

Managing the Transition to Sustainable Energy Pricing

Bariş Sanlı

Index

- Turkey (brief)
- Prices & Taxes in TurkeyNew Technologies
- Energy Sector's View
- Effects
- How to mitigate(8 suggestions)

Turkey

Brief

Where is Turkey?



Turkey and the World

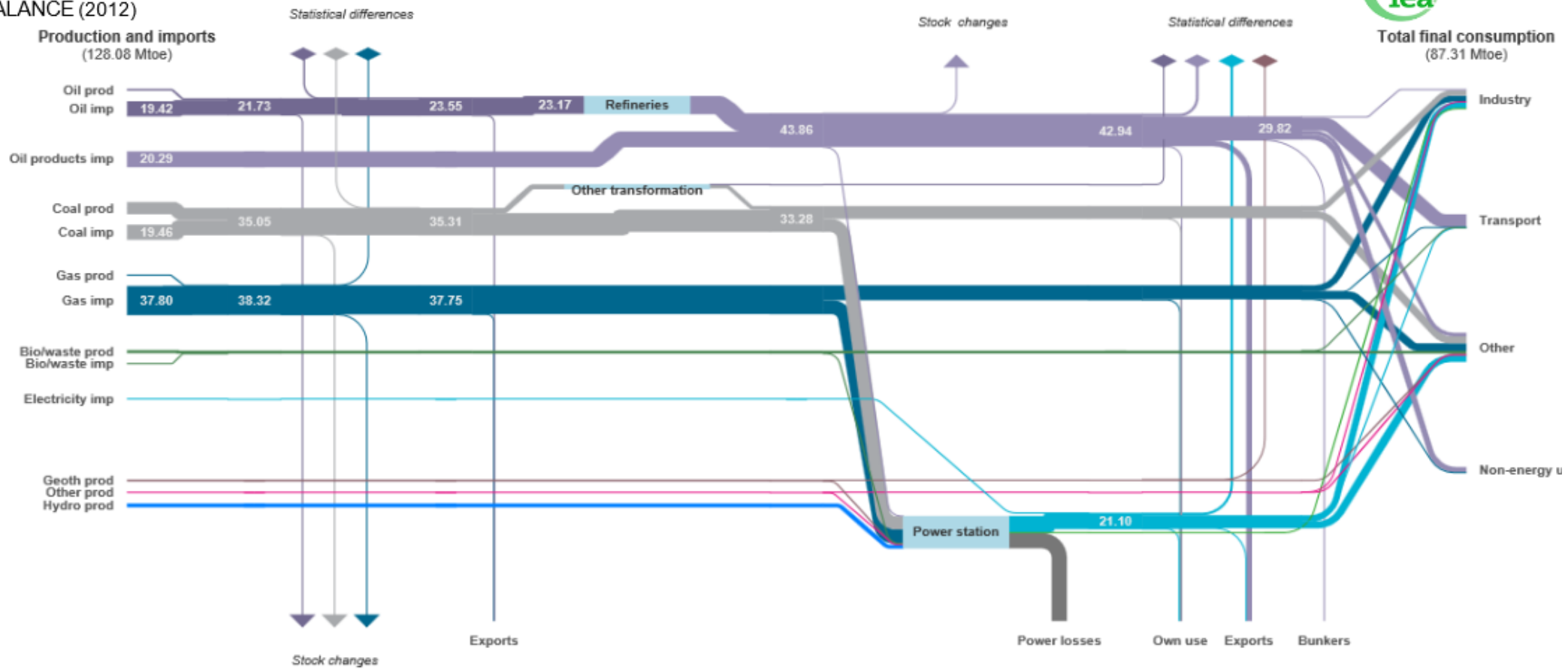
Region/ Country/ Economy	Popu- lation (million)	GDP (billion 2005 USD)	GDP (PPP) (billion 2005 USD)	Energy prod. (Mtoe)	Net imports (Mtoe)	TPES (Mtoe)	Elec. cons. ^(a) (TWh)	CO ₂ emissions ^(b) (Mt of CO ₂)	TPES/ pop. (toe/capita)	TPES/ GDP (toe/000 2005 USD)	TPES/ GDP (PPP) (toe/000 2005 USD)	Elec. cons./pop. (kWh/ capita)	CO ₂ / TPES (t CO ₂ / toe)	CO ₂ / pop. (t CO ₂ / capita)	CO ₂ / GDP (kg CO ₂ / 2005 USD)	CO ₂ / GDP (PPP) (kg CO ₂ / 2005 USD)	Region/ Country/ Economy
World	7 037	54 588	82 901	13 461	-	13 371 ^(c)	20 915	31 734 ^(d)	1.90	0.24	0.16	2 972	2.37	4.51	0.58	0.38	World
OECD	1 254	39 490	39 202	3 869	1 543	5 250	10 145	12 146	4.19	0.13	0.13	8 089	2.31	9.68	0.31	0.31	OECD
Middle East	213	1 430	4 184	1 796	-1 091	681	790	1 647	3.19	0.48	0.16	3 704	2.42	7.72	1.15	0.39	Middle East
Non-OECD Europe and Eurasia	341	1 644	4 065	1 842	-627	1 194	1 552	2 732	3.50	0.73	0.29	4 551	2.29	8.01	1.66	0.67	Non-OECD Europe and Eurasia
China	1 358	4 756	13 289	2 525	496	2 909	4 737	8 251	2.14	0.61	0.22	3 488	2.84	6.08	1.73	0.62	China
Asia	2 320	3 568	12 643	1 464	235	1 644	2 071	3 698	0.71	0.46	0.13	893	2.25	1.59	1.04	0.29	Asia
Non-OECD Americas	467	2 369	5 340	802	-172	611	979	1 148	1.31	0.26	0.11	2 094	1.88	2.46	0.48	0.21	Non-OECD Americas
Africa	1 083	1 331	4 177	1 162	-418	733	641	1 032	0.68	0.55	0.18	592	1.41	0.95	0.78	0.25	Africa

- Population: 74.9 million people
- GDP PPP: 1.01 trillion \$ (close to Africa)
- Energy Prod: 30.56 mtoe
- Net Imports: 88.97 mtoe
- TPES: 116.9 mtoe
- Elec. Cons.: 206.71 TWh
- **TPES/pop**: 1.56 toe/cap (>Africa, Non-OECD, Americas, Africa)
- **TPES/GDPPP**: 0.12 toe/\$ (Bottom 2)
- **Elec C/pop**: 2760 kWh /person (Below World Average, >Asia, Africa, Non OECD – Americas)

Turkey

BALANCE (2012)

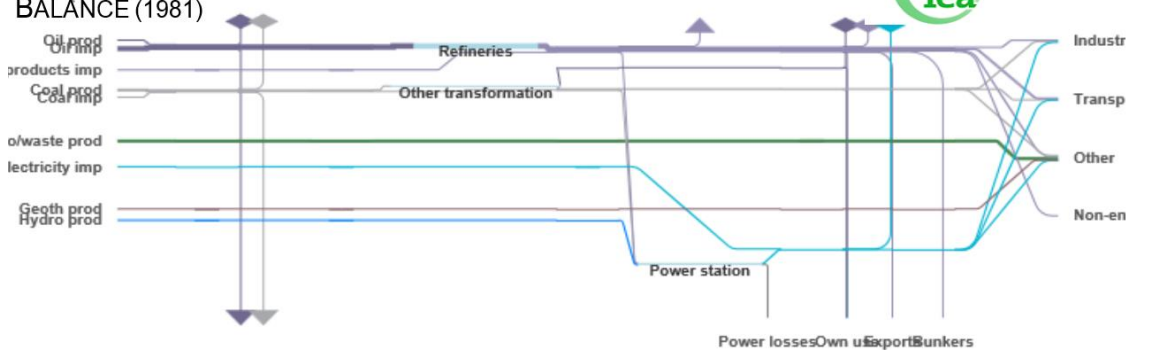
Millions of tonnes of oil equivalent



Turkey

BALANCE (1981)

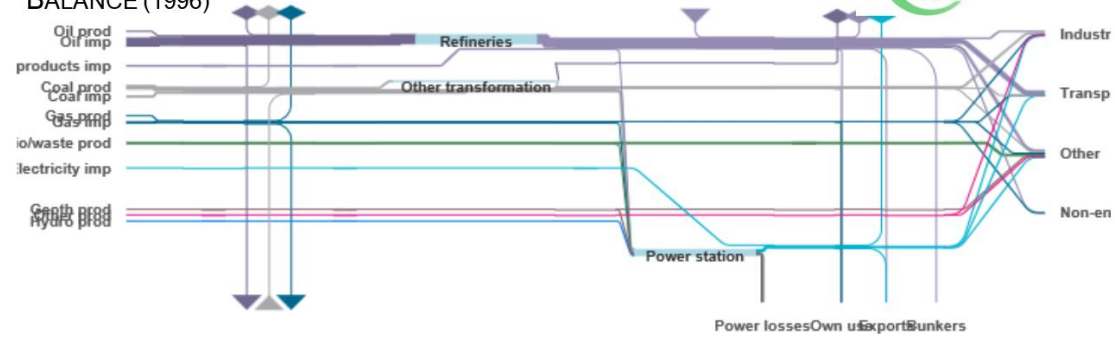
Millions of tonnes of oil equivalent



Turkey

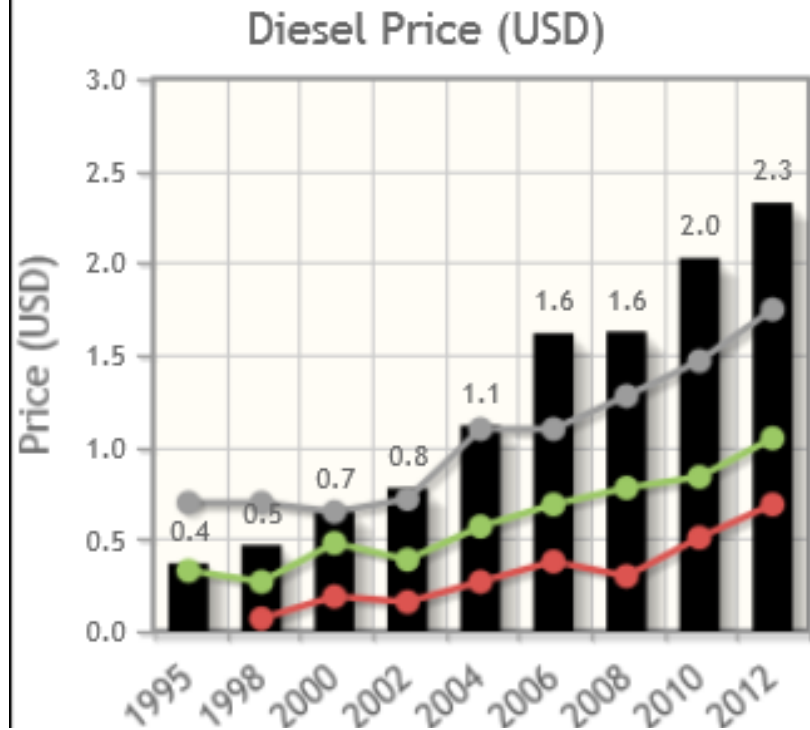
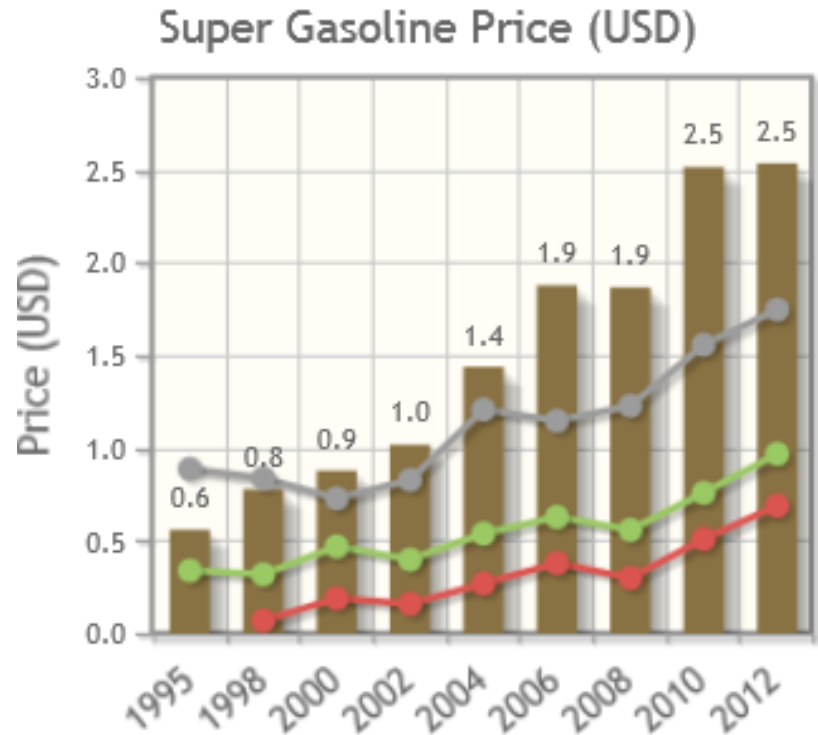
BALANCE (1996)

