

# **“Turkey’s Nuclear Power Generation Programme”**

## **The Nuclear Option for SE Europe**

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## Outline

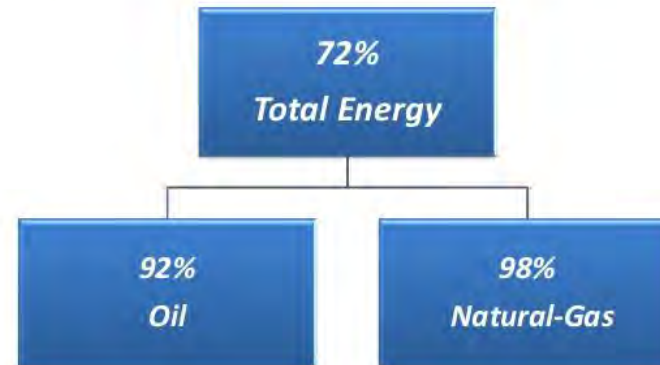
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- Turkey's dependency on energy imports
- Turkey's electricity consumption and generation
- Nuclear energy as a key component of Turkey's energy strategy
- Current Nuclear Power Projects
  - Akkuyu
  - Sinop
  - Third project
- Regulatory Issues

# Turkey's High Dependence on Energy Imports

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## *High Dependence on Energy Imports*

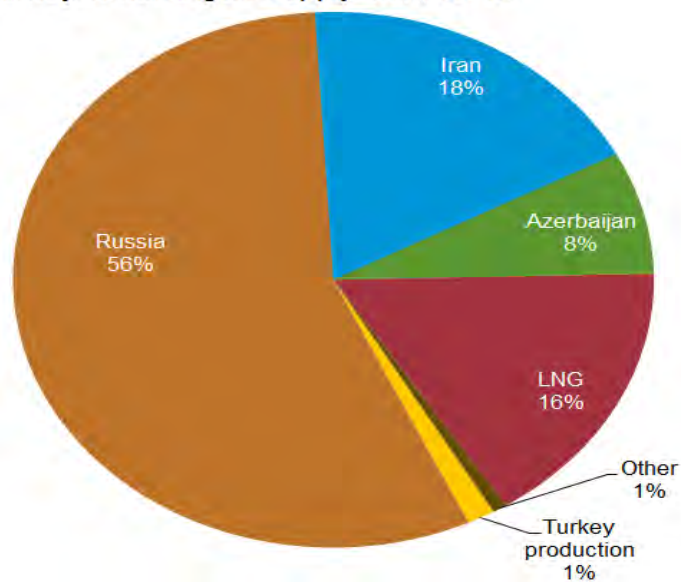


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Turkey depends heavily on imports to meet its growing domestic energy needs. In 2014 Turkey met 72% of energy demand by import and more than 90 percent of its liquid fuels consumption.

