

Energy Vulnerability in Electricity Market

Turkish Case Study

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Electricity Market and Energy Vulnerability

In the report of World Energy Council named “Europe’s Vulnerability to Crisis”, the key issue relating to energy security is that of vulnerability considered in a more broader concept including risk and resilience.

In the literature of energy vulnerability, electricity has been an indicator within the context of :

- * Fuel type used for electricity generation
- * Inaccuracy in supply and demand forecasts
- * Interconnection with neighboring countries

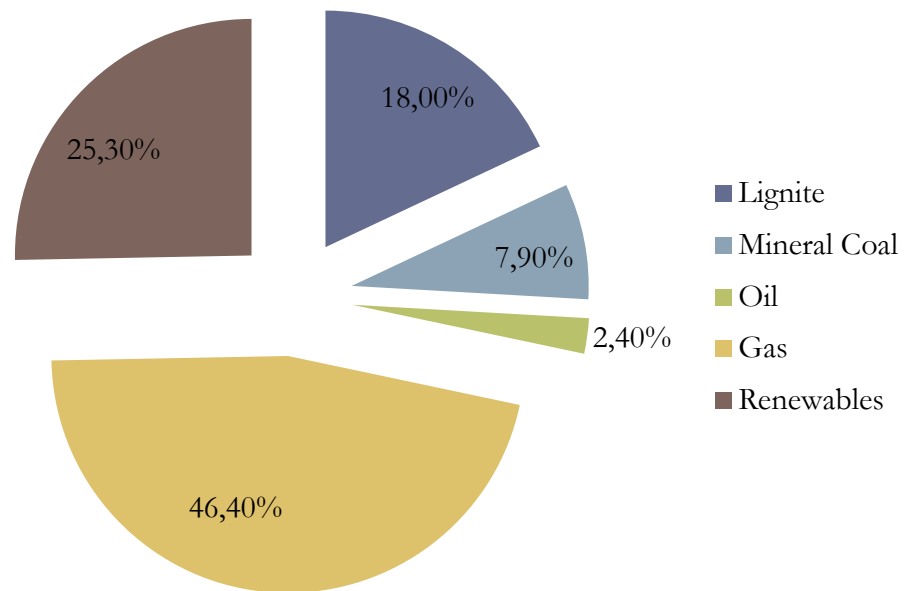
On the other hand, its impact on macroeconomic balances within the context of import bill is another factor designating the degree of energy vulnerability in electricity market.

Fuel Type Used In Electricity Production

As per 2007 data, in Turkey, almost half of power plants operate with natural gas. Coal's participation to electricity production exceeded 25 percent. Including Fuel Oil, conventional thermal's participation to electricity production is almost 75 percent.

25 %

The share of renewable energy within Turkey's electricity production mix.



Key Facts To Note

- ✳ Turkey supplies 97.7 % of its gas through imports.
- ✳ Turkey's reliance on mineral coal imports is 89 %.
- ✳ Including lignite, Turkey's total dependence to coal is 48.4 %.

The table below compares EU27 and Turkey's percentage fuel type used in electricity production as of 2006.

Years	Coal	Oil	Gas	Nuclear	Others	Renewable
EU27	28.60%	3.90%	21.10%	29.50%	2.30%	14.60%
Turkey	25.90%	2.40%	46.40%	0.00%	0.00%	25.30%

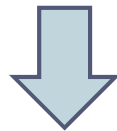
- ➡ Turkey's share in renewable energy is higher compared to the EU.
- ➡ Turkey does not employ nuclear energy at the moment.

Consequences

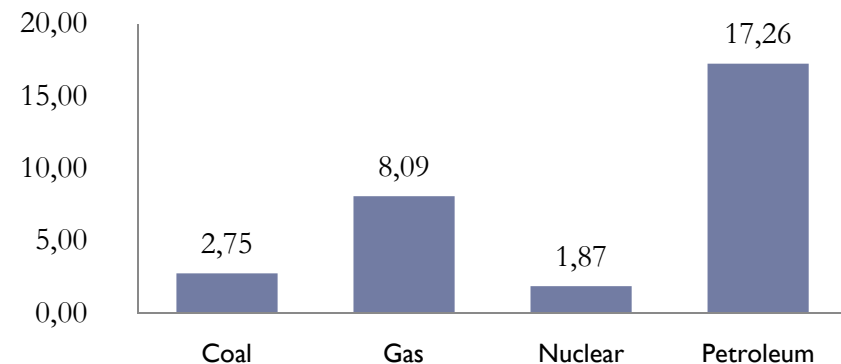
Since it is less costly and faster to establish natural gas plants, many investors prefer it over renewable plants.

Expensive means of electricity production is employed. Although initial cost of establishing the facility is lower, its operation cost is significantly higher compared to the alternatives.

