UCTEA
CHAMBER OF MECHANICAL ENGINEERS

TURKEY ENERGY OUTLOOK
JULY 2015

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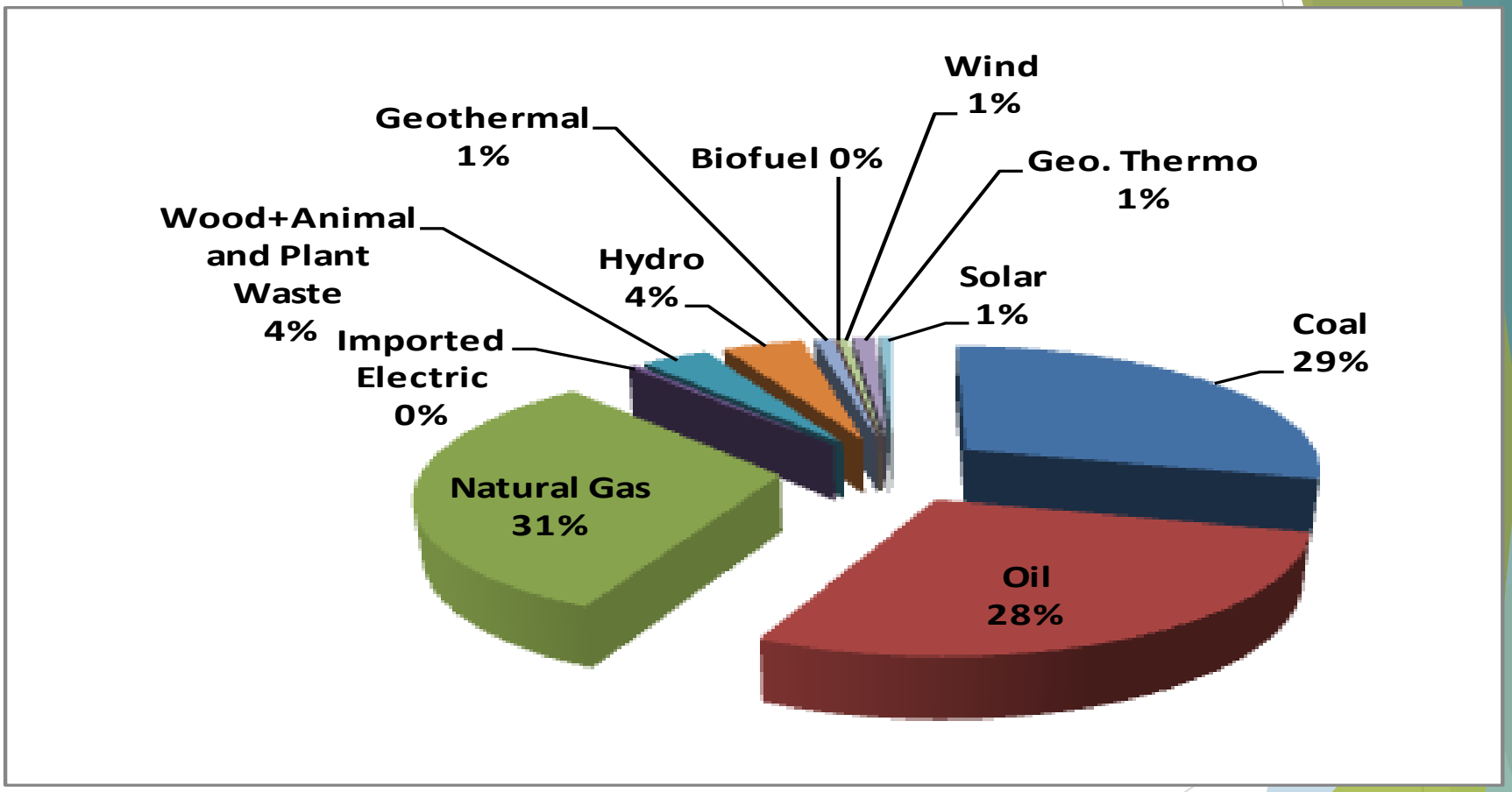
1.DEPENDENCY ON IMPORTS

Turkey Primary Energy Consumption (2013)



Source:MENR

Turkey Energy Balance (1990 – 201

	1990	2013	Change
Total Primary Energy Consumption *(million tep)*	52,9	120,29	↑ %127,39 ↑
Total Domestic Production*(million tep)*	25,6	31,94	↑ %24,78 ↑
Total Energy Import *(milllion tep)*	30,9	96,29	↑ %211,62↑
Share Of Domestic Production In Total Primary Energy Consumption	% 48	% 26,6	↓ - %44,58 ↓

Source: MENR

Energy Goods Import Of Turkey (2009 – 2012)

(Billion USD)	2009	2010	2011	2012
Crude Oil And Oil Products	14,9	20,6	29,2	31,5
Natural Gas	11,6	14,1	20,2	23,2
Hard Coal	3,1	3,3	4,1	4,6
Total Energy Goods Import	29,9	38,5	54,1	60,1
Turkey Total Import	140,9	185,5	240,8	236,5
Share In Total Import	18,8%	18,7%	20,5%	23,1%