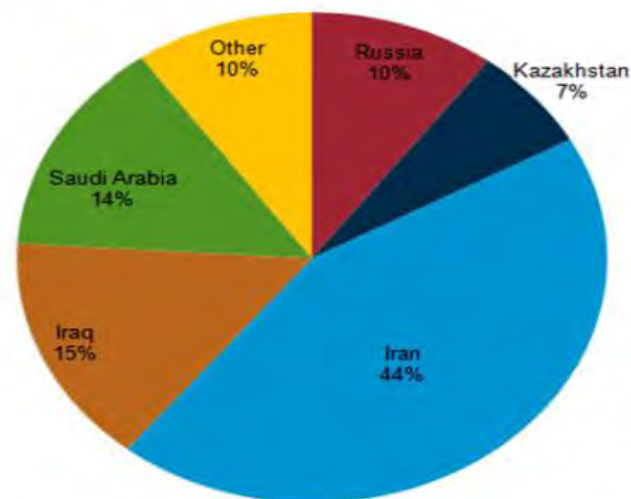
# Turkey's Oil and Gas Imports

Turkey natural gas supply mix, 2012



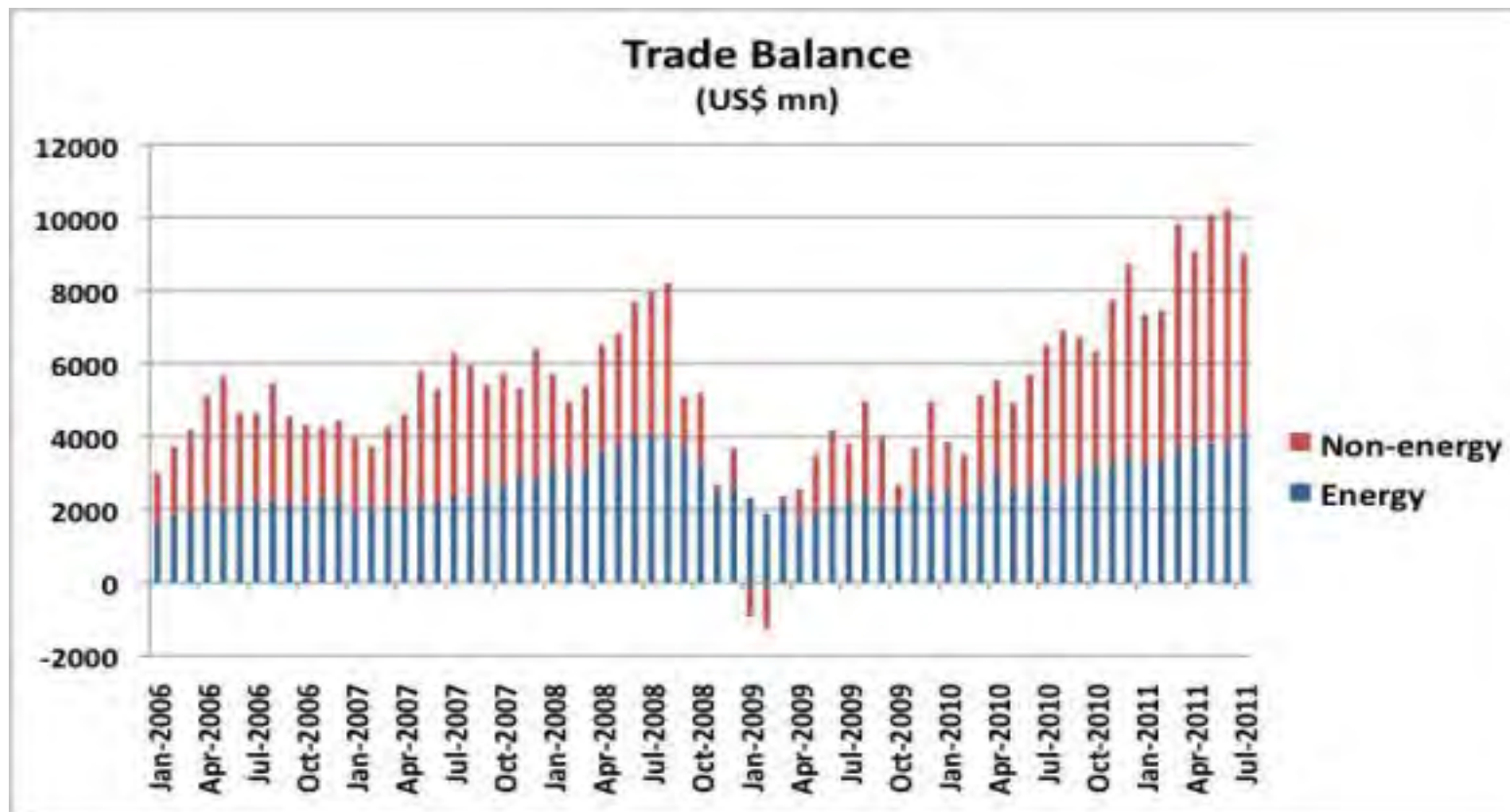
Source: U.S. Energy Information Administration, *International Energy Statistics*, Eastern Bloc Research, Cedigaz