Millions of tonnes of oil equivalent

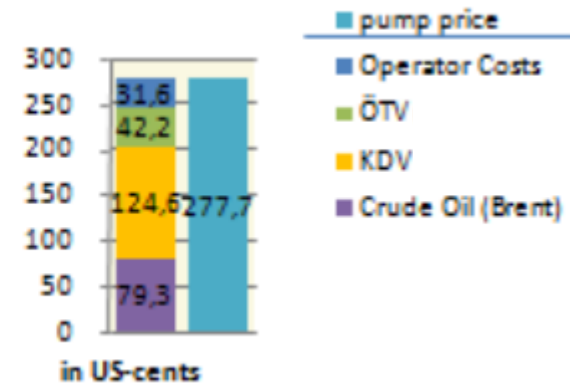


Prices & Taxes in Turkey

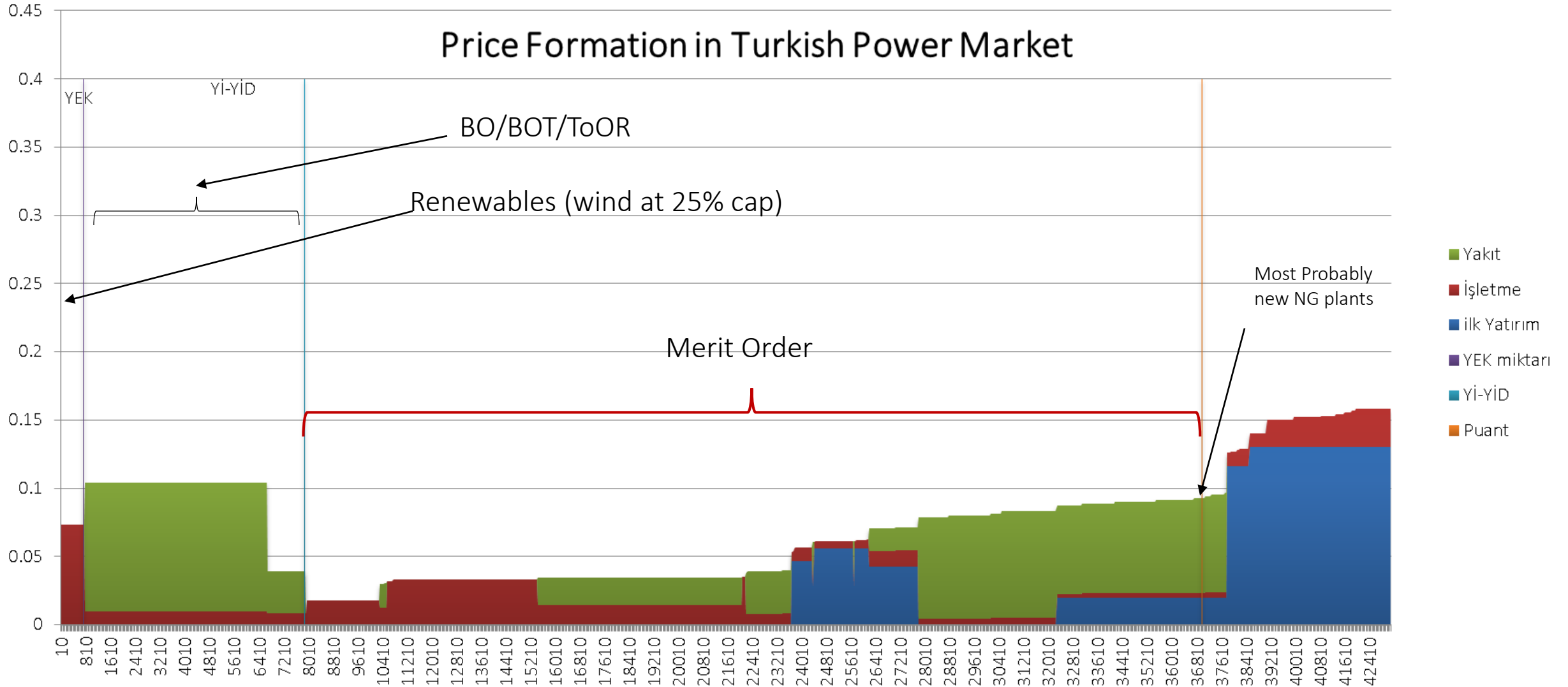
Petroleum Products



Price Component	in US-cents	in local currency	%
Operator Costs	31,6	0,48	11,4
KDV (excise tax)	124,6	1,89	44,9
ÖTV (VAT) 18%	42,2	0,64	15,2
Crude Oil (Brent)	79,3	1,2	28,6
Pump Price	277,7	4,21	100