Source:PETFORM

Energy Goods Import Of Turkey

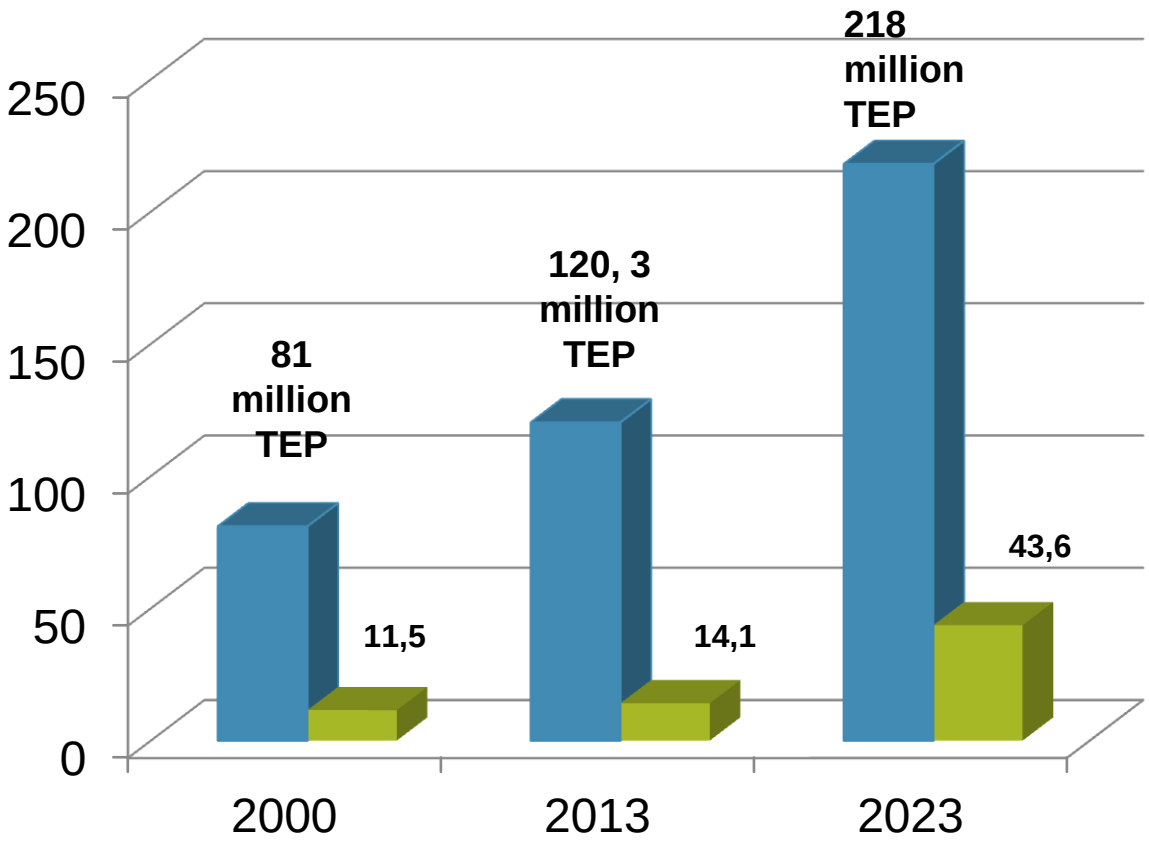
- Energy goods import in 2013 has declined in 2013 and totalled up to 55.9 billion USD versus 60 billion USD of 2012.Decrease trend continued in 2014 and according to a news of Anadolu News Agency dated 31.1.2015, energy goods import in 2014 decreased by 1.8% versus 2013 and the bill was 54,9 billion USD.
- Although Medium Term Program forecast 60 billion figure as the average for energy imports during 2015-2017,with the influence of drop in oil prices,the import bill could be less for 2015.

Turkey's Rank In World Energy Import Scale

ENERGY GOOD	IMPORT VOLUME	RANK IN WORLD
NATURAL GAS	45 BILLION M3	**5.**
OIL	35 MILLION TON	**13.**
HARD COAL	30 MILLION TON	**8.**
PETROLEUM COKE	4 MILLION TON	**4.**

Source: Dr. Nejat TAMZOK,
http://enerjigunlugu.net/turkiye-enerji-ithalatinda-kacinci_10228.html#.VLt4g0esVkM **"**

Primary Energy Consumption And Renewable Energy Sources



Increase target for 10 years 80,2 %

Source: UYEEP

Prepared By: Şayende Yılmaz ,Energy Commission ,Chamber Of Mechanical Engineers

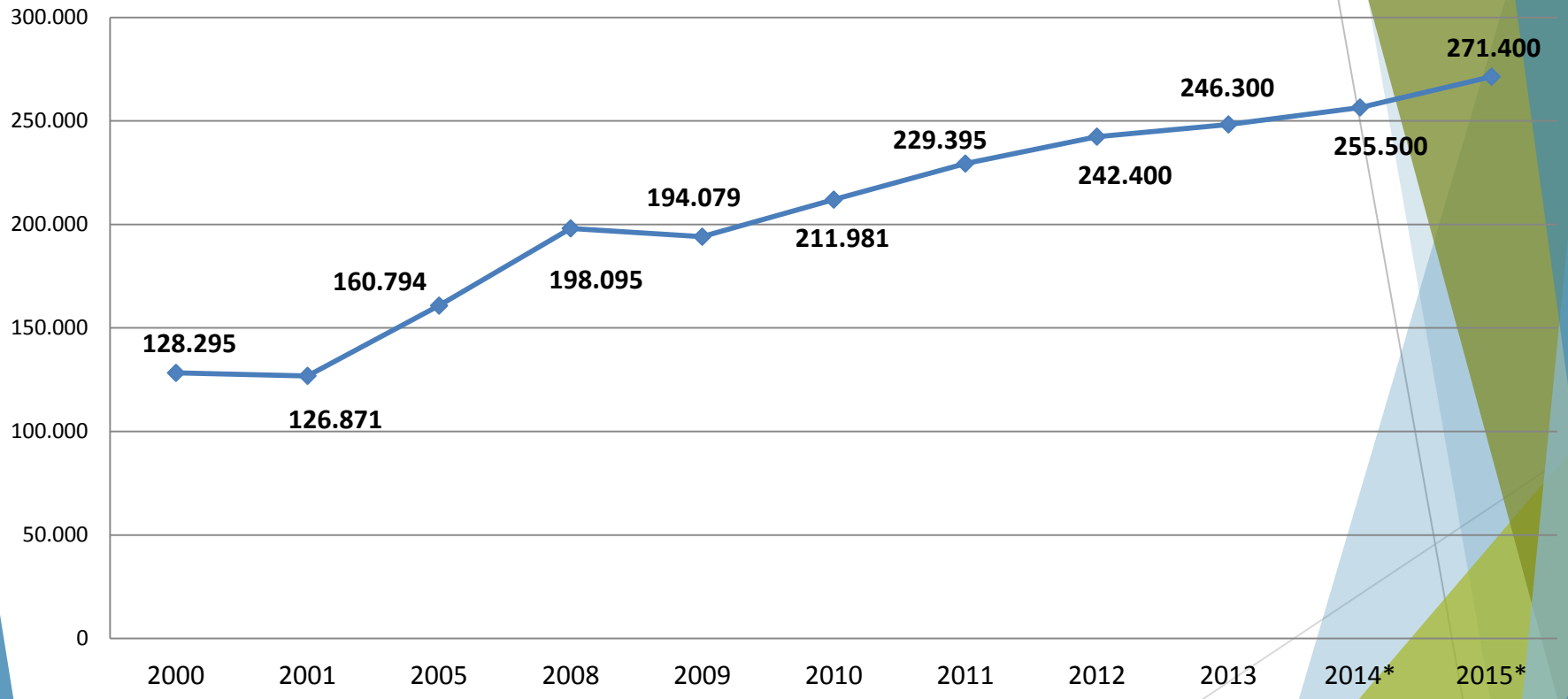
2. ELECTRICITY GENERATION AND CONSUMPTION