Share of Turkey's crude oil imports by country, January-September 2012



Source: Eurostat

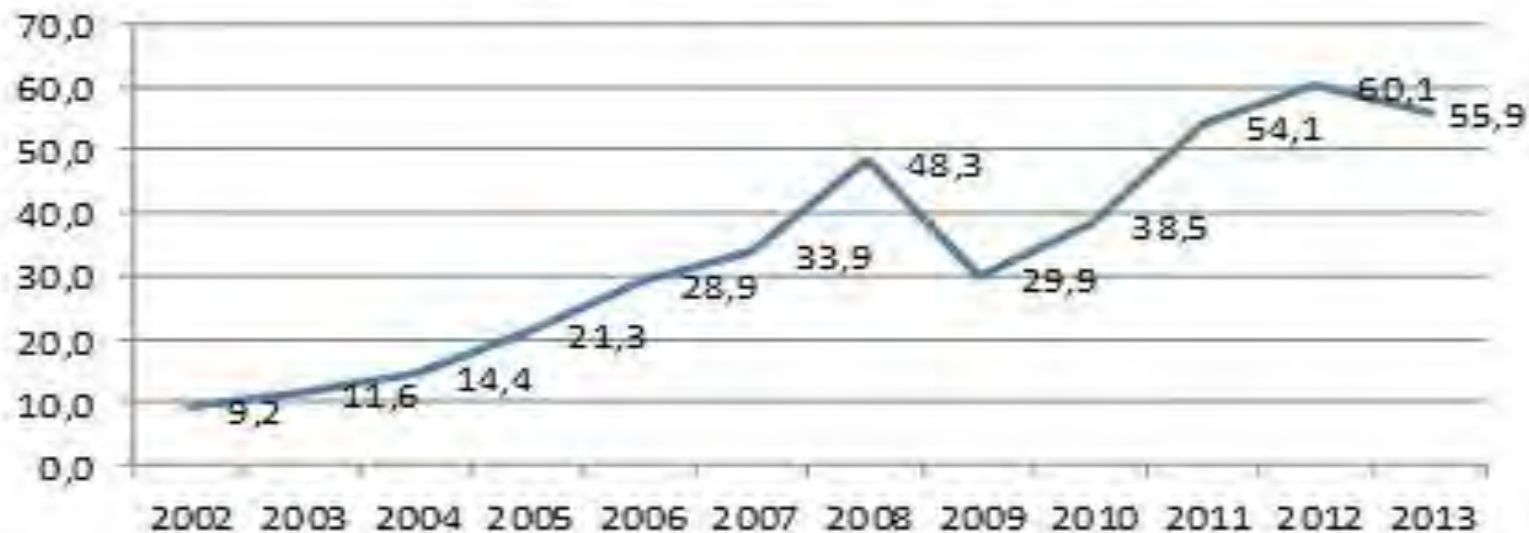
# Turkey's Trade Balance



The excess of energy imports over exports has played a key role in driving the trade deficit over the last years