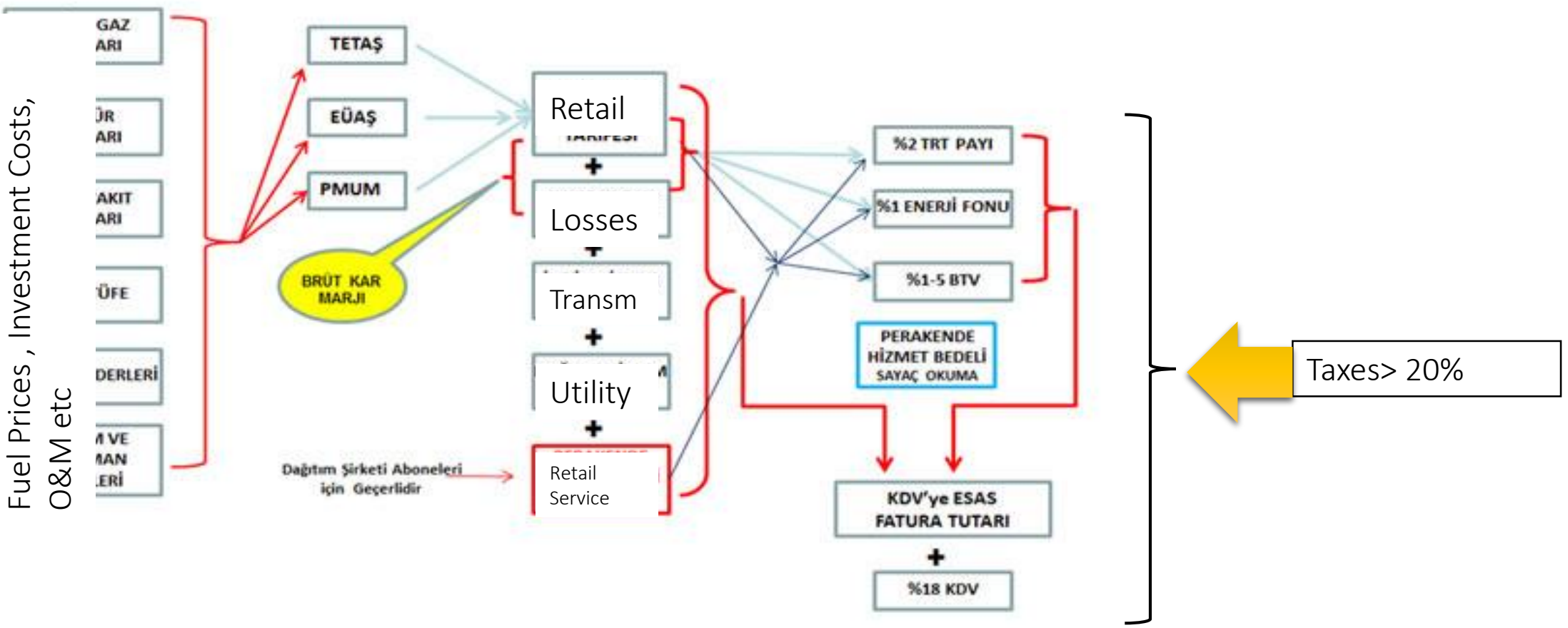


Turkish Power Prices 101

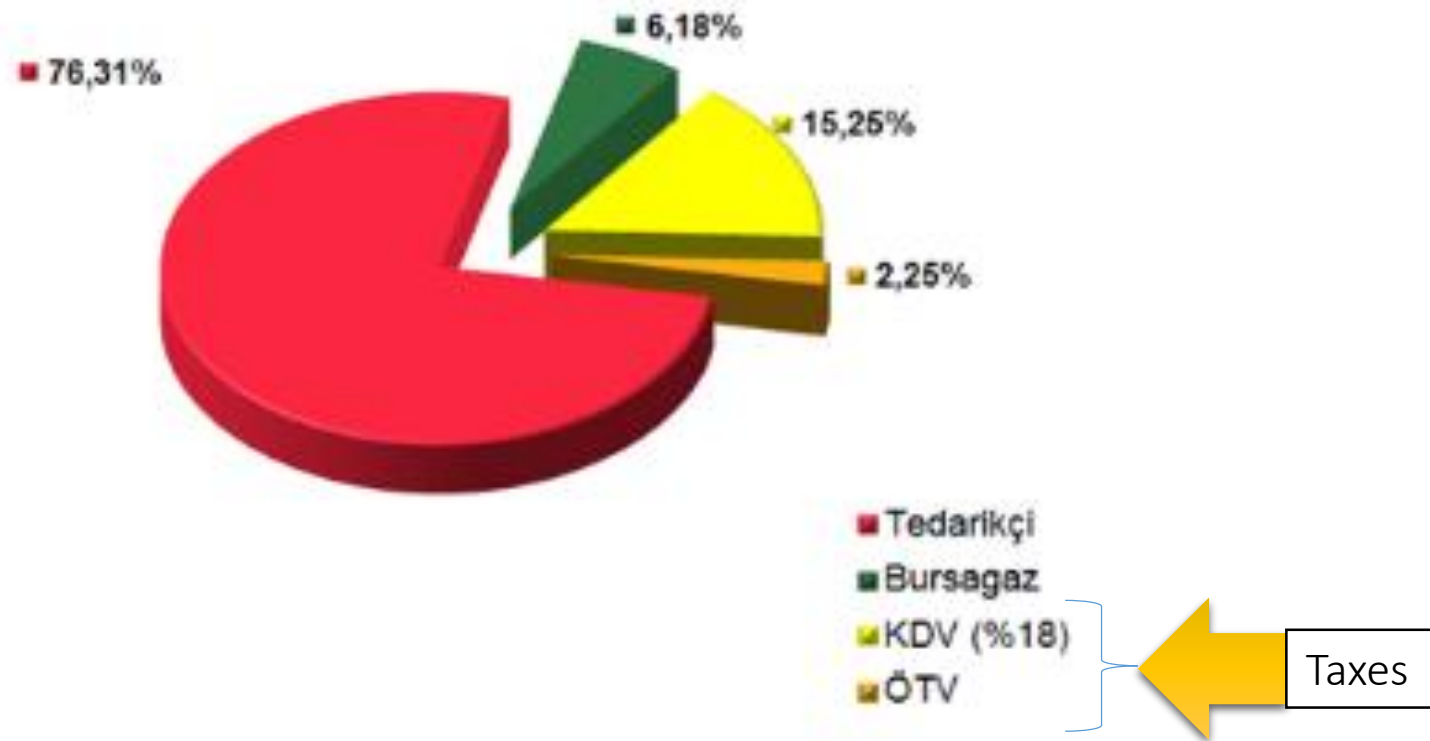


Electricity Price Formation in Turkey

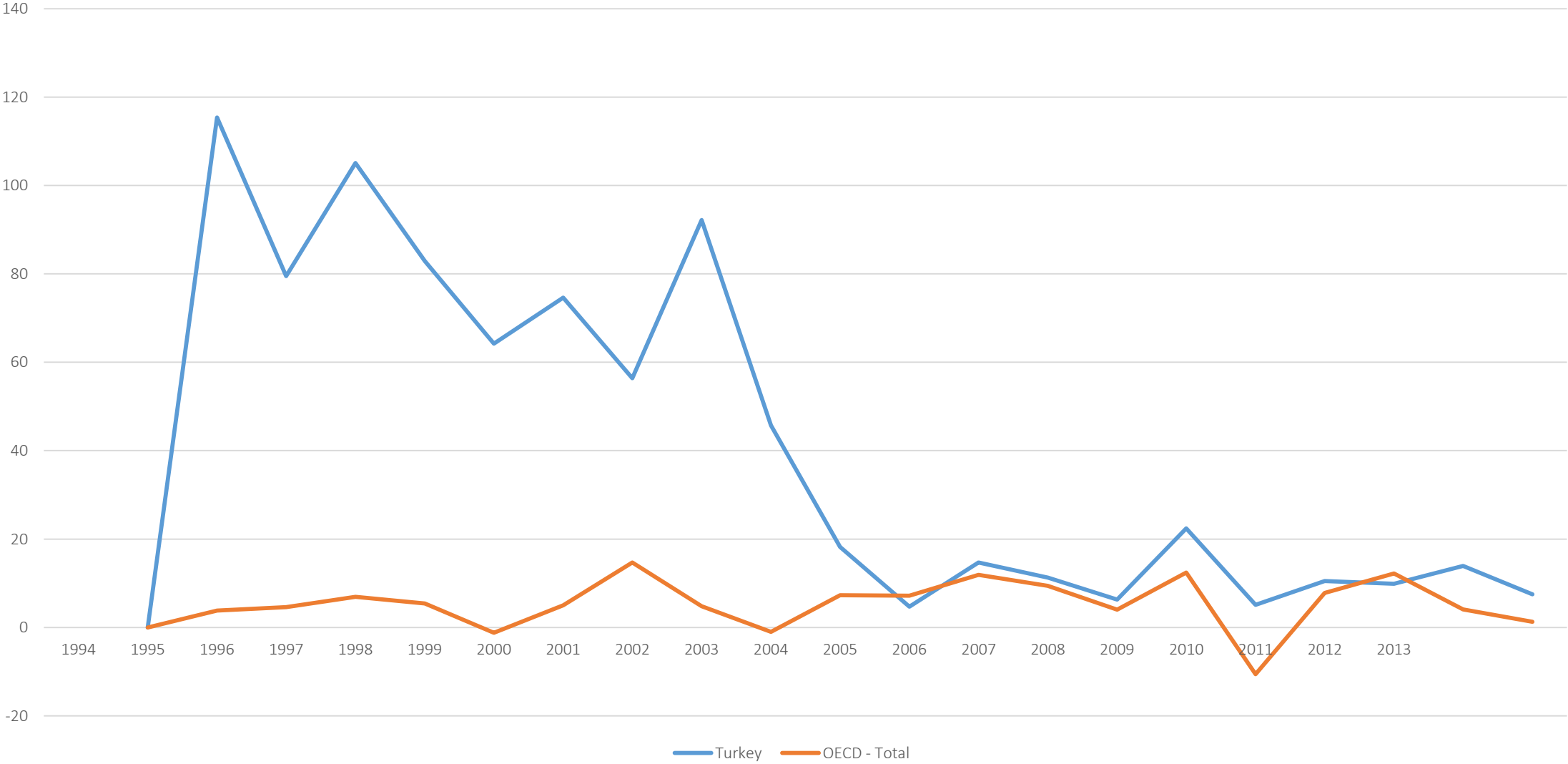
TARİFE BİLEŞENLERİ



Natural Gas Prices in Turkey



Turkey- Consumer Prices Energy(OECD Stats)



High Energy Prices

Highest to
to
Lowest Price

Top 5

Top 6

1st

1st

Bottom 7

Bottom 4

Top 7

Bottom 9

	Heavy fuel oil for industry ^(b) (tonne)	Light fuel oil for households (1 000 litres)	Automotive diesel oil ^(c) (litre)	Unleaded premium ^(d) (litre)	Nat. gas for industry (MWh GCV ^(e))	Nat. gas for households (MWh GCV ^(e))	Steam coal for industry ^(f) (tonne)	Electricity for industry (MWh)	Electricity for households (MWh)	
Australia	..	..	..	1.474	..	..	..	..	..	Australia
Austria	778.15	1 258.00	1.539	1.841	48.84	92.88	257.32	141.16	271.90	Austria
Belgium	701.97	1 119.36	1.637	2.197	39.89	88.08	..	128.24	263.77	Belgium
Canada	695.48	1 181.23	1.290	1.296	13.72	33.81	..	..	..	Canada
Chile	..	1 268.99	..	1.529	..	111.94	..	118.02	172.34	Chile
Czech Republic	519.52	1 208.00	1.508	1.801	47.33	83.95	c	148.84	205.57	Czech Republic
Denmark	949.59	2 085.14	1.624	2.257	..	129.98	..	119.62	393.93	Denmark
Estonia	..	1 339.30	1.512	1.765	47.15	66.33	..	124.85	174.76	Estonia
Finland	..	1 428.44	1.679	2.209	47.50	65.34	271.09	106.61	202.27	Finland
France	742.14	1 228.86	1.512	2.061	51.83	89.64	..	126.02	193.36	France
Germany	658.17	1 089.76	1.633	2.097	49.89	94.61	..	169.32	387.63	Germany
Greece	796.68	1 719.62	1.510	2.246	60.99	151.50	..	141.91	216.38	Greece
Hungary	676.29	x	1.487	1.821	45.62	57.51	..	132.71	182.01	Hungary
Ireland	1 124.71	1 426.52	1.647	2.097	51.74	96.98	..	173.32	292.66	Ireland
Israel	c	2 056.61	c	2.079	c	x	x	114.34	151.62	Israel
Italy	776.85	1 928.14	1.841	2.353	..	..	..	321.70	305.56	Italy
Japan	913.89	1 011.60	1.213	1.540	..	..	126.21	174.23	242.14	Japan
Korea	904.89	1 261.81	..	2.058	78.68	75.80	..	..	101.42	Korea
Luxembourg	..	1 028.04	1.421	1.777	53.53	78.88	x	106.60	206.82	Luxembourg
Mexico	509.78	x	0.831	0.975	..	34.24	x	121.53	90.85	Mexico
Netherlands	665.34	..	1.616	2.316	41.48	103.68	..	112.84	257.20	Netherlands
New Zealand	710.87	..	0.931	1.860	24.01	116.72	c	..	..	New Zealand
Norway	..	1 834.71	1.756	2.432	x	x	..	68.71	148.51	Norway
Poland	811.50	1 264.97	1.420	1.738	42.27	68.05	100.40	109.48	196.30	Poland
Portugal	1 081.15	1 753.62	1.673	2.114	55.71	117.47	215.09	152.06	279.57	Portugal
Slovak Republic	683.53	..	1.561	1.984	49.34	70.64	..	179.07	238.05	Slovak Republic
Slovenia	x	1 383.58	1.513	1.983	57.89	91.38	c	125.73	212.76	Slovenia
Spain	754.40	1 221.25	1.514	1.913	45.12	108.22	..	..	..	Spain
Sweden	1 450.56	2 062.81	1.793	2.183	63.80	162.77	..	90.43	233.66	Sweden
Switzerland	809.34	1 153.54	1.721	1.918	72.24	108.36	123.52	132.55	203.69	Switzerland
Turkey	1 186.07	1 795.43	2.248	2.472	43.73	52.54	105.19	146.68	189.96	Turkey
United Kingdom	c	1 093.03	1.889	2.140	41.89	76.67	155.47	139.78	228.86	United Kingdom
United States	705.22	1 101.07	1.046	0.944	15.39	34.05	79.39	68.20	121.16	United States

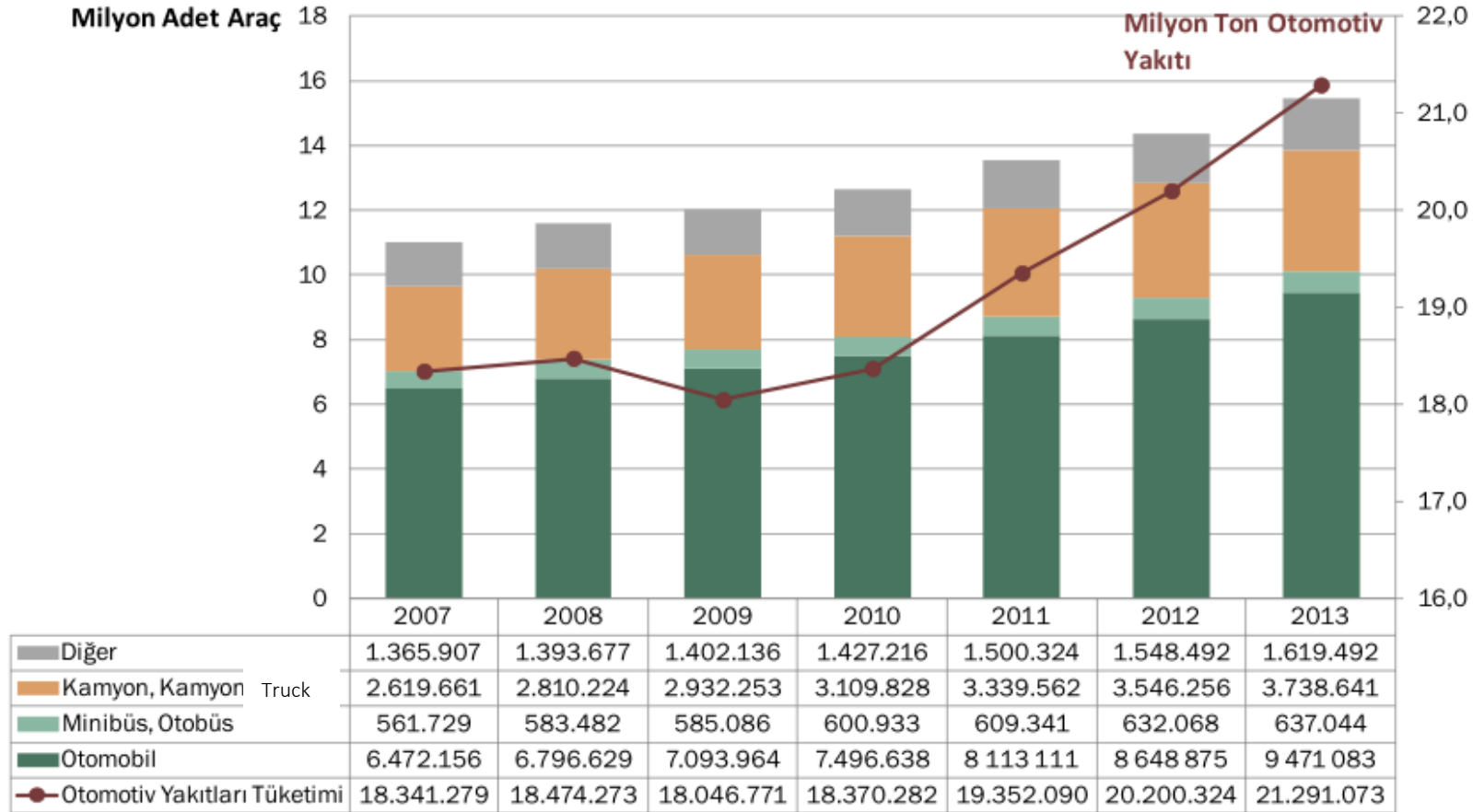
• In terms of energy prices:

- Turkey is 1st in Diesel, Gasoline prices
- For other resources, it depends on other factors

15% of tax revenue from oil and gas

Effects

Car Stock in Turkey

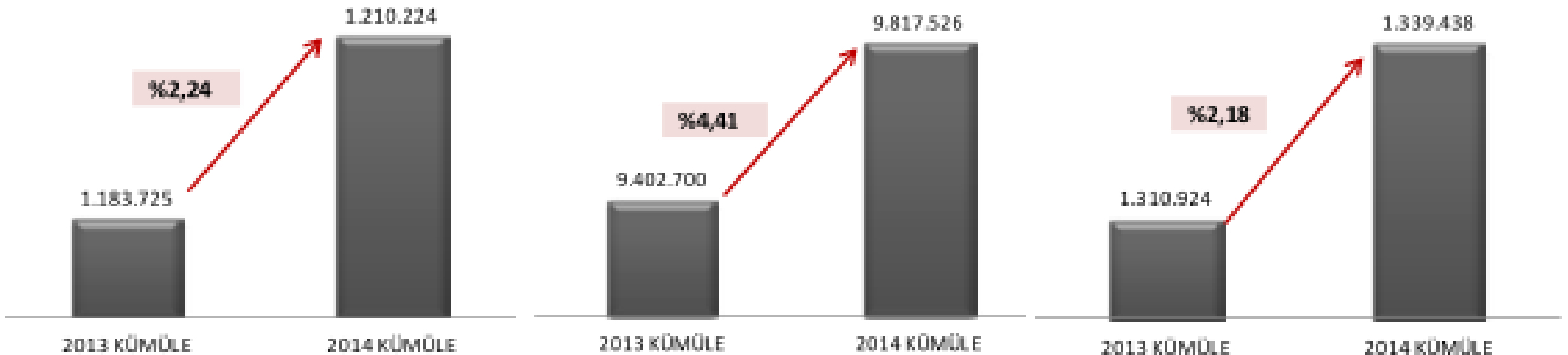


Cumulative Demand Increase (Aug 2014 from Aug 2013)