Less environment friendly consumption pattern due to excess reliance on fossil consumption.



Higher Degree of Energy Vulnerability



Total marginal production cost of electricity production in dollar cents per kilowatt – hour is presented.

Electricity Trade

Years	Million KWh (GWh)		Share
	Imports	Consumption	
2001	4,579	123,028	3.72%
2002	3,588	129,400	2.77%
2003	1,158	140,581	0.82%
2004	464	150,698	0.31%
2005	636	161,956	0.39%
2006	573	176,300	0.33%
2007	865	191,109	0.45%

Electricity Trade (Twh)	Imports	Exports
2000	3,8	0,4
2001	4,6	0,4
2002	3,6	0,4
2003	1,2	0,6
2004	0,5	1,1
2005	0,6	1,8
2006	0,6	2,2
2007	0,9	2,6



The mismatch in energy supply and demand may lead import to actualize in case the projected demand is higher than the supply.



Higher reliance on electricity imports has a negative effect on energy vulnerability. Turkey is a net electricity exporter since 2004.



Higher interconnection rate with neighboring countries work positively to reduce energy vulnerability in electricity market as it ensures the option to import in case of urgent electricity demand and offers the option to export when it is demanded by neighboring states.

Renewable Energy Opportunities

Countries	2006 Renewable Capacity in ktoe					
	Total	Biomass	Hydro	Wind	Solar	Geothermal
EU27	129,719	89,512	26,569	7,074	988	5,576
Share	100.00%	69.00%	20.50%	5.50%	0.80%	4.30%
DE	21,113	16,120	1,714	2,641	472	167
FR	18,003	12,784	4,872	188	29	130
SE	14,813	9,415	5,307	85	6	
IT	13,097	4,657	3,181	255	38	4,966
NO	11,635	1,310	10,267	58		
TR	10,538	5,159	3,813	11	402	1,162
ES	9,385	5,064	2,226	2,003	84	8
FI	8,576	7,574	988	13	1	
AT	7,282	4,000	2,999	148	101	35
PL	4,987	4,776	176	22		13
RO	4,781	3,185	1,578	0		18
CH	4,575	1,733	2,662	1	28	151
PT	4,320	3,011	946	252	24	88
UK	4,320	3,523	395	363	37	1
IS	3,259	2	627			2,630
DK	3,257	2,708	2	525	10	12
NL	2,909	2,643	9	235	22	
CZ	1,972	1,746	219	4	3	
EL	1,796	1,010	520	146	109	11
BE	1,767	1,700	31	31	3	2
LV	1,433	1,197	232	4		
HU	1,272	1,164	16	4	2	86
BG	1,140	741	364	2		33
HR	884	366	516	2		
SK	859	474	378	1	0	6
LT	787	750	34	1		2
SI	768	459	309			
EE	531	523	1	7		
IE	420	217	62	139	1	1

Turkey has plentiful renewable energy resources. It is ranked as the 6th in Europe.

✪ 1st in Europe in geothermal energy and 7th in the world

✪ Total authorized potential for wind plants is 20.000 MW. As of 2008, total installed wind capacity did not exceed 500 MW.

✪ Turkey owns almost 16 % of Europe's entire economically feasible hydroelectric potential.

Relevant Policy Implications

- ✦ Nuclear energy is considered to be a wise solution for Turkey in terms of reducing energy dependency for foreign imports, ensuring the continuity of power supply and decreasing the production cost of electricity.



- ✦ Actualizing the potential in renewable energy would enable Turkey to generate electricity through cleaner and cheaper resources.



Turkey's Energy Vulnerability on a General Outlook

✱ Both due to the supply uncertainty of renewable energy and its inadequacy in terms of offering the full potential to meet electricity demand, Turkey will continue to need fossil fuels to ensure its electricity supply.

✱ For this reason, reducing the vulnerability in fossil energy resources will enhance the electricity market.

✱ In 2008, Turkey paid 48 billion USD for energy imports. The figure was only 8 billion USD in 2001 and 14.3 billion in 2004.

66 %

Turkey's dependence to Russia in natural gas imports.

58 %

Energy's share in Turkey's foreign trade deficit as of 2008.

In Conclusion

- ✱ Electricity market forms an integral portion of energy vulnerability.
- ✱ Plant type that is employed for electricity production designate the degree of energy dependency, production cost, energy bill, carbon emissions and etc.
- ✱ Due to its lower establishment costs, although their marginal cost of production is significantly higher, natural gas plants are widely preferred by investors.
- ✱ Actualizing its renewable energy potential would enhance Turkey's energy security.
- ✱ When its operational safety is ensured, nuclear energy is a promising alternative.
- ✱ Although reliance on electricity imports work negatively for energy vulnerability, available of technical infrastructures (i.e. interconnection) is advantageous for guaranteeing the supply under unforeseen cases.

Questions & Thank You



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