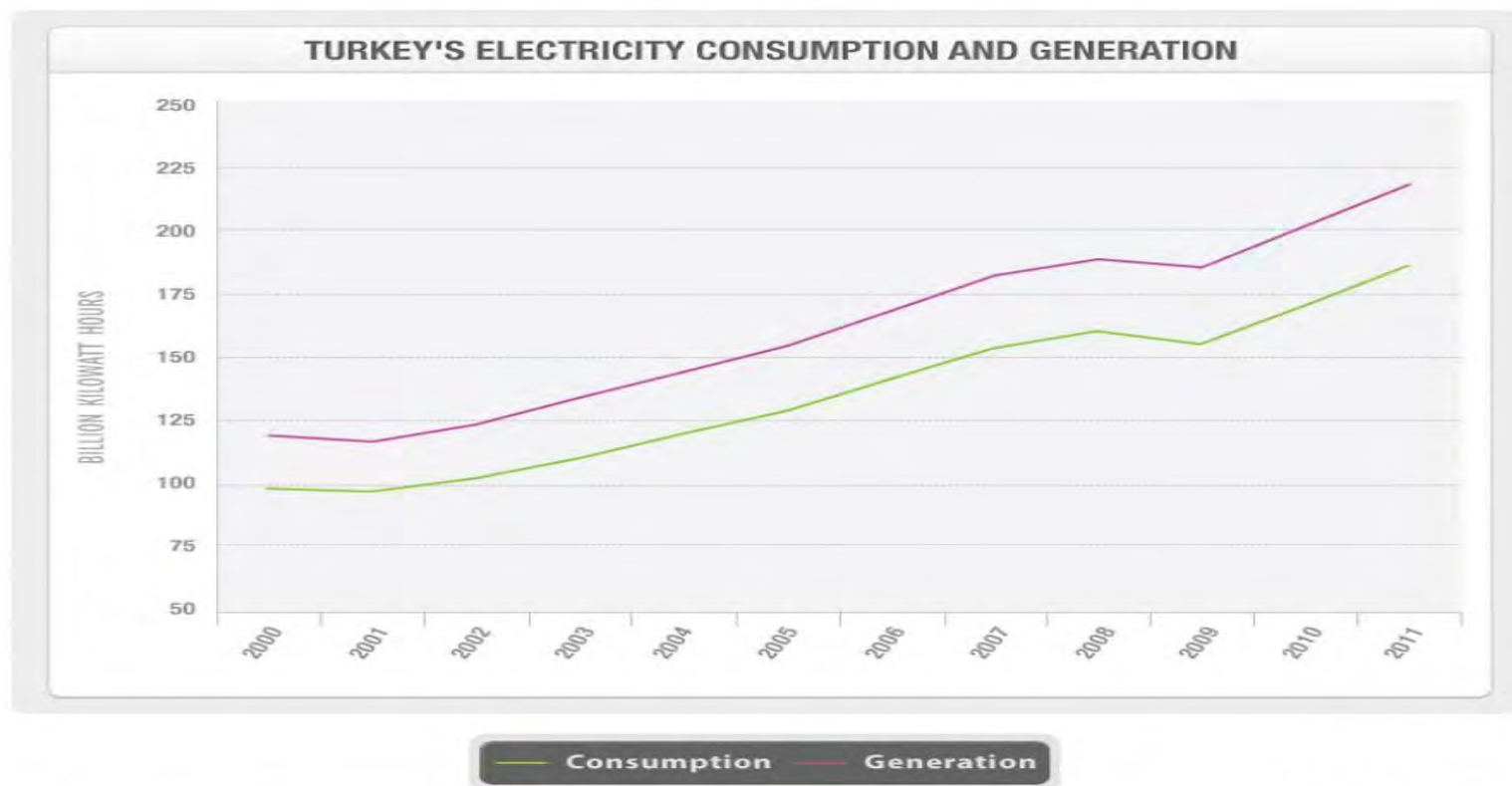
# Turkey's Trade Deficit

## Total Energy Imports of Turkey (billion dollars)



The numbers reveal that dependence on imported energy is highly responsible for Turkey's high level of current account deficit.