Turkey's Per Capita Electricity Consumption Targets

YEAR	TARGET ELECTRICITY CONSUMPTION PER CAPITA PER ANNUM
2015	3429 kWh
2020	4800 - 5000 kWh
2023	5500 - 6000 kWh
2030	>7000 kWh
2040	>8000 kWh

- IT IS AIMED TO REACH EU'S 2013 AVERAGE CONSUMPTION TOWARDS 2030.
- EU AIMS TO INCREASE ENERGY EFFICIENCY BY 2020.TURKEY SHOULD ALSO CONSIDER INCREASING ENERGY EFFICIENCY,DECREASING ENERGY DENSITY RATHER THAN INCREASING ELECTRICITY CONSUMPTION.

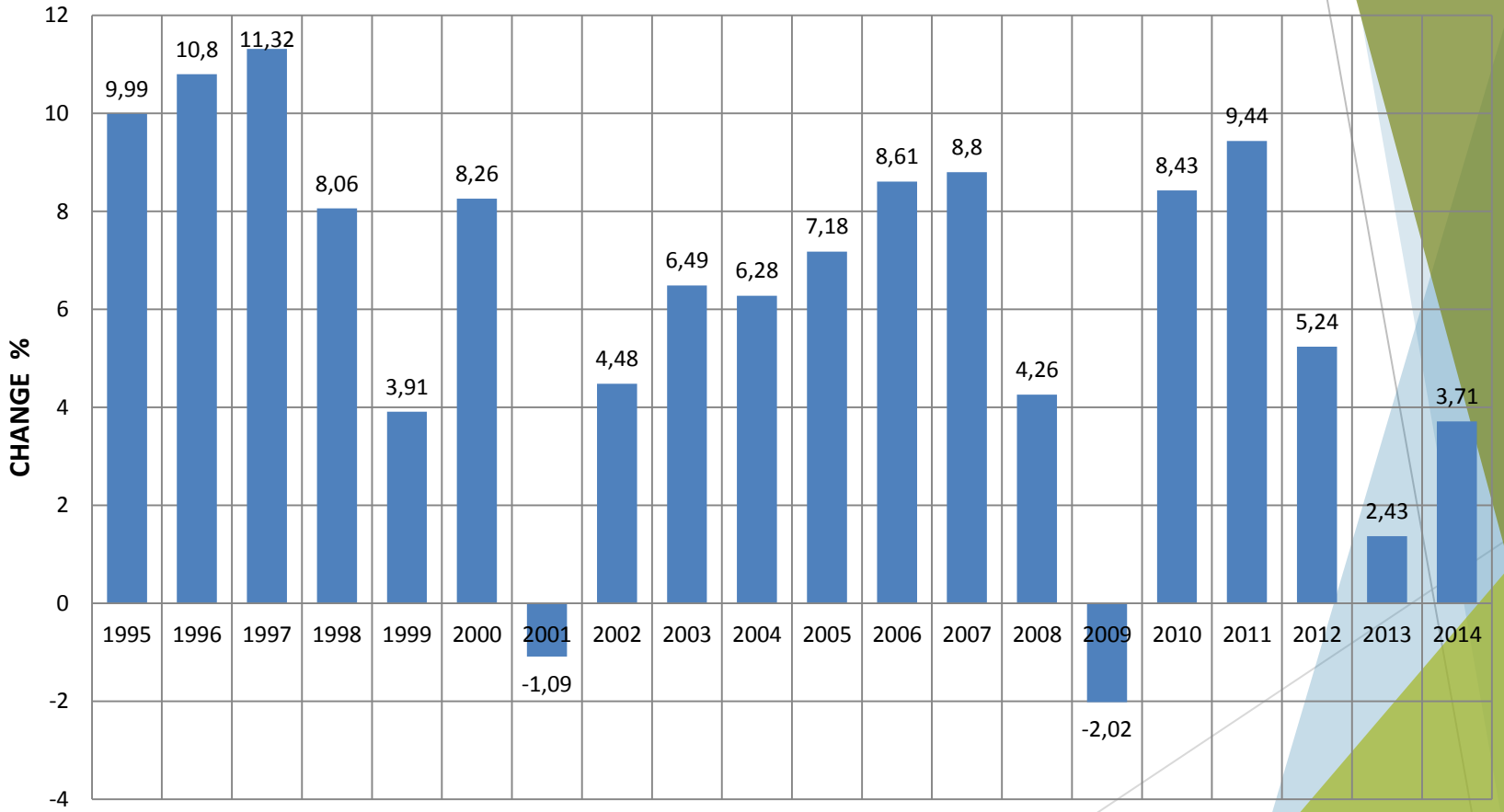
Electricity Suppy For Consumption (GWh) 2000-2015