Gasoline

Diesel

LPG



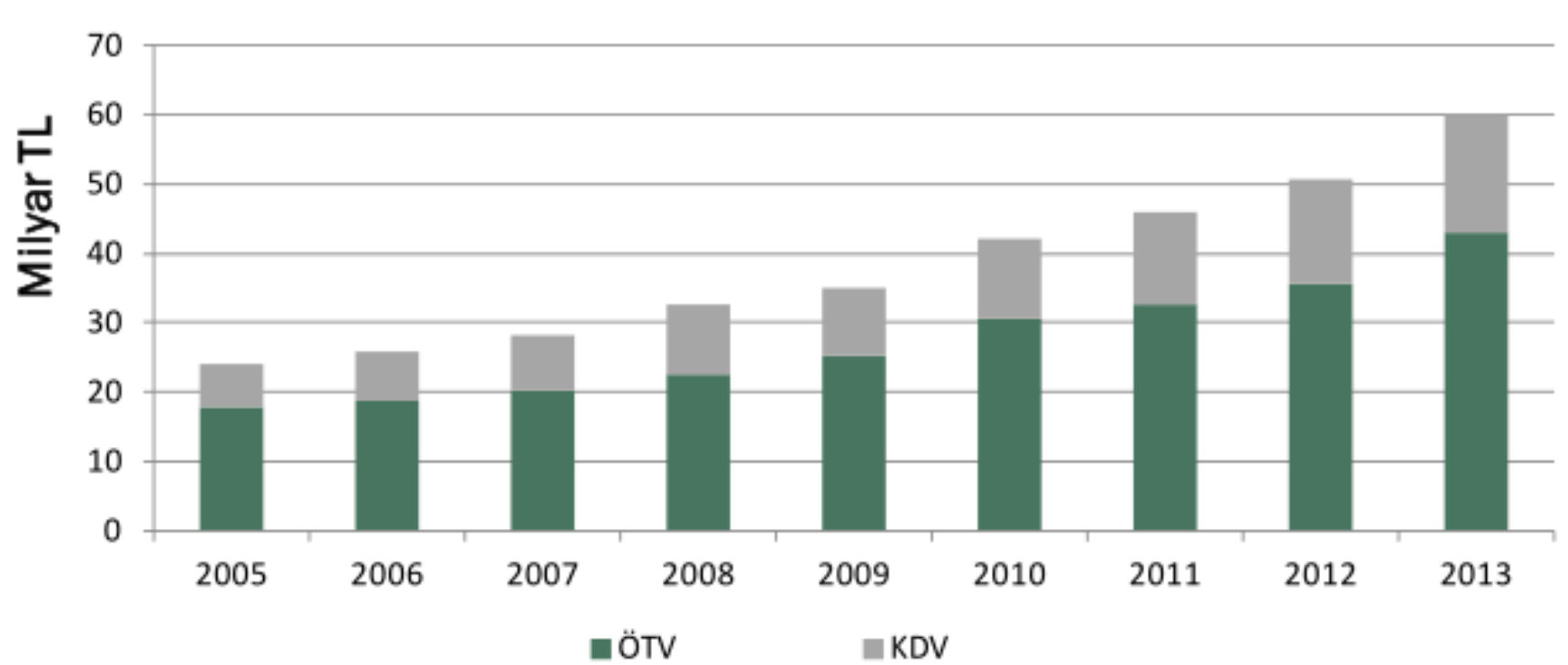
GDP Growth vs Vehicle Fuel Growth(%)



Şekil 29: Yıllık Otomotiv Yakıtı Tüketimi ve GSYİH Büyüme Oranları (%)

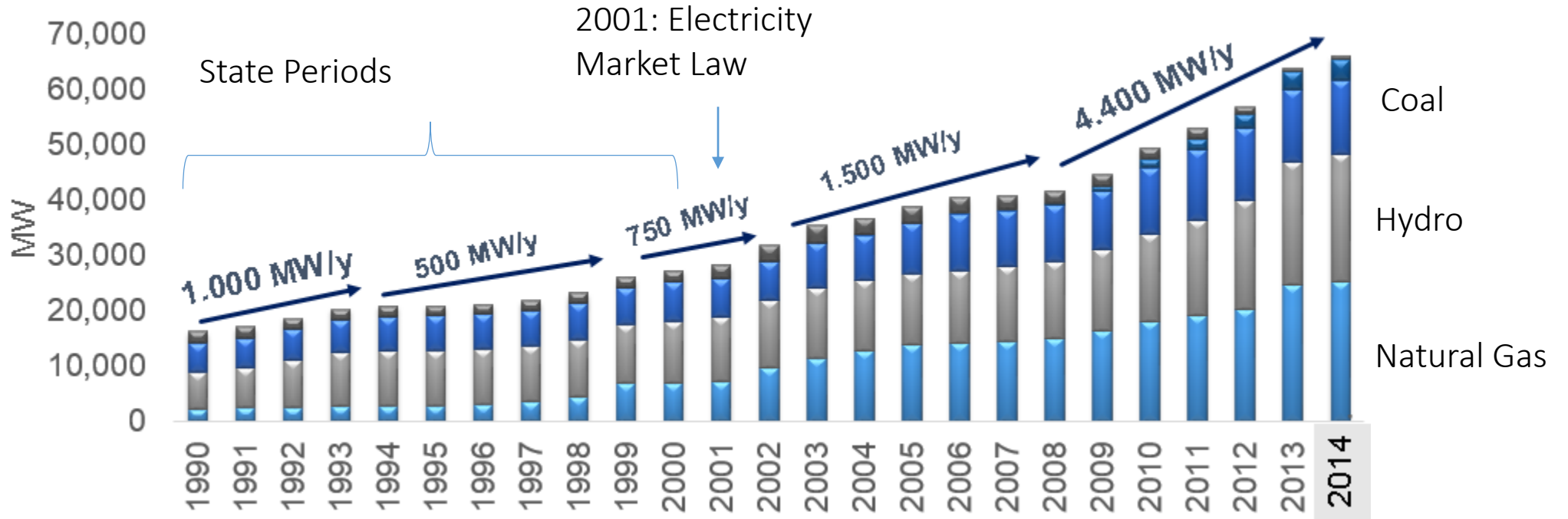
Kaynak: TÜİK, EPDK ve PETDER verileri

Total Contribution of Petroleum Products to Taxes



Şekil 5: Akaryakıt ve LPG'den Sağlanan Toplam Dolaylı Vergilerin Yıllara Göre Değişimi
Kaynak: EPDK, PETDER, TCMB

Electricity Market – Growth 5%

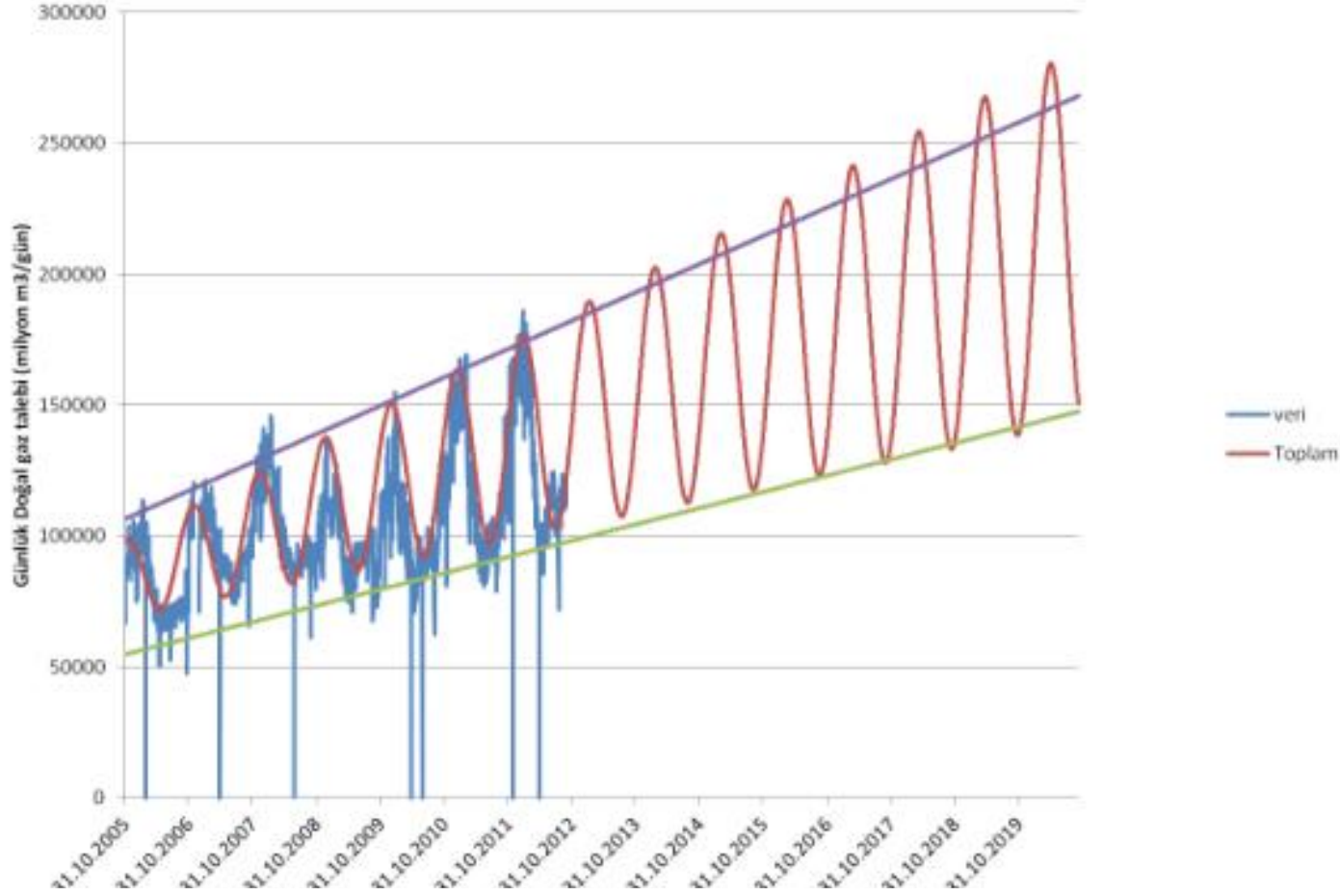


2002				
Resource	Installed Capacity (MW)	Share (%)	Generation (TWh)	Share in Generation (%)
Natural Gas	9.702	31	52,5	41
Hydro	12.241	38	33,7	26
Lignite	6.959	22	28,0	22
Imported Coal	480	1	4,1	3
Renewable	33.9	0	0,2	0
Other	2.761	8	10,9	8
Total	31.846	100	129,4	100

2014				
Resource	Installed Capacity (MW)	Share (%)	Generation (TWh)	Share in Generation (%)
Natural Gas	25,538	38	104,8	44
Hydro	23,299	34	59,2	25
Lignite	8,566	13	30,0	13
Imported Coal	4,862	7	31,4	13
Renewable	3,819	6	8,8	4
Other	1,354	2	5,1	2
Total	67,431	100	239,3	100

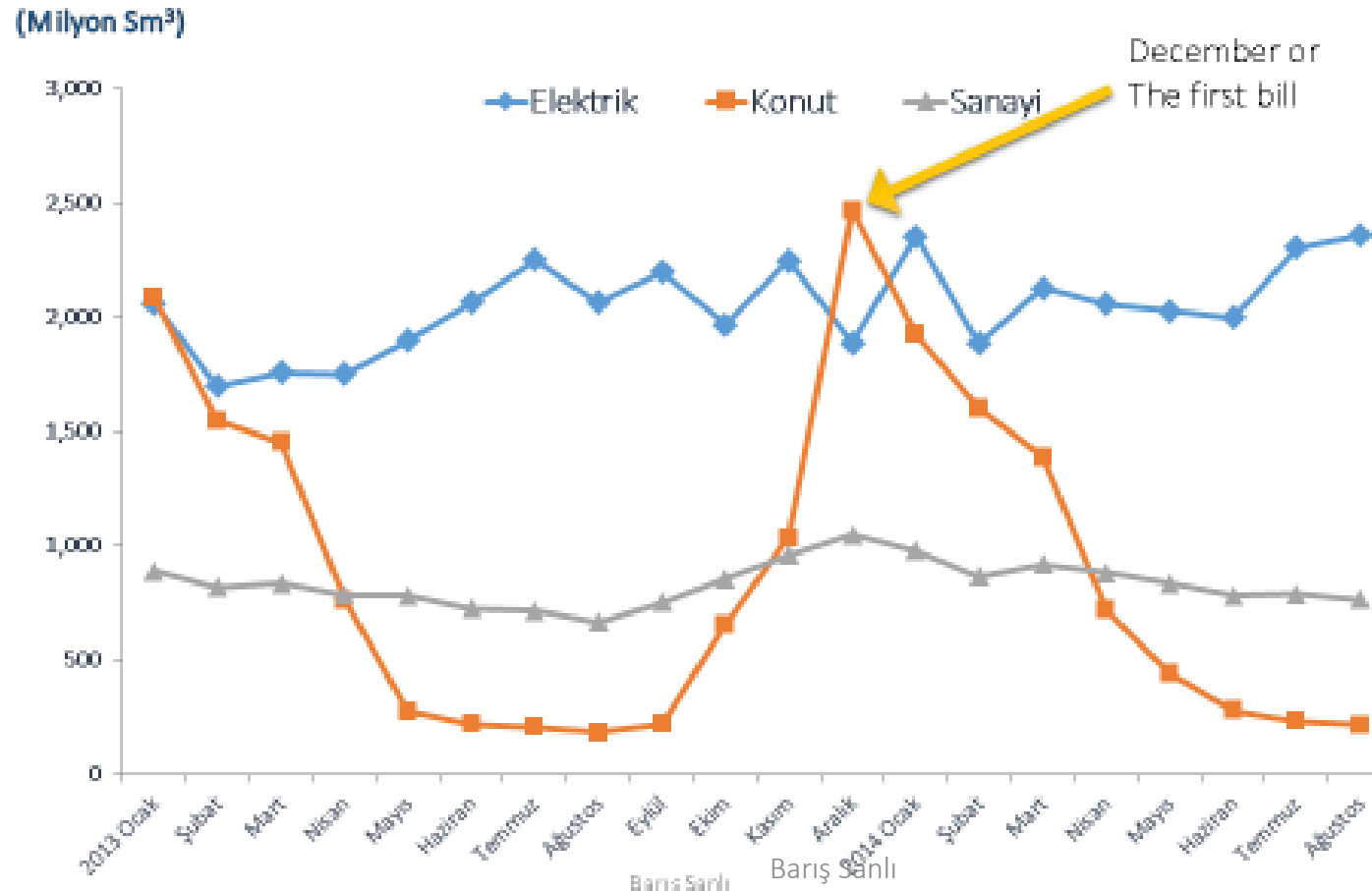
Natural Gas Demand Growth (10%)