# Turkey's Electricity Production and Consumption

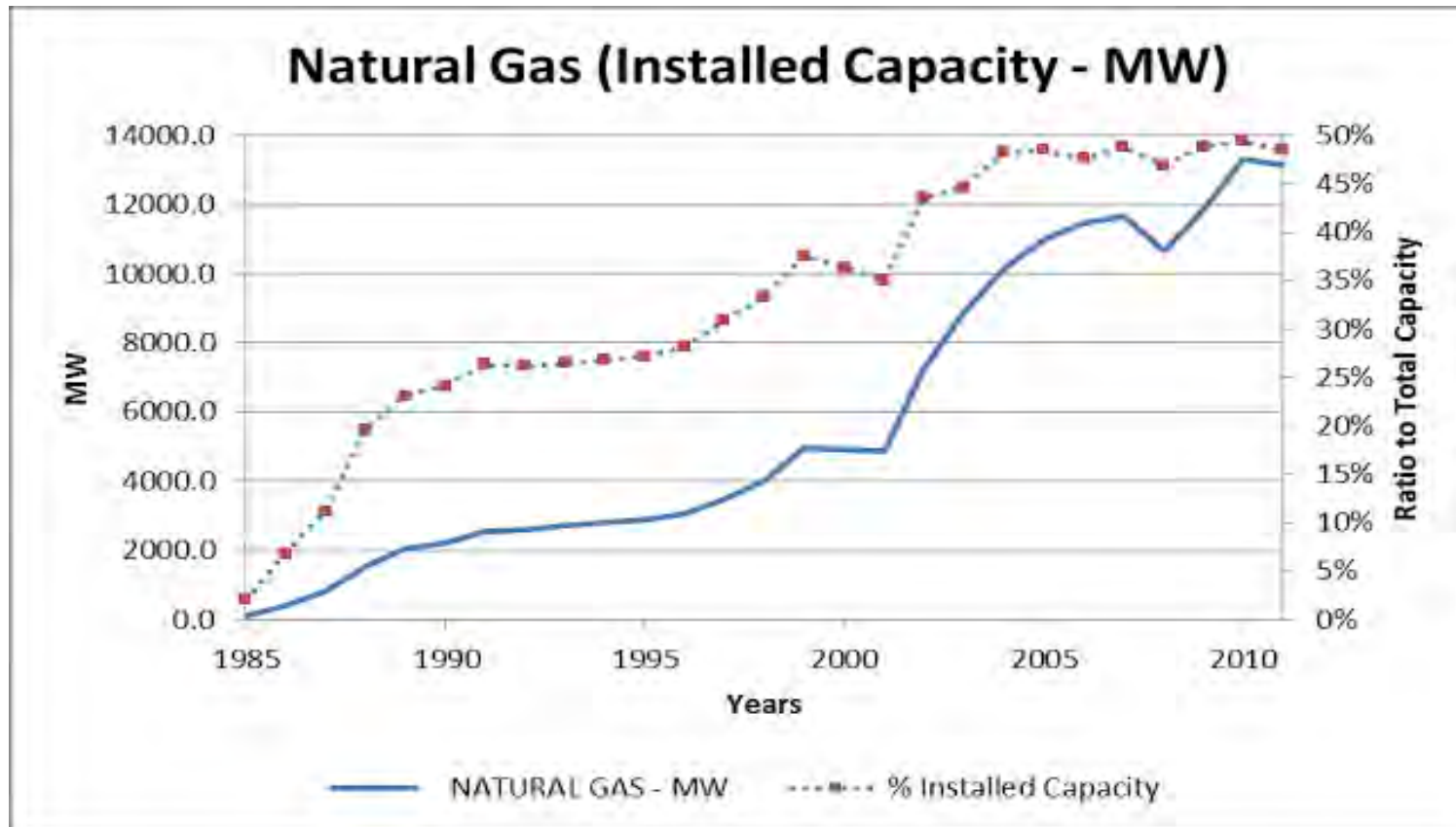


Source: Turkish Statistical Institute

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In 2014, Turkey's total electricity installed capacity