* 2014 Provisional Figures
* 2015 TEİAŞ Program Target

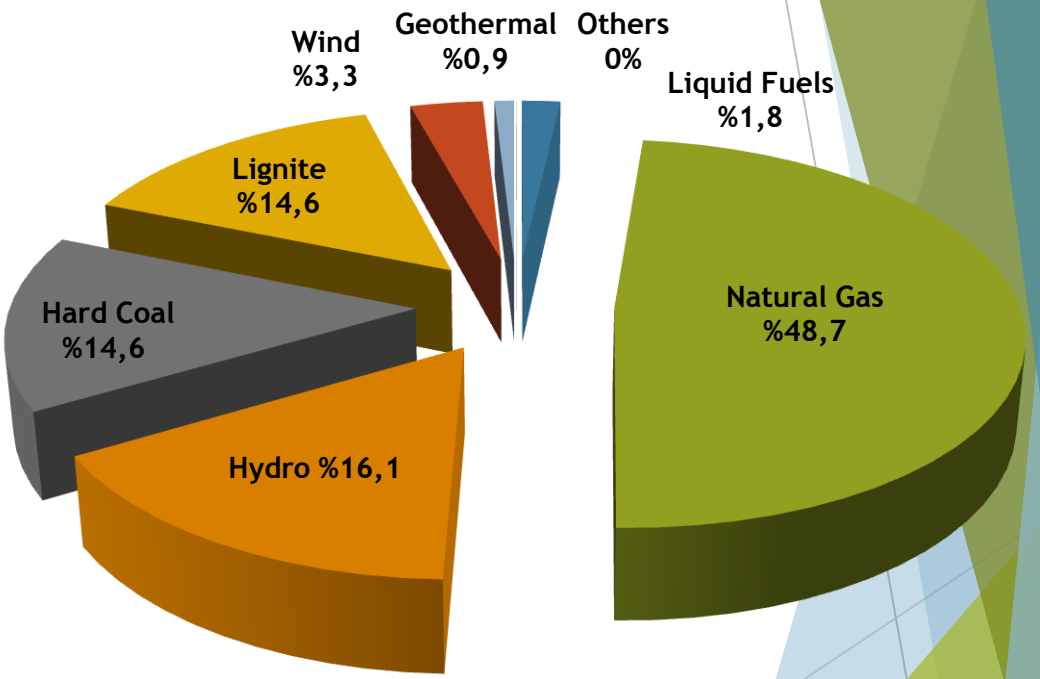
- Source:TEİAŞ

Annual Electricity Consumption (1995-2014)



Sources Of Power Generation – End Of 2014

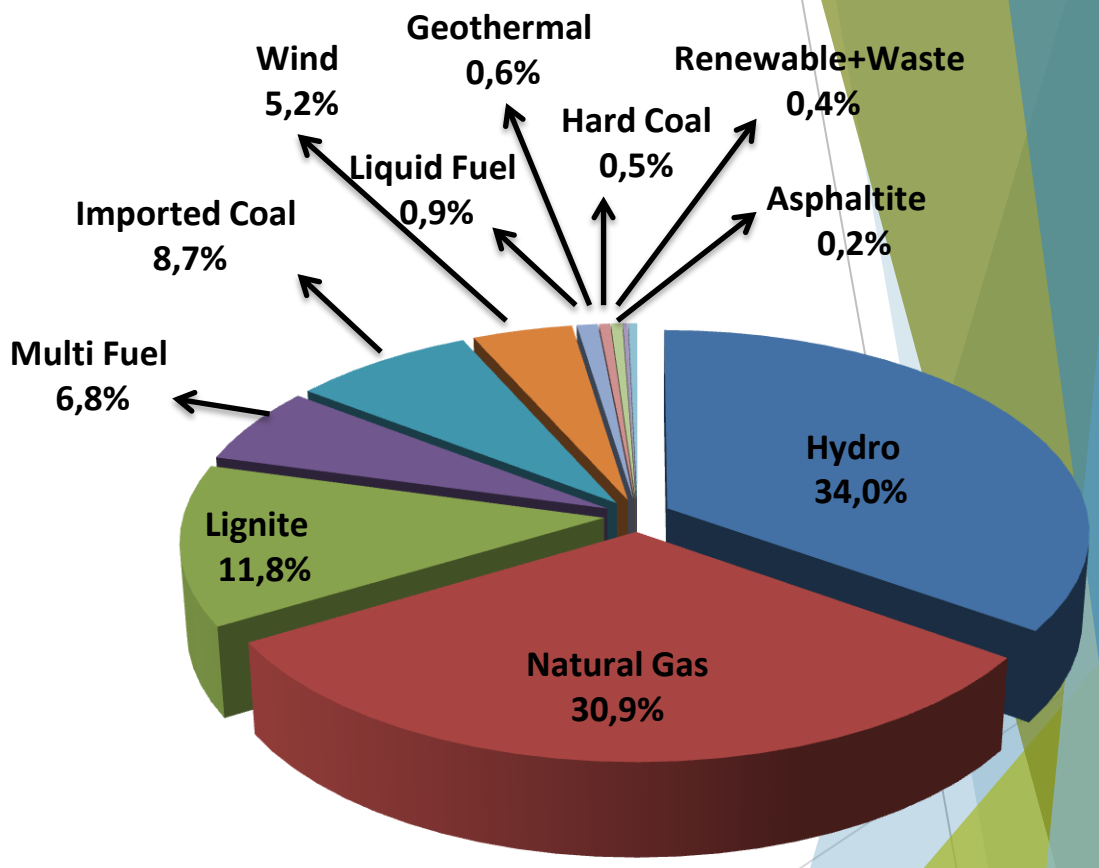
Source	Generation (MWH)	Share (%)
Liquid Fuels	4.423,70	1,8
Natural Gas	121.843,80	48,7
Hydropower	40.401,80	16,1
Hard Coal	36.637,70	14,6
Lignite	36.413,40	14,6
Wind Power	8366,8	3,3
Geothermal	2251,8	0,9
Others	42,3	0
Total	250381,2	100



Source: TEİAŞ

Installed Capacity (MW)(End Of 2014)