Doğalgaz Talep Koridoru



	Toplam	İstanbul Avrupa	İstanbul Anadolu	Ankara	Bursa	Eskişehir	İzmit	Şehirler Toplamı	Sanayi
Maksimum Tüketim/ Minimum Tüketim	2.4	13.34	18.44	23.5	25.14	41.37	15.27	15.57	2.37

Billing periods also effect demand

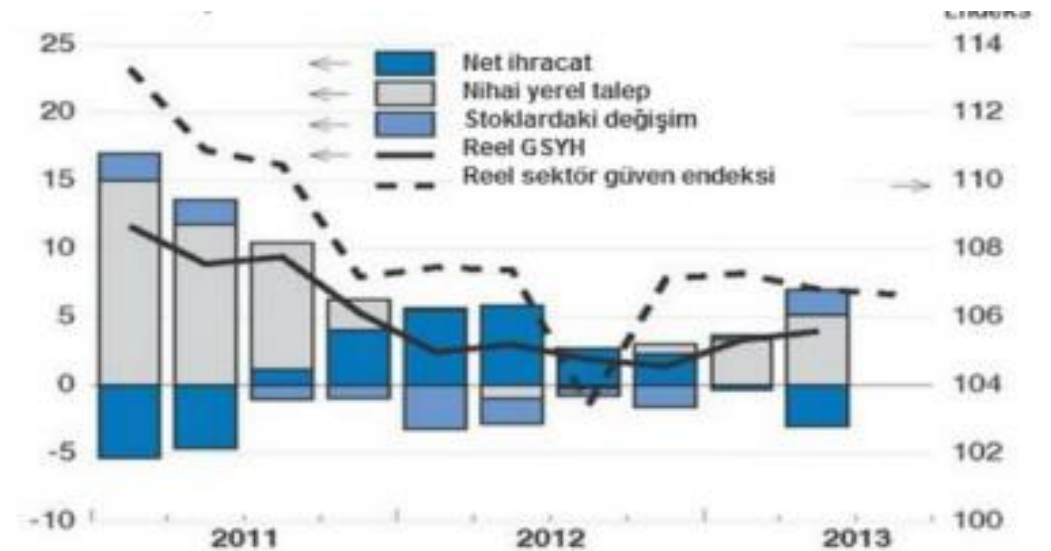


How to mitigate

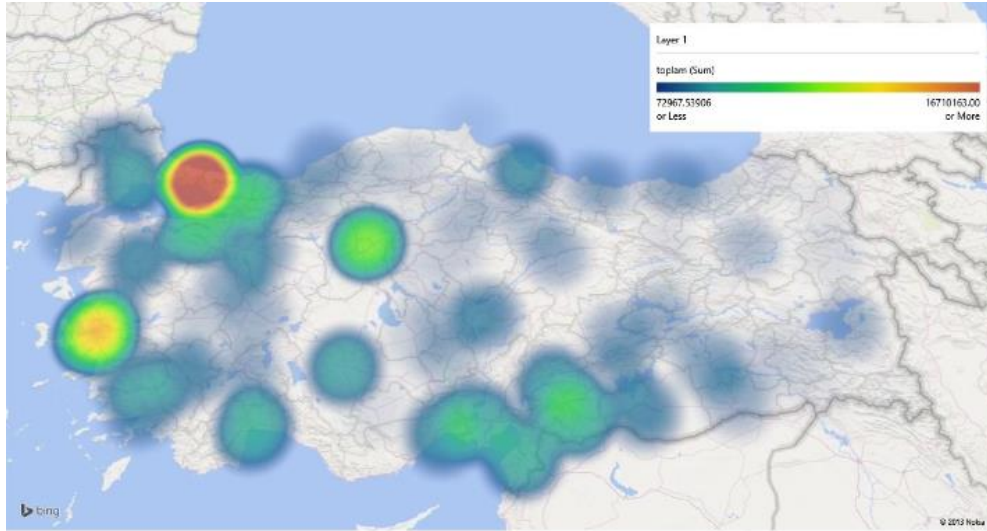
What I learned?

1st - Know Demand Dynamics

- Is it domestic consumption?
- Is it export orientations? (so you produce for your neighbour)
- Which sectors are the top energy consumers? (Iron & steel, cement, etc)
- Which fuels are used in these sectors? (coal, nat gas, petrocoker, etc.)

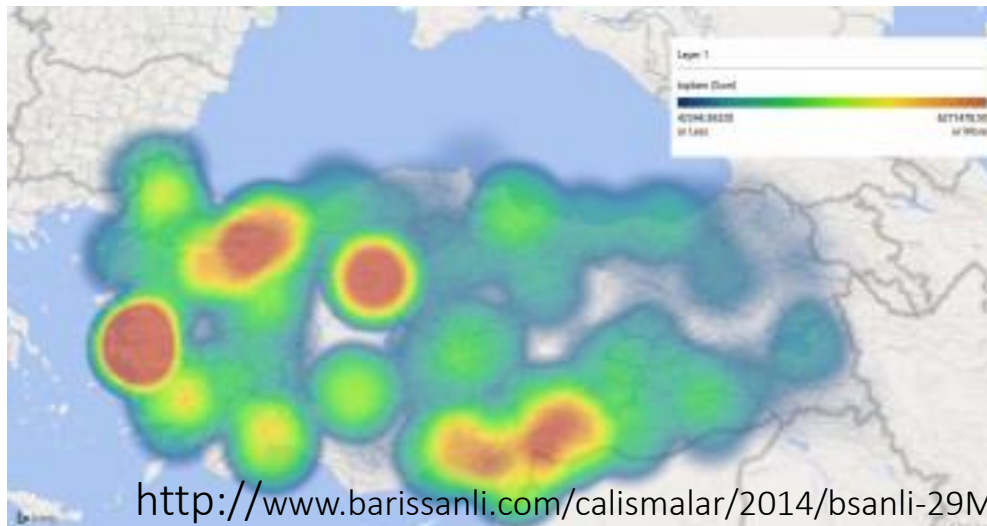


Back to drawing board –Demand Dynamics



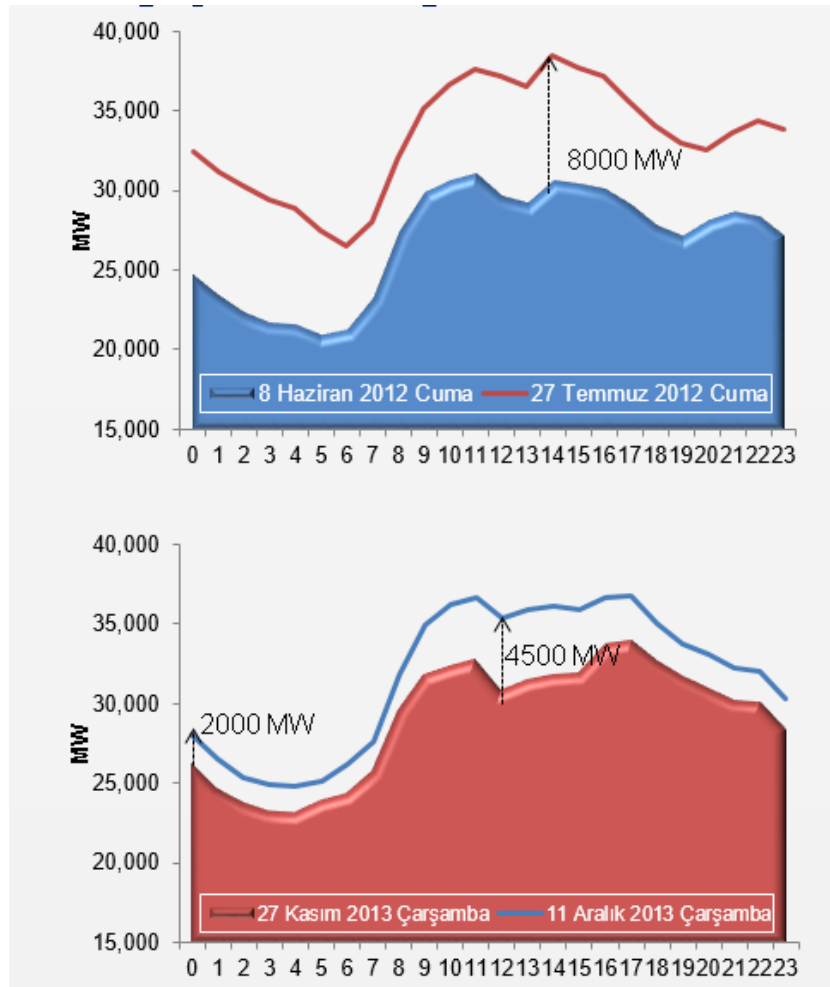
Electricity consumption

- (with Istanbul)



- (without Istanbul)

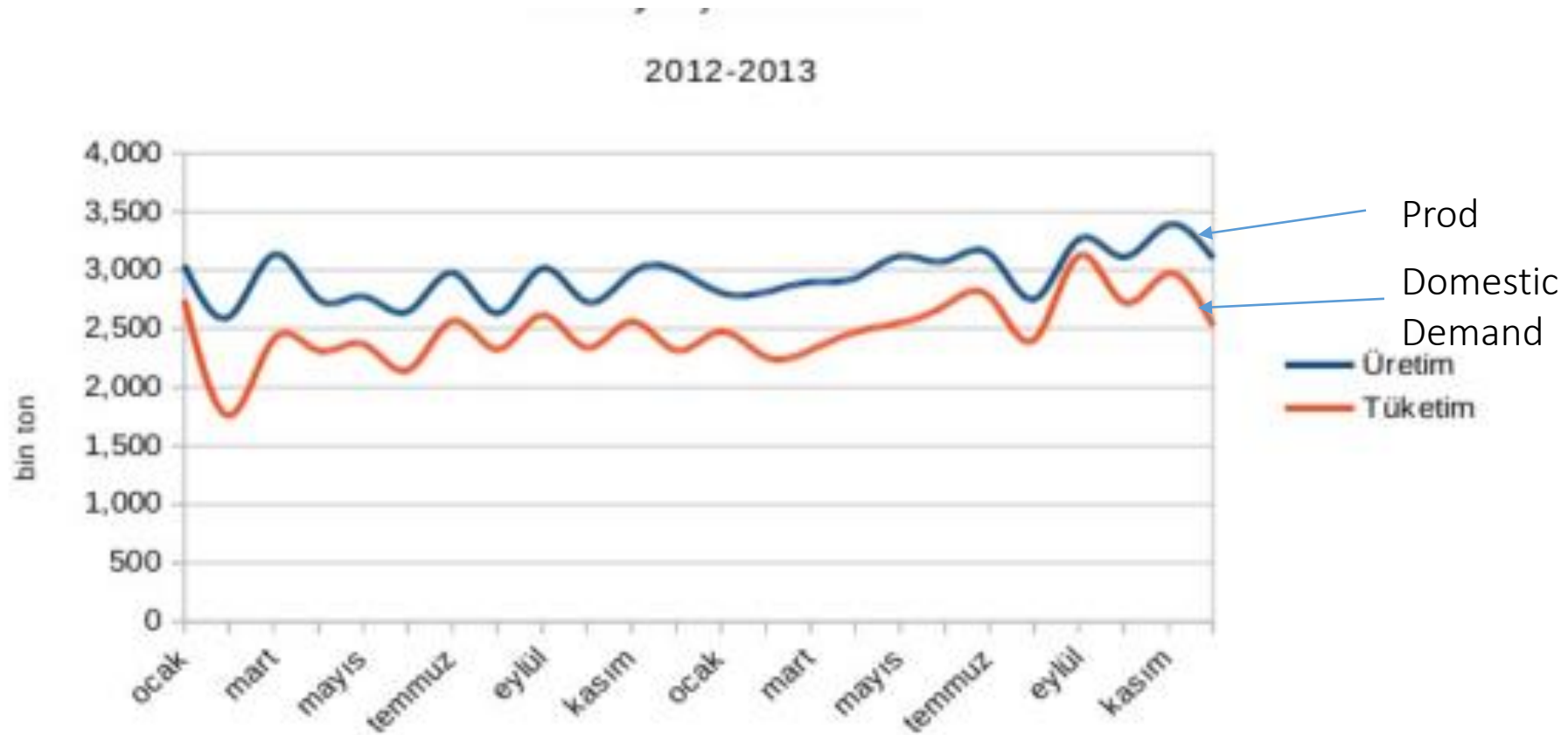
Turkish Demand Dynamics



- When it is hot (+8000 MW)

- When it is cold (+4000 MW)

Ex – Turkish Iron & Steel



Exchange rate harmed the competitive advantage of Turkish steel producers.

