂ -eq)	Emission per Capita
1990	57,5	170,1	3,03
2004	150,7	296,6	4,13(*)
%	162	74	36

(*)World Average: 4.24 , OECD Average: 15.6

EMISSION SCENERIOS:



POLICIES

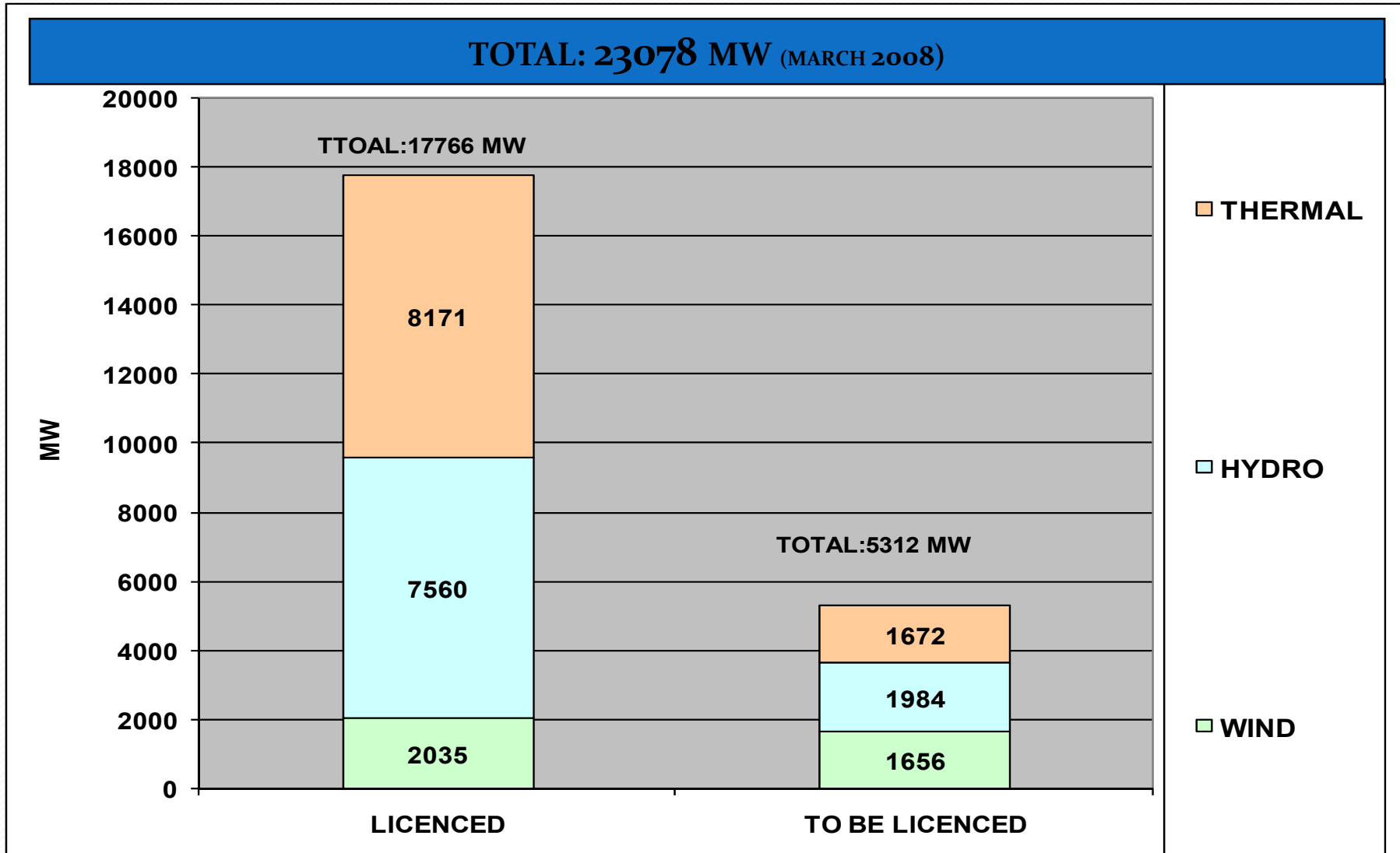
- Energy security
 - New investments to cope with increasing demand
 - Reduce import dependency, diversification
 - Increase the utilisation of Local Sources
 - Establishing Functioning markets based on competition
- Environmental sustainability :
 - Renewable Energy: Wind, Hydro, Geothermal, Solar, Biofuels
 - Clean Coal Technologies, Carbon Capture & Storage
- Efficiency Increase
- Nuclear Energy (5000 MW until 2020)

UNFCCC (Turkey became a Party in 2004)