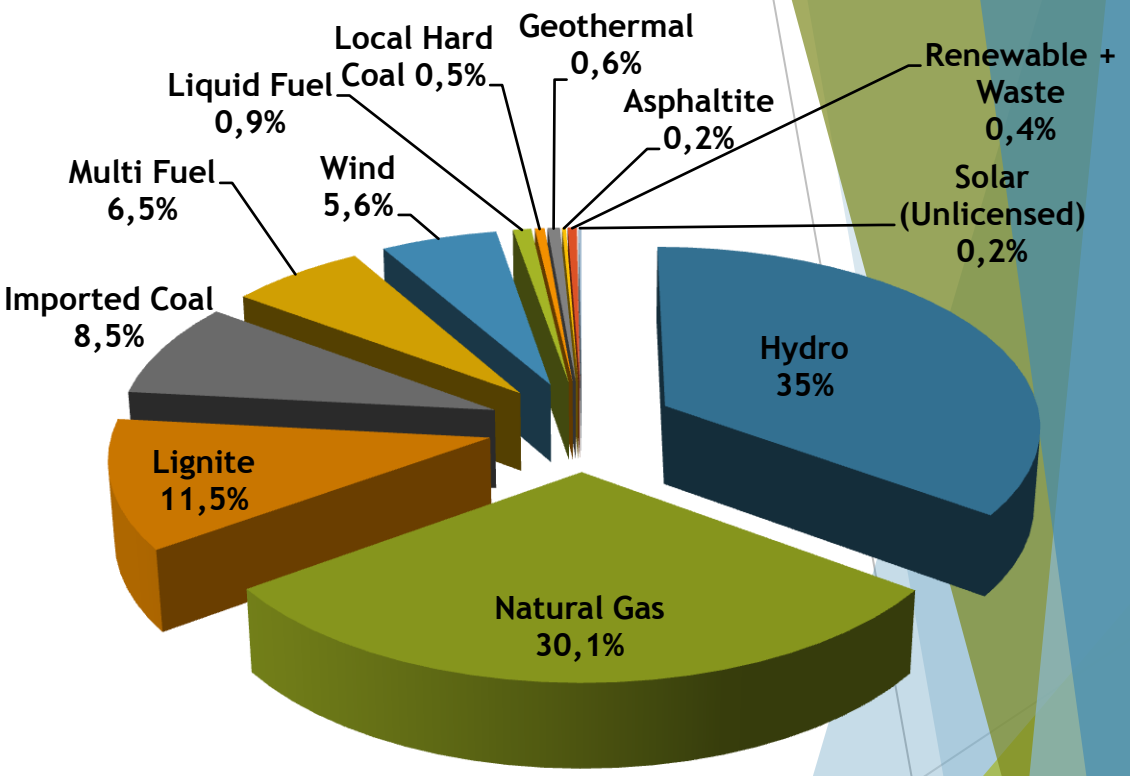
Source	(MW)	Share (%)
Hydropower	23.690,9	34,0
Natural Gas	21.476,1	30,9
Lignite	8.238,4	11,8
Imported Coal	6.062,6	8,7
Multi fuel (Solid+liquid)	4.741,8	6,8
Wind Power	3.629,7	5,2
Liquid Fuel	523,8	0,8
Local hard Coal	335,0	0,5
Geothermal	404,9	0,6
Asphaltite	135,0	0,2
Renewable +Waste	288,1	0,4
Total	69.516,4	100,0



Source: TEİAŞ

Installed Capacity (MW)(End Of June 2015)

Source	(MW)	Share (%)
Hydropower	25.056,6	35,0
Natural Gas	21.571,3	30,1
Lignite	6.259,4	11,5
Imported Coal	6.064,2	8,5
Multi fuel (Solid+liquid)	4.672,9	6,5
Wind Power	4.024,4	5,6
Liquid Fuel	631,3	0,9
Local hard Coal	335,0	0,5
Geothermal	431,2	0,6
Asphaltite	135,0	0,2
Renewable +Waste	314,7	0,4
Solar (Unlicensed)	107,6	0,2
Total	71.603,7	100,0



Source: TEİAŞ

- 3.ENERGY POLICIES OF GOVERNMENT
- NEED FOR PARADIGM CHANGE
- QUESTIONS AWAITING REPLIES

Energy Policies Of Government(1)

In “Strategic Plan” of MENR for 2015-2019 period,sixteen aims are listed under eight themes for Turkey energy sector.In summary,below objectives are defined and targets in line with these objectives and strategies to be followed for reaching these targets are stated.

Objectives:

“Strong and reliable energy infrastructure”

“Optimum resource variety”

“Effective demand management”

“Using energy efficiently”

“Capacity development for energy efficiency and savings”

“Ministry with strong institutional capacity and efficienty using IT”

“Integration to regional energy markets, powerful in international arena “

“Local technology in energy and natural resources,result focused RD Approach “

“Competitive and transparent markets”

“Supply security of raw materials other than energy and efficient usage”

Energy Policies Of Government(2)

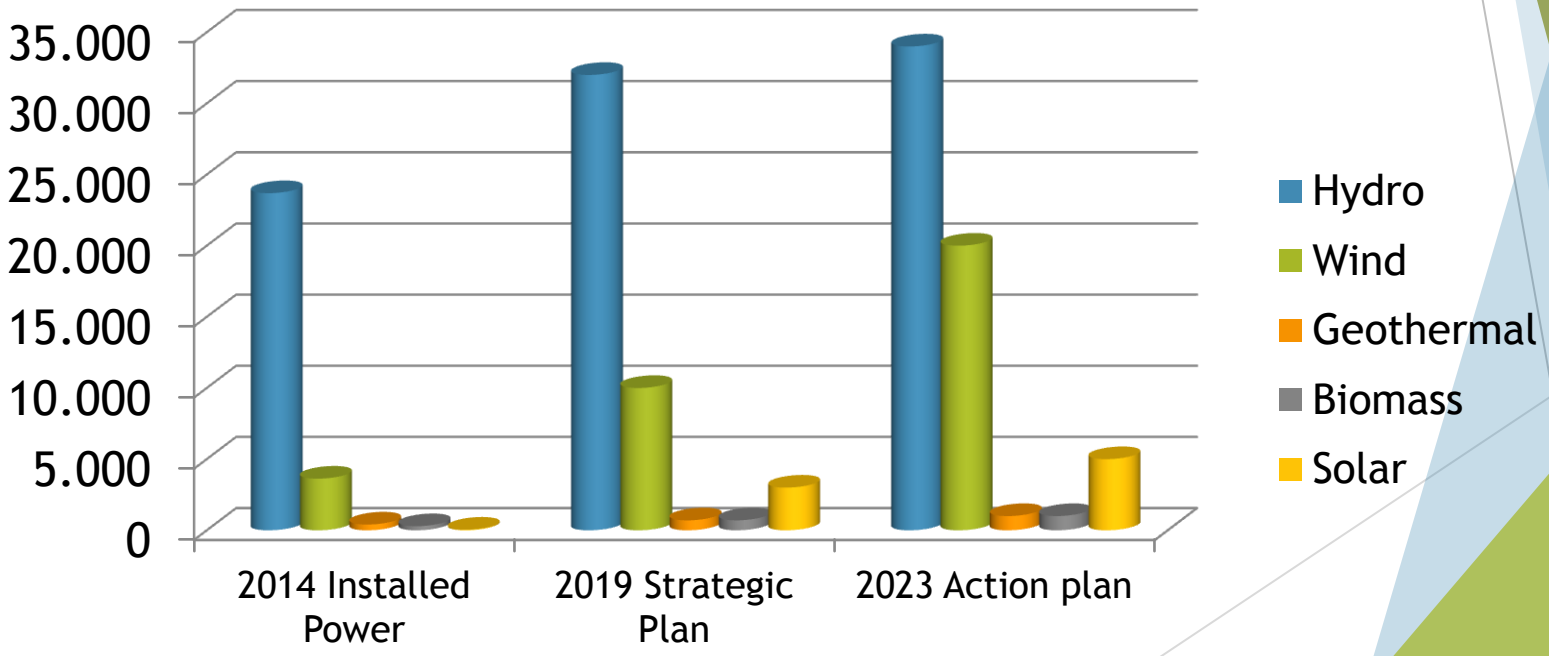
Strategic Plan targets below capacities for domestic and renewable energy sources for 2019 :