Their solution: They will form a R&D center

Ex - Cement

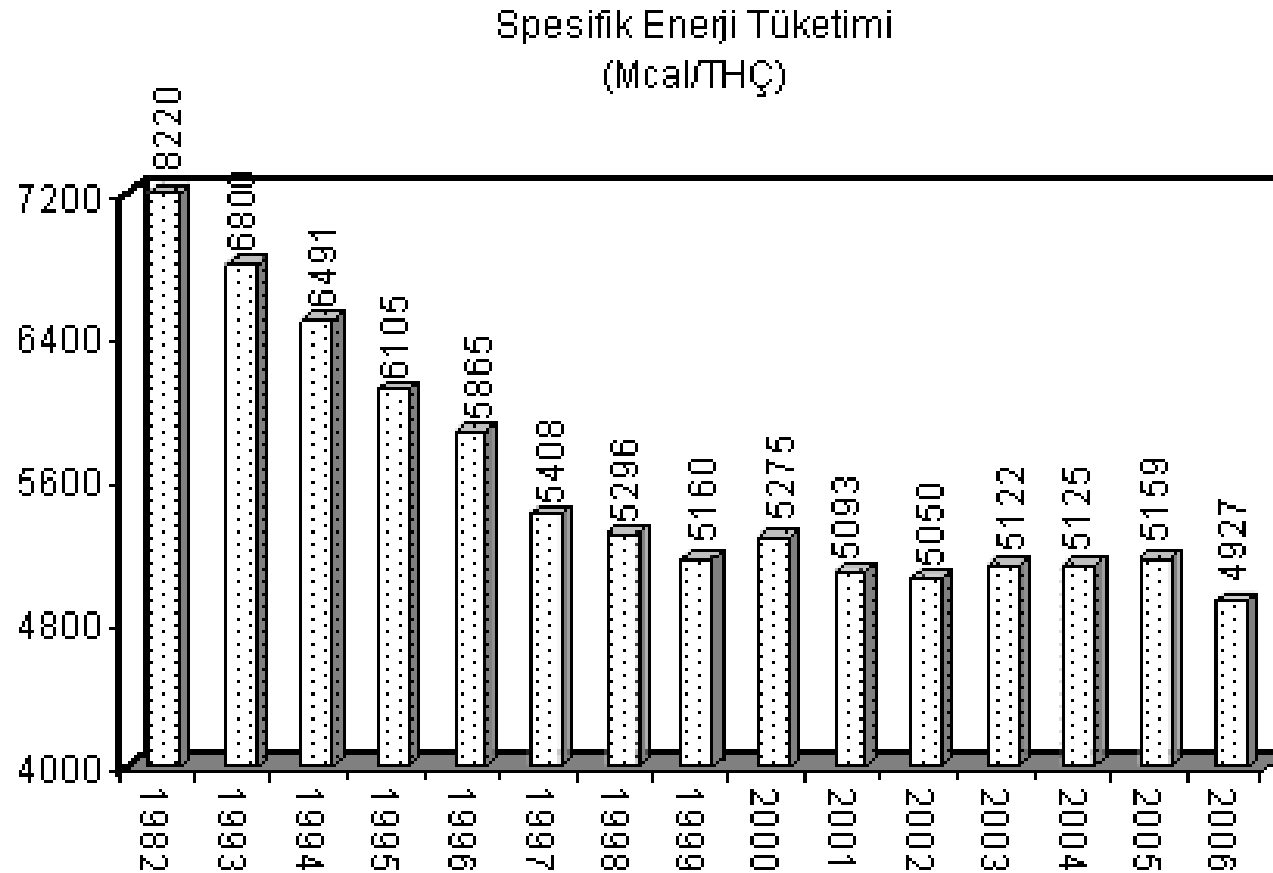
- Switch to Petro Coke
 - (Total Industrial demand: 2093->2800 from 2010 to 2012)
- Asked for incentives for the Waste Heat to Electricity
- Switching from Nat Gas to Coal decreases efficiency
- Price of Coal very important
- Germany's insulation of industrial tariffs from renewable subsidies.

2nd - Use Correct Metrics

- Energy Intensity
 - Without changing the machine stock, if your currency devalues, your inefficiencies increase
 - Use toe/ton ... Energy per production weight/area etc
- To use correct metrics, have to make industrial surveys
 - Balance tables
 - Balance tables by sectors
- Because if your sector is very efficient they will consume more and produce more for the exports. This may distort statistics



Ex – Iron and Steel



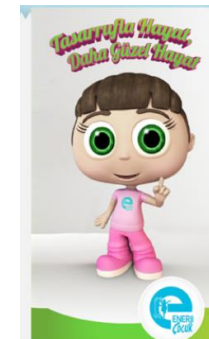
- Energy consumption Mcal/Tonnes of Steel

3rd - Efficiency is very important

- Turkey started from 1960s (1962- 1st Development Report-Energy part - Savings)
- 1980s – chronic shortages
 - Commission for Enerji Efficiency(Savings)
 - National week for Energy Savings
- 1995 – Some kind of methodology*
- Early 2000s – International Projects
- 2010s - An established institutional structure
 - YEGM – DG for Renewable Energy
 - National Energy Efficiency Forums

Demand Side – Targeting Audiences

- Education programs for Kids and Woman
 - www.enerjihanim.com and City tours (for Ladies)
 - www.enerjicocuk.org for kids and cartoons
- For Industry
 - <http://www.enerjiverimlisanayi.com/>
- Govt targets for efficiency gains
- Missing: no eff. For agriculture?



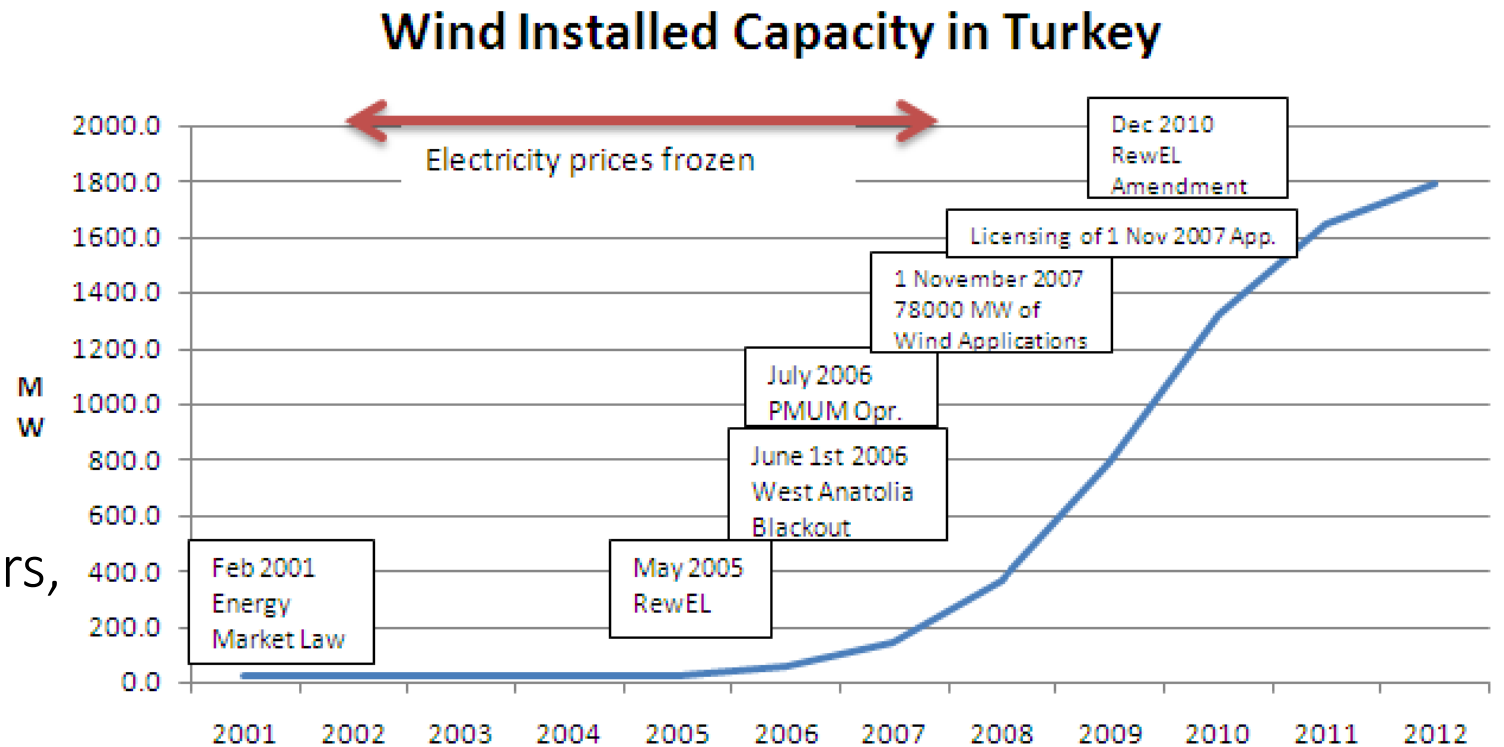
But....

- Jevon's Paradox
 - A carpet maker from Gaziantep, increased efficiency by 10%
 - Increased his profit margins
 - Adds another unit
- Rebound effect (Why Turkey's oil demand is still 2-4%)
- Consumer
 - Tries to limit the share of energy costs.
 - If efficiency decreases the bill, the savings (\$/TL) used for another activity which also consumes energy

Autoproducers are important

- Cogeneration incentives
- If not selling to grid, no taxes

- But if the market has distorted prices, may have unintended effect (Consume from grid during peak hours, And sell your production to grid)

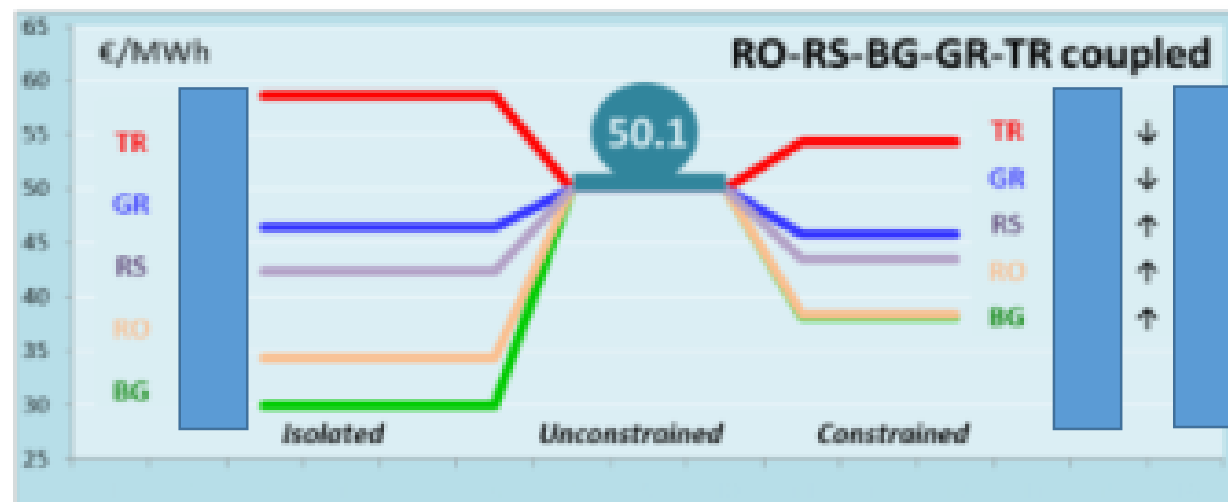


Ex: Bursa Demirtaş Industrial Zone



4th – Competitive Energy Market & Integration with Other Energy Markets

- Arbitration effect (Increases (most of the time) efficiency in Electricity Generation Sector)
- Provides Security of Supply
- Increases the quality of human resources (for Turkey)
- Liquidity