stood at 56.1 MW. Turkey's electricity demand grew by more than 90% from 2001 to 2012, with much of the growth occurring between 2002 and 2008.

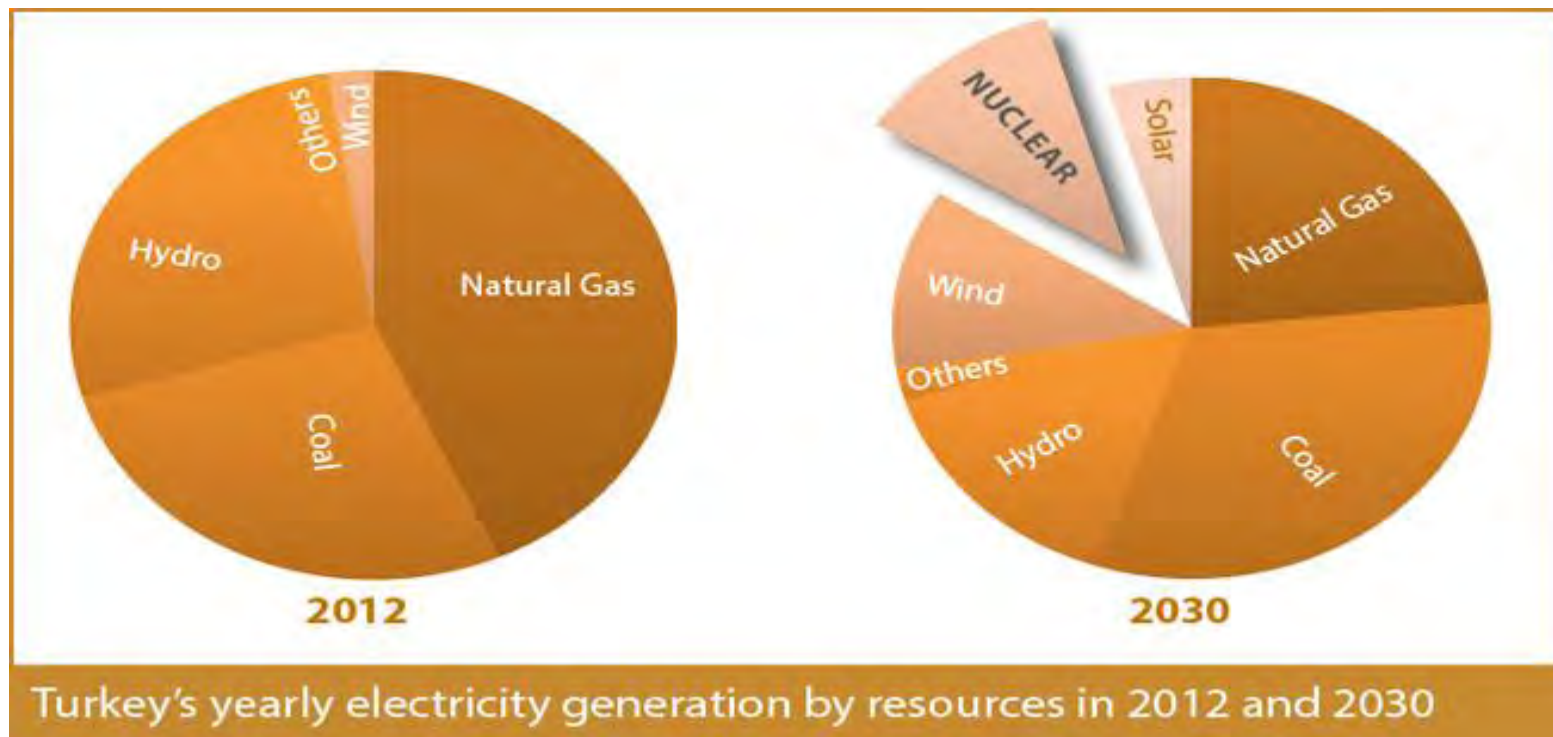
# Natural gas share in Turkey's Electricity Production