- *"Increasing power generation based on domestic coal to 60 billion kWh"*
- *" Increasing installed capacity of hydro power plants to 32.000 MW"*
- *"Increasing installed capacity of wind power plants to 10.000 MW"*
- *"Increasing installed capacity of geothermal power plants to 700 MW "*
- *"Increasing installed capacity of solar power plants to 3.000 MW"*
- *"Increasing installed capacity of biomass power plants to 700 MW"*

- *Also starting test power generation in Akkuyu NPP,to start construction of Sinop NPP,to finalize the preparatory works for third NPP*

TARGET CAPACITIES IN MENR 2019 STRATEGIC DOCUMENT AND NATIONAL RENEWABLE ACTION PLAN FOR 2023

	HYDRO	WIND	GEOTHERMAL	BİOMASS	SOLAR	TOTAL
2014	23.691	3.630	405	288	45	28.059
2019	32.000	10.000	700	700	3.000	46.400
2023	34.000	20.000	1.000	1.000	5.000	61.000



Prepared By: Şayende Yılmaz,Member Of Energy Commission of Chamber of Mechanical Engineers

- In order to reach above targets of MENR Strategy Document and National Renewable Energy Action Plan (NREAP),compared to 2014 figures, 65,4% increase is required for reaching 2019, 117,4% increase is required for reaching 2023 targets.According to (NREAP),in 2023 49% of installed power will be based on renewable energy sources.
- However,review of status of investment projects licensed by EMRA and energy sources of projects at licensing stage implies that above targets are not realistic.
-

NEED FOR PARADIGM CHANGE AND QUESTIONS AWAITING REPLIES (1)

- Government forecasts 5-6% increase per annum in electricity demand.The demand increase was estimated to increase 5.4% for 2013.However,consumption only increased by 2.43% and generation decreased by 0.1%.For 2014,although 5.5% increase was expected,consumption increased by 3.71% which was one third behind forecast.
- It should be noted that Turkey is facing an economic crisis evey seven-eight years.In connection with developments in Turkish economy,increase in electrical demand is slowing down.Previously,the rate of increase in electricity demand was more than the rate of increase in national income.In connection with the change in electricity consumption patterns,this correlation is also changing and electricity demand increase is shrinking to national income increase rate.
- .

NEED FOR PARADIGM CHANGE AND QUESTIONS AWAITING REPLIES(2)

- Noting the economic slow down which has world wide effects and severe economic crisis in neighbor countries starting with RF,Iraq,Syria,Greece which will adversely effect Turkey and 2-3% increase forecasts in national income,it is possible to arrive the conclusion that electricity demand will only increase with small percentages.
- If this is the case,how reliable are the assumptions which forecast 6% linear increase as stated in 10'th Development Plan and TEIAS studies which forecast 5% increase per annum.

NEED FOR PARADIGM CHANGE AND QUESTIONS AWAITING REPLIES(3)

- Would it not be more meaningful to use energy more efficiently,to manage demand and utilize the savings that will accrue for covering the increase in demand rather than building new energy facilities for the same purpose?
- In the industrialization policies,would it not be a more clever policy to concentrate on new advanced technology industries such as electronic,computer hardware and soft ware, robotics, avionics, laser, telecommunication, genetics,nano technologies whose added value are high and energy consumption are low rather than old traditional industries with low added value and high energy consumption such as cement,ceramic, iron and steel arc furnaces,textiles ?

NEED FOR PARADIGM CHANGE AND QUESTIONS AWAITING REPLIES(4)

- Why not to rethink and apply planning ,to locate and list energy sources reliably in country,region and province level,to provide strategic and institutional priorities to renewable energy sources rather than natural gas and imported coal which increase import bills and dependency on imported sources and to evaluate local and renewable energy sources at maximum level.
- When public authorities are granting license to power plants or permissions for survey and operation of natural resources,should not they take into account society's benefits and analysis and ensure that the benefits of the subject facilities to the society are more than their costs and give priority to projects whose benefits and gains to society are more than their costs.

- 4.CURRENT STATUS OF POWER GENERATION INVESTMENT PROJECTS
- QUESTIONS AND COMMENTS ABOUT PROJECT PIPELINE

Projects That Obtained License from EMRA as of January 2015

Source	Total Licensed Installed Power (MWe)	Total Capacity Under Construction (MWe)
Biomass	62,18	31,41
Others	39,64	32,60
Natural Gas	17188,73	15411,56
Fuel-oil	297,67	188,00
Hydro	10281,33	10019,42
Imported Hard Coal	6176,20	4786,20
Geothermal	395,44	327,92
Lignite(Brown coal)	1673,00	1651,00
Wind	7459,10	6013,76
Local Asphaltite	540,00	405,00
Local Hard Coal	1187,50	1165,00
General Total	45300,79	40031,87
Licensed Projects Which Did Not Start Investment		5268,92

Source: EMRA

Realization Ratio-RR (%) of Licensed Power Plant Projects as of January 2015

Source	INFO N/A	0>RR<10	10<RR<35	35<RR<70	RR>70	General Total	Share In Total %
Asphaltite		135			270	405	1,01
Biomass	4,54	9,30	8,41	2,59	6,57	31,41	0,08
Natural Gas	547,27	9.326,74	2.970,40	1.117,24	1.539,91	15.411,56	38,50
Fuel Oil	67,64				120,36	188,00	0,47
Hydro	614,62	3.415,66	1.854,66	1.631,85	2.502,63	10.019,42	25,03
Geothermal	3,00	20,00	62,00	41,42	201,50	327,92	0,82
Lignite (Local)	3,34	500,00	135,00		1.012,66	1.651,00	4,12
H.Coal (Import)	140,70	3.445,00		1.200,00		4.786,20	11,96
H.Coal(Local)		1.100,00			65,00	1.165,00	2,91
Wind	97,20	3.611,75	1.562,70	405,00	337,11	6.013,76	15,02
Others	22,50				10,10	32,60	0,08
General Total	1.500,81	21.473,95	6.593,18	4.398,09	6.065,84	40.031,87	100,00
Share In Total %	3,75	53,64	16,47	10,99	15,15	100,00	100,00