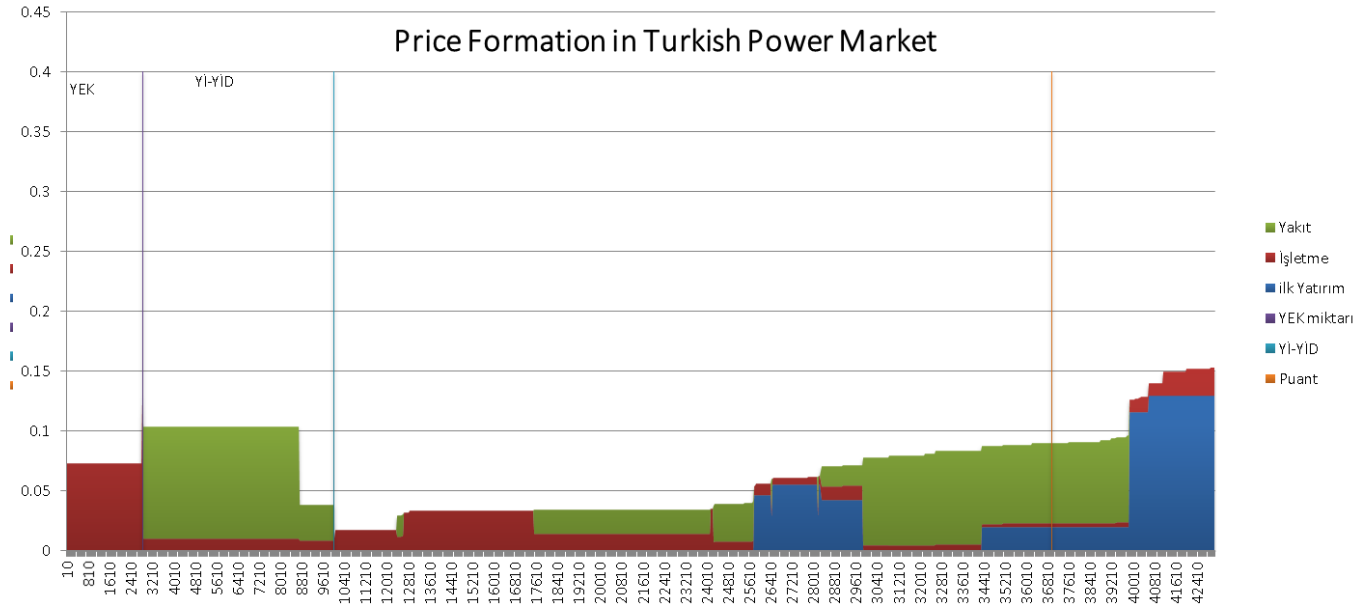
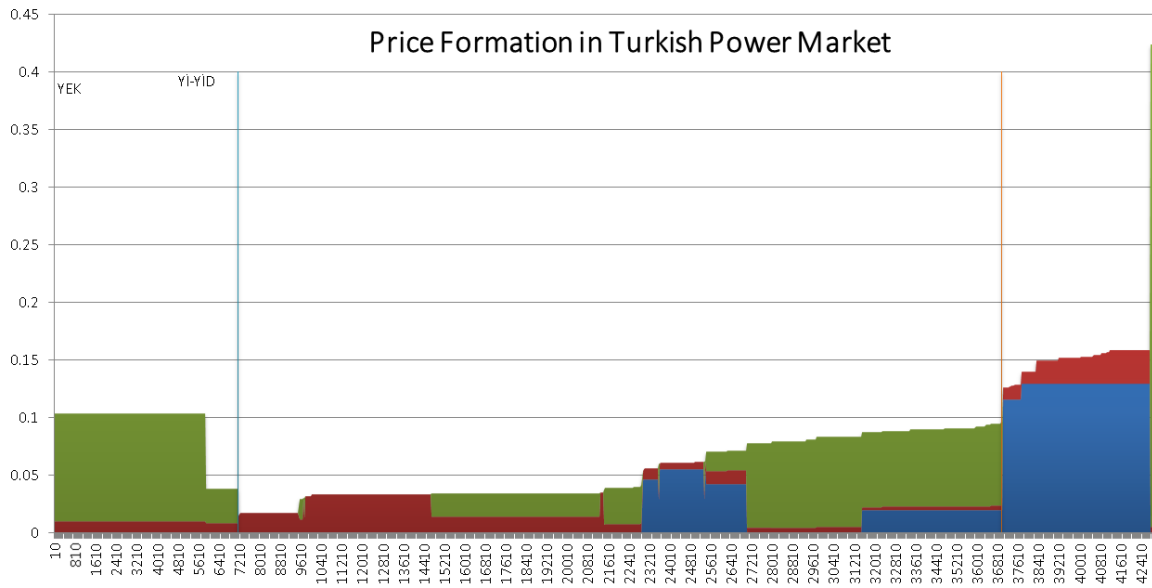
Turkish policy makers tried several models

- TEK (Turkish version of EDF)
 - Chronic financial problems, long construction times, inefficient operation
- BO/BOT (Özal model Built-Own/Built-Own-Transfer)
 - High tariffs (accelerated returns)
- ToOR for existing plants
- Electricity Market Model in 2001
 - Eliminate cross subsidies
 - Transparent price formation
 - But you have lots of contracts in hand with purchasing guarantees!



Price decreases due to Renewables?

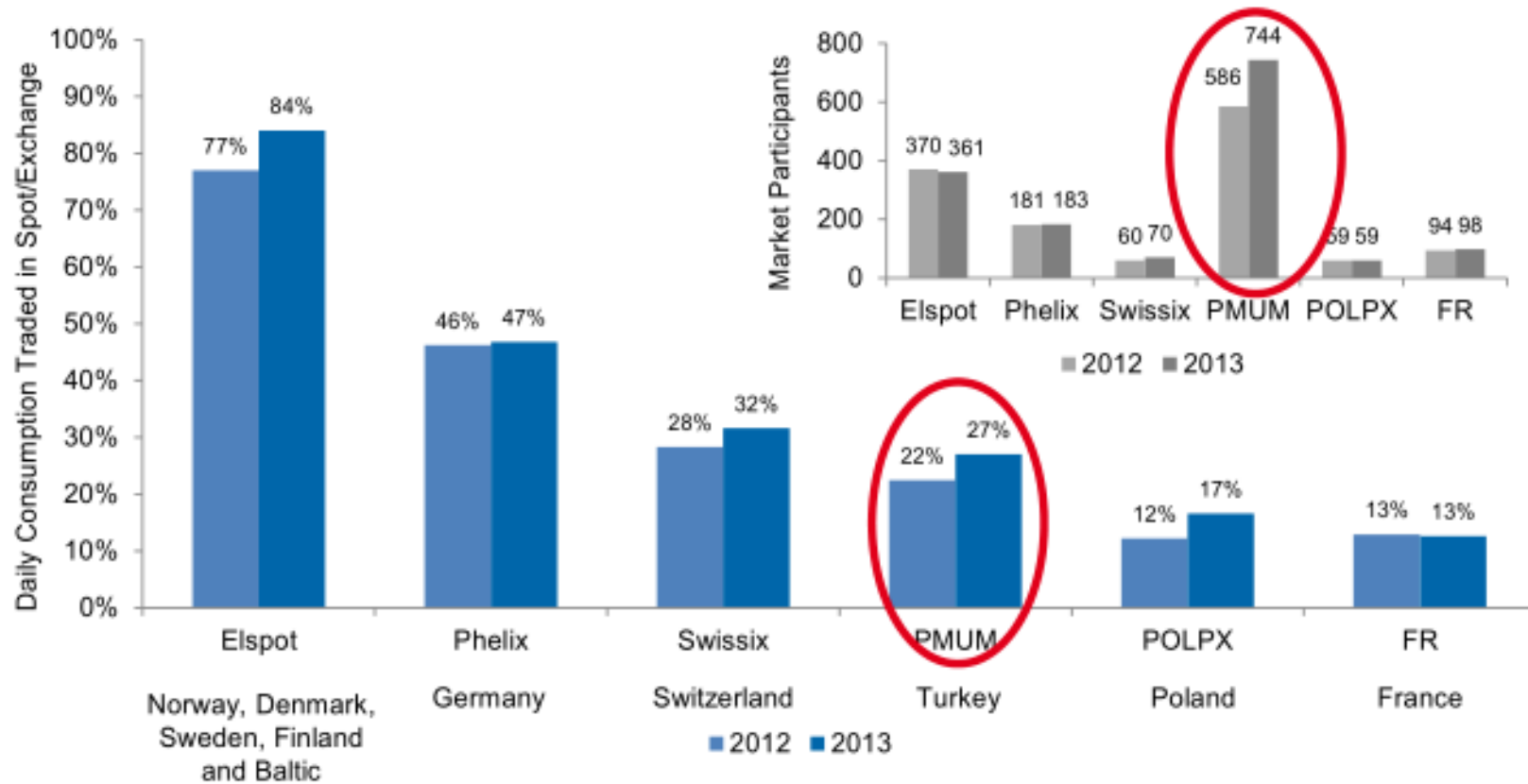
No wind / Wind (3000 MW)



- Yakıt
- İşletme
- ilk Yatırım
- YEK miktarı
- YI-YİD
- Puant

Still the price is formed by natural gas plant but what is the efficiency?

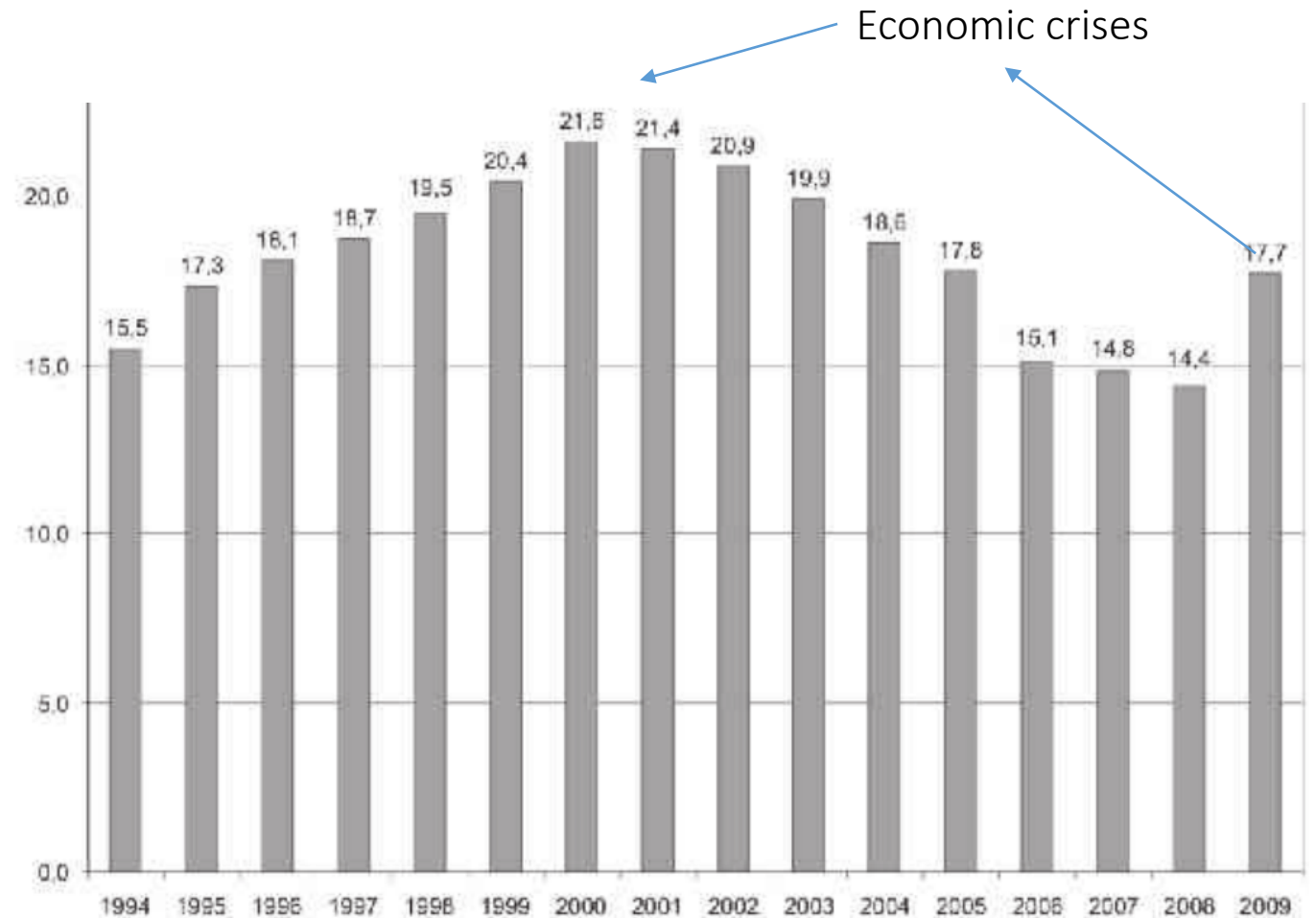
Turkish Electricity Market and EU



Turkish spot market has reached liquidity of European energy markets

5th – Are you sure about overnight hikes?