About 50% of electricity production is made in power plants that use natural gas.



# Turkey's Energy Strategy

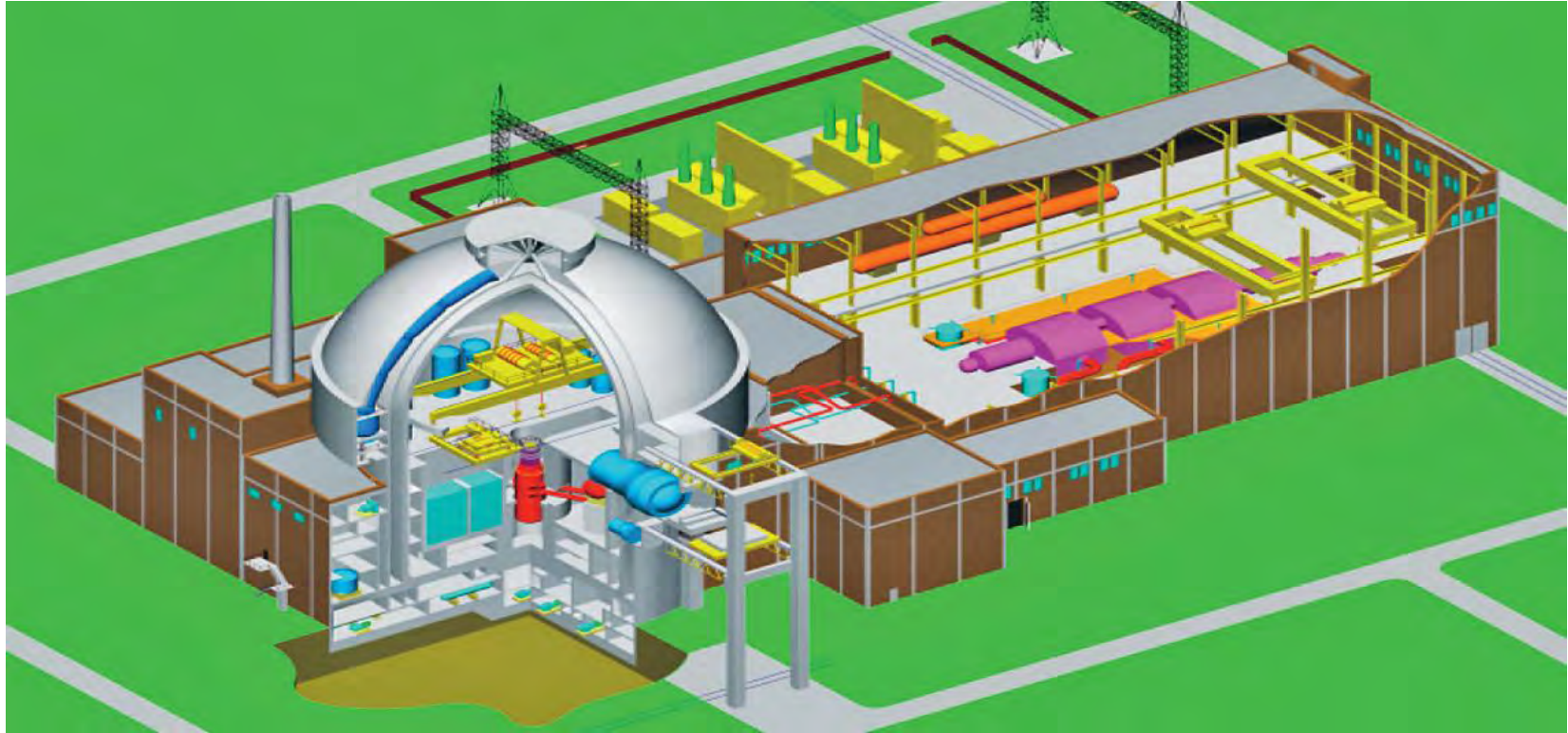


- ❖ **Energy Plan**
- Renewable Energy Sources (RES) (Solar Thermal, Solar PV, Wind, Biomass, Geothermal, Min Hydro)
- Energy Efficiency
- Nuclear Energy

# Current Nuclear Power Projects in Turkey



## - The Akkuyu project



- ❖ In May 2010 Russia and Turkey signed an intergovernmental agreement with Rosatom to build, own and operate (BOO) the Akkuyu nuclear power plant of four 1200 MWe AES-2006 units with a total cost of US\$ 20 billion project.

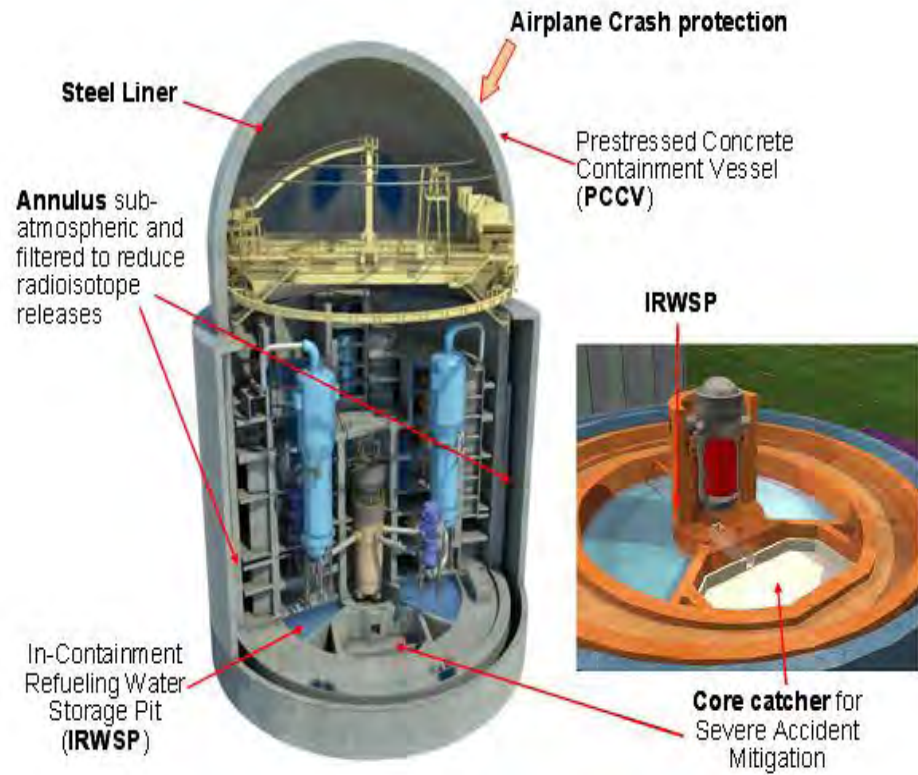
## The Akkuyu project

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- ❑ Rosatom, through Atomstroyexport will finance the project and start off with 100% equity in the Turkish Akkuyu project company (APC)
- ❑ In July 2010 the Turkish parliament ratified the May agreement for 4800 MWe at Akkuyu
- ❑ The project company was registered in December 2011.
- ❑ The equity position then was: Rusatom Overseas (64.96%), Rosenergoatom (30.66%), AtomStroyExport (3.17%), Atomenergoremont (0.03%) and Atomtechenergo (0.03%).
- ❑ Late in 2012 JSC Akkuyu NPP quoted the cost as \$18.7 billion, and in December of the same year Russia announced that will fully finance the project to more than \$20 billion.