Source :EMRA

Prepared By:Barış Levent,CME

Realization Ratio (%) of Licensed Power Plant Projects as of January 2015(2)

- Above table shows that 11,6% of all licensed projects which equal to 7.5% of total installed power of Turkey, have not even started investment although they have obtained license from EMRA.
- Within all licensed projects which have started investment,those which have a realization ratio over 35%, total up to a capacity of 10.463,93 MW and have a share of about one quarter,(26,14%) of all licensed projects at investment stage.

- On the other hand,projects whose realization ratio is less than 10% are more than all projects with a 53,64% share.3,75% of projects don't provide information to EMRA abour their realization rates.It is possible to say that 57,39% of all licensed power generation projects have not started investment.This figure will be 75,14% for imported coal,64,7% for natural gas,61,17% for wind ,40,22% for hydro power projects.

Number And Capacity Information Of Power Generation Projects At License Application Procedures As Of 4.11.2014

Fuel Type	At Application Stage		At Inspection and Review Stage		Approved		Total	
	Item	Installed Power (MWe)	Item	Installed Power (MWe)	Item	Installed Power (MWe)	Item	Installed Power (MWe)
Hydro	126	10.815,63	87	2.517,52	220	13.699,31	433	27.032,46
Wind	7	167,10	8	399,50	17	1.098,05	32	1.664,65
Geothermal	8	189,20	10	103,67	4	110,00	22	402,87
Biomass	7	71,66	14	46,44	3	13,01	24	131,11
Solar	495	7.860,38	0	0,00	0	0,00	495	7.860,38
Import Coal	13	14.332,00	13	9.390,00	0	0,00	26	23.722,00
Local Coal	2	770,00	2	600,00	0	0,00	4	1.370,00
Pyrolitic Oil & Pyrolitic Gas	1	5,00	0	0,00	0	0,00	1	5,00
Natural Gas	26	10.470,87	28	9.999,06	0	0,00	54	20.469,93
Others	6	4.774,00	4	3.001,40	0	0,00	10	7.775,40
Uranium	0	0,00	1	4.800,00	0	0,00	1	4.800,00
Coal	0	0,00	1	825,00	0	0,00	1	825,00
Process Waste Heat	0	0,00	1	3,00	0	0,00	1	3,00
Total	691	49.455,84	169	31.685,59	244	14.920,37	1.104	96.061,79

Source : EMRA

Installed Capacity Of Projects In Operation, Investment and License Application Stages 1

DESCRIPTION	INSTALLED POWER (MW)
INSTALLED CAPACITY AS OF END OF DECEMBER 2014	69.516,40
LICENSED PROJECTS AT INVESTMENT STAGE AS OF JANUARY 2015	45.300,79
EXISTING PLANTS AND PROJECTS AT INVESTMENTS STAGE	114.817,19
PROJECTS WHOSE LICENSE APPLICATIONS ARE APPROVED AS OF 4.11.2014	14.920,37
PROJECTS AT LICENSE APPLICATION STAGE AS OF 4.11.2014	(49.455,84)
PROJECTS AT REVIEW AND EVALUATION STAGE AS OF 4.11.2014	31.685,59
EXISTING PLANTS + PROJECTS AT INVESTMENT AND CONSTRUCTION PHASE +PROJECTS AIMING TO OBTAIN LICENSE AND START INVESTMENT	161.423,15

Installed Capacity Of Projects In Operation, Investment and License Application Stages 2

TANIM	KURULU GÜÇ (MW)
PROJECTS WHICH APPLIED FOR TERMINATING LICENSES	14.359,68 MW
PREVIOUSLY TERMINATED LICENSES	800,72 MW
TOTAL OF TERMINATED LICENSES	15.160,40 MW
TOTAL PROJECT PIPELINE AS OF JANUARY 2015	146.262,75 MW
2023 TARGET OF GOVERNMENT AS OF 2015	125.000 MW

Questions and Comments About Project Stock

- In this analysis,projects in application stage and totalling up to 49.455,84 MW as of 4.11.2014 has not been taken into account.The reasons are as follows:
- Noting that there are not any subsidies for natural gas based power plants and no new natural gas purchase contracts are signed,it is not realistic to assume that these new natural gas power plant investments would be made.
- Noting installed capacity of currently operating hydro power plants is 23.640,90 MW, projects in investment phase total to 10.281,33 MW, projects whose license applications are approved total to 13.699,31 MW and installed capacity of these groups total up to 47.621,54 MW and since this capacity already exceeds Turkey's hydro power capacity,feasibility and possibility of realization of 126 additional hydropower projects with 10.815,63 MW capacity is quite arguable.

Questions and Comments About Project Stock 2

- Although 495 solar power projects at application stage total up to 7.860,38 MW ,it must be taken into account that EMRA will only license a capacity of 600 MW through tenders where firms compete by offering highest figures for each MW to be installed and only winners will be connected to the national grid.
- EXCESS CAPACITY IN GAS AND IMPORTED COAL PROJECTS
- IMPORTED COAL PROJECTS
- Similar questioning can be made for imported hard coal based power plants.
- Installed capacity for end of 2014 is 6.026,60 MW,projects at investment phase total up to 6.176,20 MW. 13 projects at review and evaluation total up to 9.390 MW and another 13 projects at application stage total up to 14.332 MW.

Questions and Comments About Project Stock 3

- Noting the question whether Turkey needs so many imported coal power plants
- The problems that could occur when many plants are built in same narrow coast lines
- In some trials against environmental impact assessment studies(EIA), the Supreme Court have started to ask for Cumulative EIA covering all imported coal power plants that will be built in same coast lines
- The social reactions and protests of people living in the region
- Feasibility of subject imported coal projects is quite arguable.