- During the 2001 & 2009 economic crises
- People may go bust
- Lose their habit of regular payments

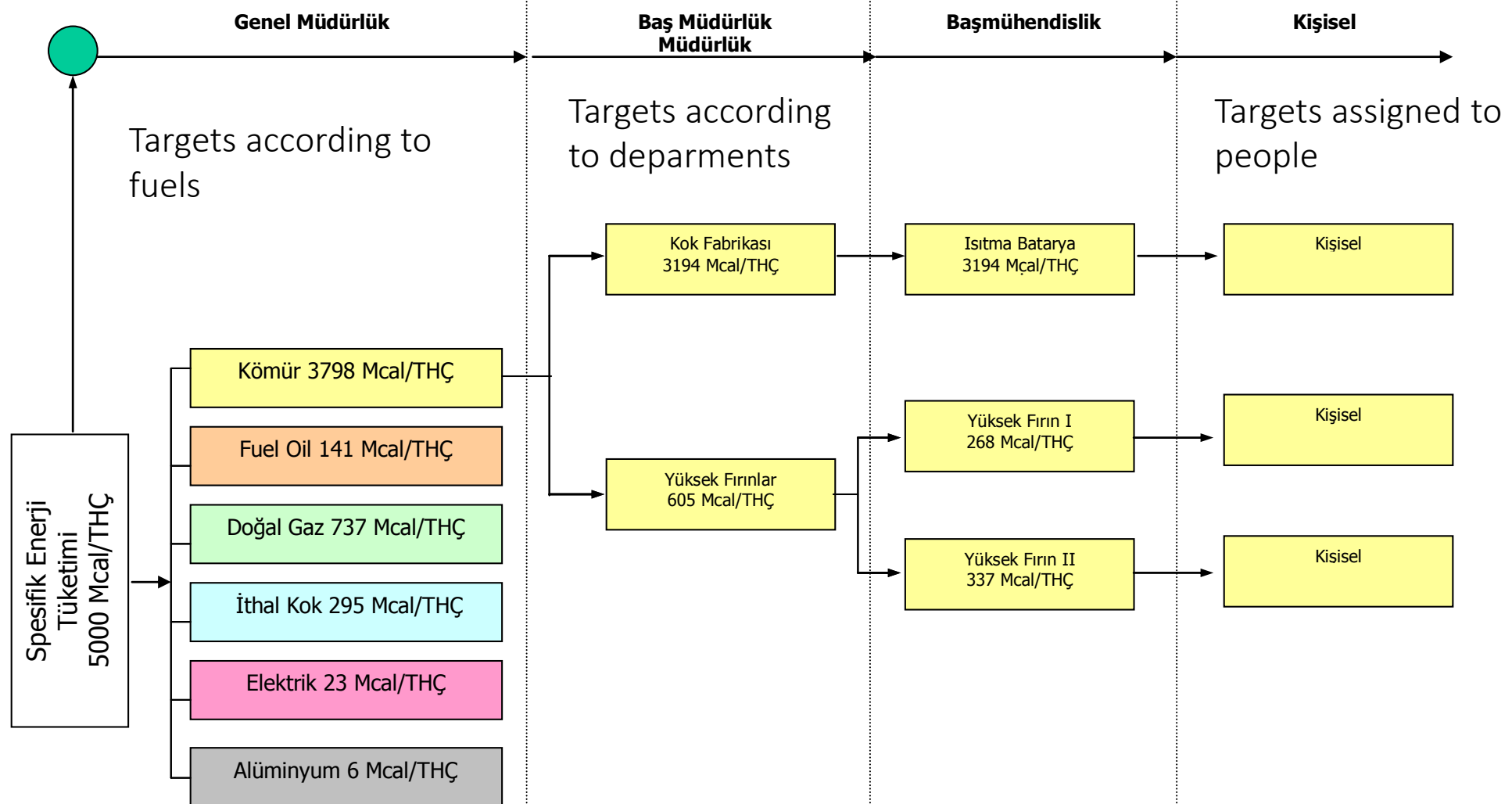


Turkish electricity system theft&loss ratio over years

6th – Targeted frontier projects

- The composition of your Industry is important
- Turkey
 - Automobiles, household appliances, cement, steel
- In these industries most of the energy consumptions are from
 - Motors
 - Boilers
 - Heating/cooling systems

Ex: Project from Iron & Steel (Erdemir)

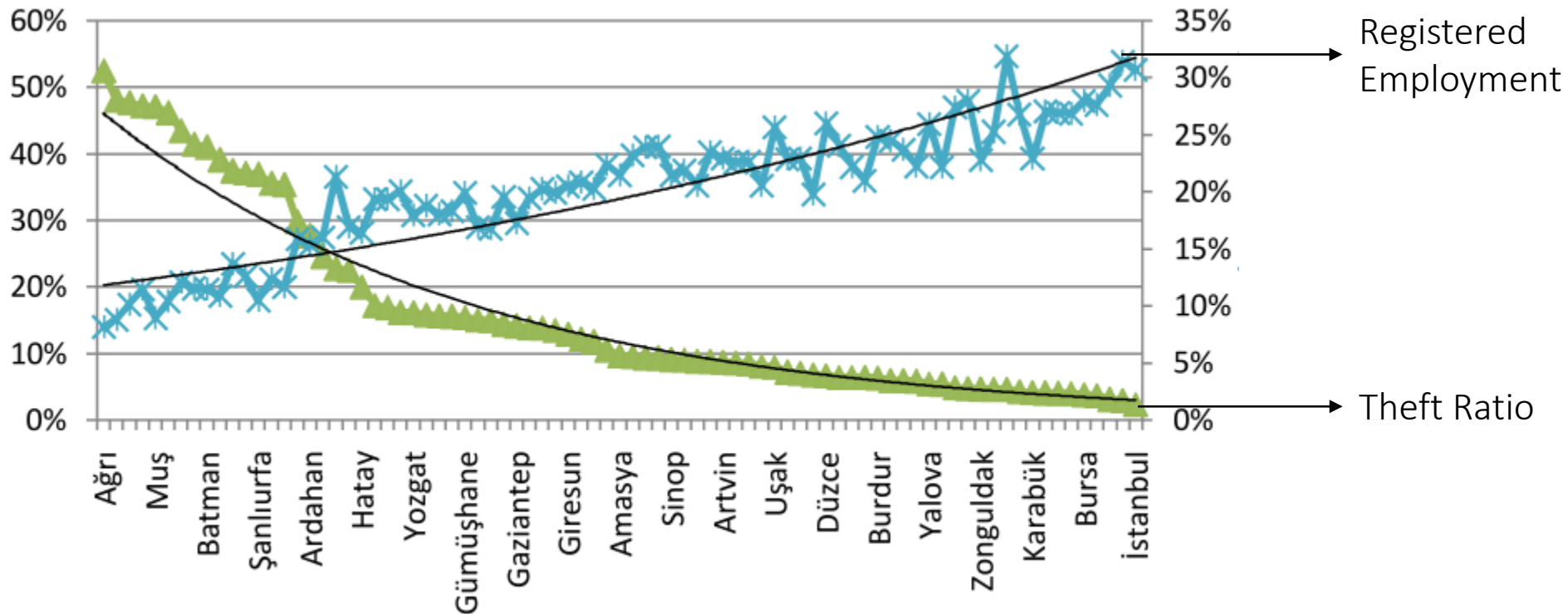


7th- Seperate «Can't Pay» & «Won't Pay»

- This is a must before price hikes
- Price hikes must first target middle-higher income level
 - In Turkey car taxes >1600 cc is higher(levelized)
 - Start from the appliances (inefficient ones)
 - Move to fuels
 - Produce the correct signal

Finding the difference between

- «can't pay» and «won't pay»



Conclusion

Conclusions

- Markets as «institutions»
- Built a good institutional structure to monitor, analyse, survey, disseminate
- High prices effect people differently
 - Save the subsistence (limited, time limited)
 - Expose the middle-high
- Increase predictability

Thank you

Bariş Sanlı

Addendum

Manufacturing value added per capita and industrial energy intensity at the country level, 2010



Waves of innovation

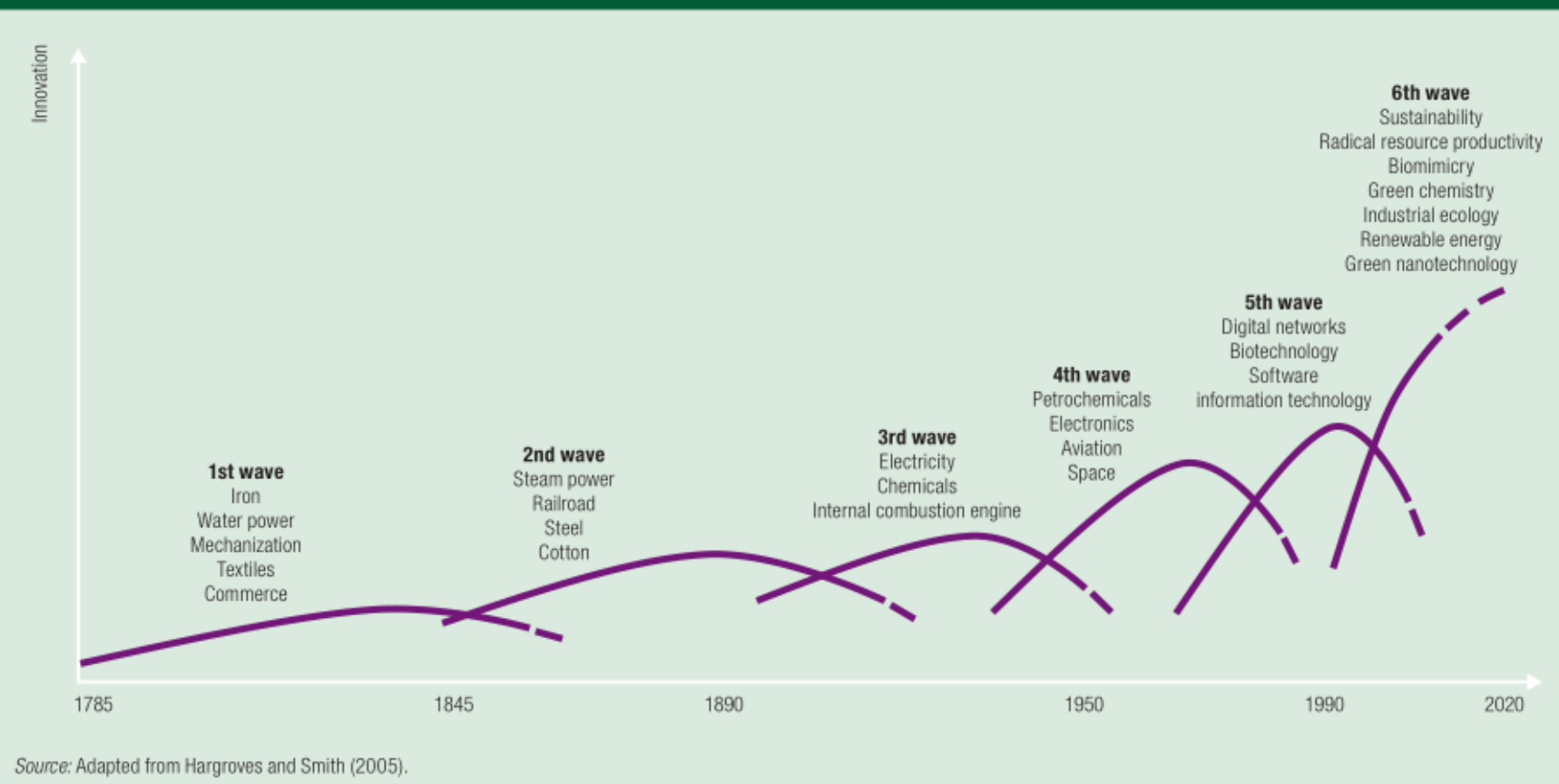


Table 1.1
Share of energy costs in total industry input costs, by sector, latest available year (percent)

Sector	All countries	Developed countries	Developing countries	Group of large developing countries ^a
<i>Process sectors</i>				
Refined petroleum and nuclear fuel ^b	61.6	59.4	70.6	68.4
Non-metallic minerals	11.8	7.2	12.7	6.5
Basic metals	7.3	5.8	8.3	9.9
Chemicals and chemical products	3.9	4.9	3.5	10.0
<i>Discrete product sectors</i>				
Other transport equipment	3.2	1.3	5.6	2.4
Fabricated metal products	2.4	2.5	2.4	5.1
Machinery and equipment	2.0	1.4	2.7	4.0
Medical and optical instruments	1.8	1.3	3.0	1.7
Electrical machinery and apparatus	1.5	1.7	1.4	2.2
Radio and television	1.4	1.2	1.6	1.3
Motor vehicles	1.1	1.0	1.6	1.2
Office and computing machinery	0.7	0.6	2.0	0.9
<i>Combined sectors</i>				
Rubber and plastic products	5.3	3.4	6.8	7.8
Paper, pulp and printing	3.2	3.6	2.9	4.0
Wood products	3.0	2.4	3.5	4.2
Textile and leather	3.0	2.3	3.3	2.5
Food and tobacco	2.3	1.7	2.5	1.9
Non-specified industry	2.0	1.3	2.8	3.2
Total	12.3	6.1	17.5	8.9
Excluding refined petroleum	3.6	2.5	4.3	4.8