# Current Nuclear Power Projects in Turkey

## - The Sinop Project



The ATMEA nuclear reactor. Four ATMEA units will be built at Sinop



## The Sinop project

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- ❑ In March 2010 an agreement was signed between Korea Electric Power Corporation (Kepco) and EUAS but in April 2013 the energy minister said that Kepco was no longer in contention
- ❑ Japan then indicated its interest in negotiating to build the 5600 MWe plant, and in December 2010 signed an agreement to prepare a bid. However talks were suspended at Japan's request following the Fukushima accident
- ❑ In May 2013 the government accepted the proposal from a consortium led by Mitsubishi Heavy Industries (MHI) and Areva, with Itochu, which proposed four Atmea1 reactors with total capacity of about 4800 MWe at a cost of some \$22 billion.
- ❑ In October 2013 an official agreement at prime ministerial level was signed for the project.
- ❑ EUAS intends to take a 25% stake in the project company.
- ❑ Construction is planned for 2017 and the plant will be operational from 2023.

## The third project

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- ❑ Plans are being discussed to build one more nuclear plant in a completely new site, as part of 100 GWe required by 2030.
- ❑ TAEK has identified “Igneada” on the Black Sea, 12 km from the Turkish-Bulgarian border, and Akcakoca between it and Sinop as possible plant sites. Ankara – with low seismic risk – and Tekirdag on the northwest coast of the Sea of Marmara have also been mentioned as possible sites.
- ❑ Start of construction is planned for 2019
- ❑ In November 2014 EUAS signed an agreement with the State Nuclear Power Technology Corporation (SNPTC) of China and Westinghouse to begin exclusive negotiations to develop and construct a new four-unit nuclear power plant in Turkey

# Comparison of basic characteristics of Turkey's nuclear power plants

Details	Akkuyu NPP	Sinop NPP
Location	Akkuyu-Mersin	Sinop or another location
Land ownership	Nonremunerative allocation	Nonremunerative allocation
Reactor	VVER 1200 (AES 2006 Design)	ATMEA-1
Installed capacity	4 x 1,200 MWe (4,800 MWe)	4 x 1,120 Mwe ■ 4,480 MWe
Project duration	Until the decommissioning process of NPP	Until the decommissioning process of NPP
Commissioning (Planned)	Unit-1: 2020 Unit-2: 2021 Unit-3: 2022 Unit-4: 2023	Unit-1: 2023 Unit-2: 2024 Unit-3: 2027 Unit-4: 2028
Company and shareholders	Main Contractor JSC "Atomstroyexport" (ASE)	Mitsubishi, ITOCHU and EÜAŞ. EÜAŞ will hold the 30% - 49% of the equity during the period of Power Purchase Agreement (PPA)
Financing	Project finance for 70% and equity for 30%. Equity will be 100% funded by Russia.	Project finance for 70% and equity for 30%. Turkey will fund equity based on the EÜAŞ shares in the project company.
Feed-in tariffs	The average sales price to be equal to USD cents 12.35/kWh for the half of electricity generated during the first 15 years. The price cap is set at USD cents 15.33/kWh.	The average sales price to be equal to USD cents 10.8 (10.83) /kWh for the first 20 years. Tarrifs will be finalized after the feasibility.
Feed-in tariff period (Year)	15 year	20 year
Fuel price	Included in the tariff	Excluded in the tariff
Waste management tariff (USD cents/kWh)	0,15	0,15
Decommissioning fund tariff (USD cents/kWh)	0,15	0,15
Post PPA period after feed-in tariff	Electricity will be free-traded in the market. 20% of the net profit to be transferred to Turkish party by the Project Company.	Electricity will be free-traded in the market.
Radioactive wastes	Project company will pay the necessary funds for the waste management.	Project company will pay the necessary funds for the waste management.

## Regulatory Issues

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- ❑ In November 2007 a new law concerning Construction and Operation of Nuclear Power Plants and Energy Sale (of their electricity) was passed by parliament and subsequently approved by the President.
- ❑ The Turkish Electricity Trade & Contract Corporation (TETAS) will buy all the power under 15-year contracts.
- ❑ The law addressed waste management and decommissioning, providing for a National Radioactive Waste Account (URAH) and a Decommissioning Account (ICH) which generators would pay into progressively at USD 0.15 c/kWh.
- ❑ Subsequent to this law, Criteria for Investors who will Construct and Operate Nuclear Power Plants, and regulations were published together with IAEA safety standards
- ❑ Turkey's draft nuclear energy laws have also been reviewed by the IAEA. Turkey's nuclear law addresses safety, security and safeguards





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**Thank you for  
your attention**

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