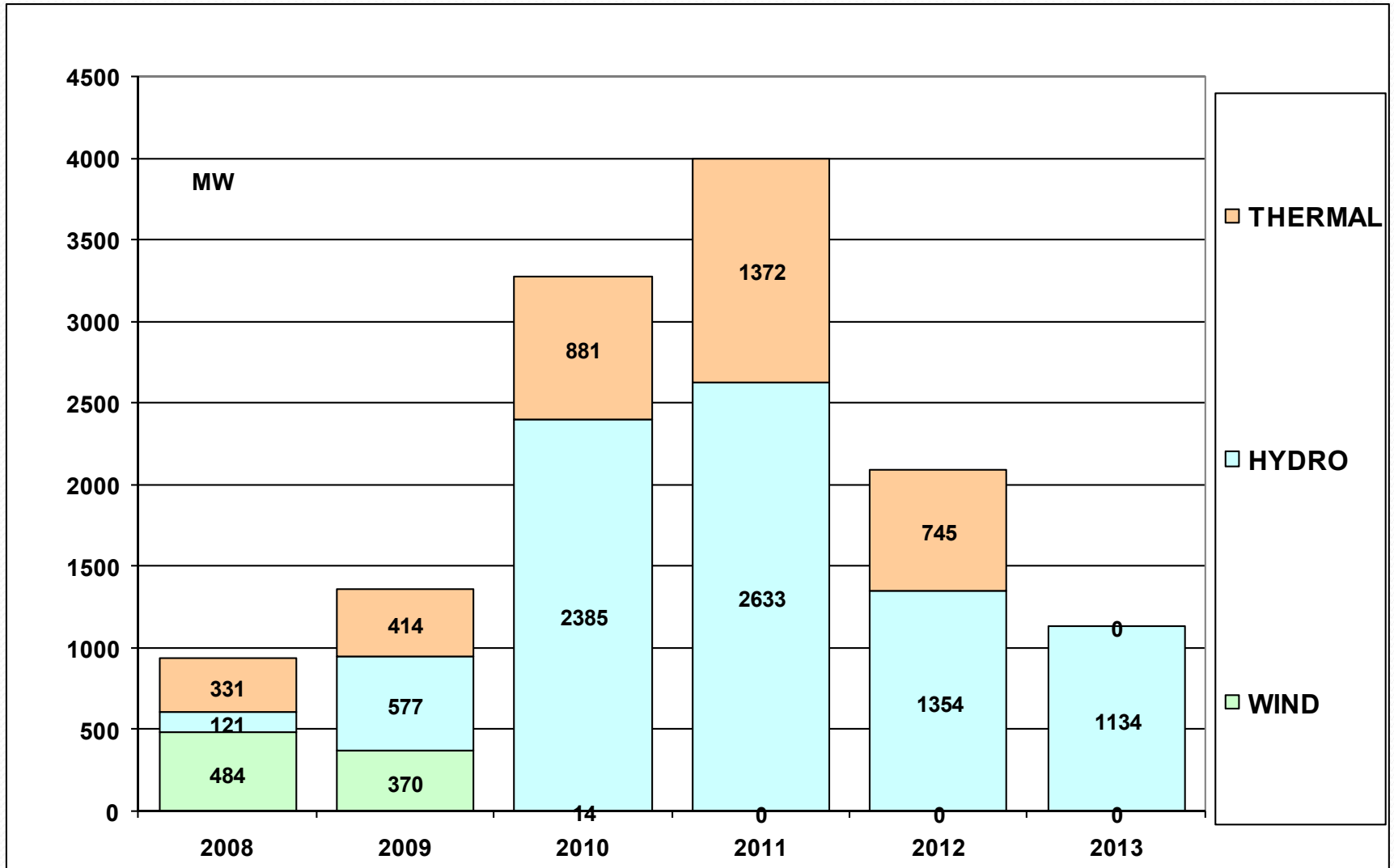
Renewables

- Second largest contributor to the primary production
 - ➔ In 2006 **12%** of TPES was supplied from renewable sources
 - ➔ **25%** of total electricity production was from renewable sources (43736 GWh)
- **Aim:** to keep and further increase renewable share in energy balance
 - (80 % increase in supply from renewables until 2020)
 - Utilization of the remaining hydro resources until 2023
 - 37 % being utilized at present, 18% under construction (Total 35000 MW, Today 13000 MW)
 - > 10 000 MW Additional Wind (Today 250 MW, 500 MW under Construction))

NEW INVESTMENT : LICENCED PROJECTS



NEW PROJECTS, EXPECTED COMMISSIONING YEARS



Energy Efficiency

- Energy conservation potential up to the 30% was defined in end use sectors.
- Energy Efficiency Law was adopted in the Turkish Grand National Assembly,
 - To increase the energy efficiency awareness through media, training in schools, contest, informative billing etc.
 - To set up administrative structure and mechanism for energy efficiency services
 - To promote the energy services activities in the market
 - To promote renewables and cogeneration for the protection environment (Cogeneration installed capacity: 4476 MW, i.e. 11% of total installed capacity as of April 2007.)
 - Incentives and obligations to decrease energy intensity
 - Demand side measures , incentives
 - Measures for production & supply