GAS PROJECTS

- Installed capacity of natural gas power plants as end of 2014 is 21 476,1MW.Licensed projects at investment stage total up to 17.188,73 MW ,projects at the license application stage total up to 9.999,06 MW.

Questions and Comments About Project Stock 4

- These figures refer to an excess capacity and specialists and TEIAS estimate only 3.800 MW of this project stock can be realized in the next couple of years.
- If only 22.1% of licensed projects can be realized,this will imply that there is a serious planning problem.Even if no new project is not granted license,in case those projects whose realization ratio is over 10% are finished,then installed capacity will reach 27.114 MW.This scenario will require additional 7-8 billion cubic meters gas but currently there is no specific supply deal to meet this extra requirement.

5. PRIVATIZATION

New Owners Of Privatized Electricity Distribution Companies

Public Power Plants Are Being Privatized

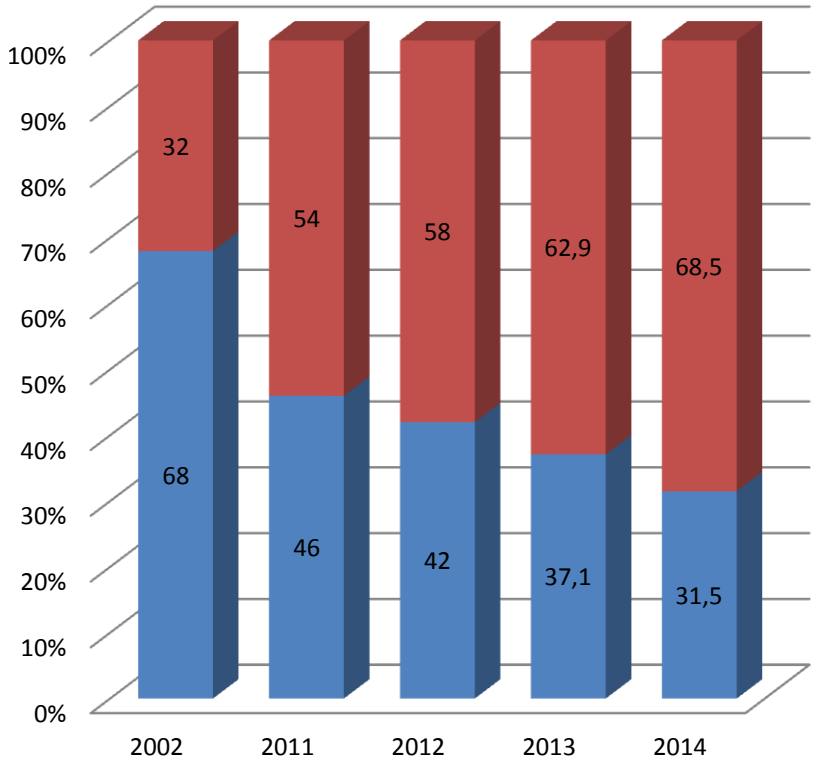
Government aims to privatize 14.147 MW portion of public power plants including all thermal power plants and some of hydropower plants which will result a capacity of 9.574 MW composed of hydro power plants builts on rivers crossing boundaries to be left for public power generation company EUAS.

Seyitömer, Kangal, Hamitabat, Yatağan, Çatalağzı, Kemerköy, Yeniköy,Soma,Orhaneli,Tuncbilek thermal power plants have been transferred to private companies.Government stated the target to conclude privatization of all thermal power plants by the end of 2016.

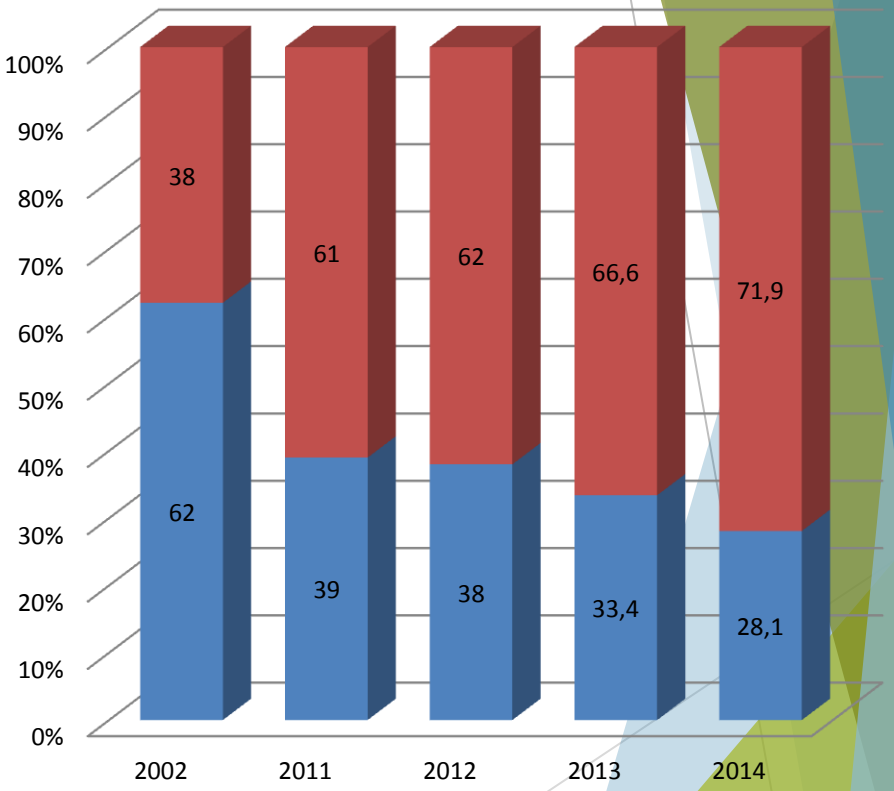
Private Monopolies Are On The Stage

- While public monopoly is demolished with privatization,claiming that there will be competition,some private groups now proudly state that they control 30% of distribution and their share in power generation is rapidly increasing.Some private groups want to control distribution,wholesale,retail sale and generation at the same time.Public monopoly is being replaced by a few private groups.Currently,two private group controls more than 50% of electricity distribution market.Multinational companies have entered the power market and buy outs are in their agenda.This expectation is also shared by EMRA directors who claim that there will be consolidation in the market.New owners of distribution companies have influenced EMRA to change price tariffs in their favor and plan to ask for more.

Share of Public And Private Sectors



INSTALLED CAPACITY



POWER GENERATION

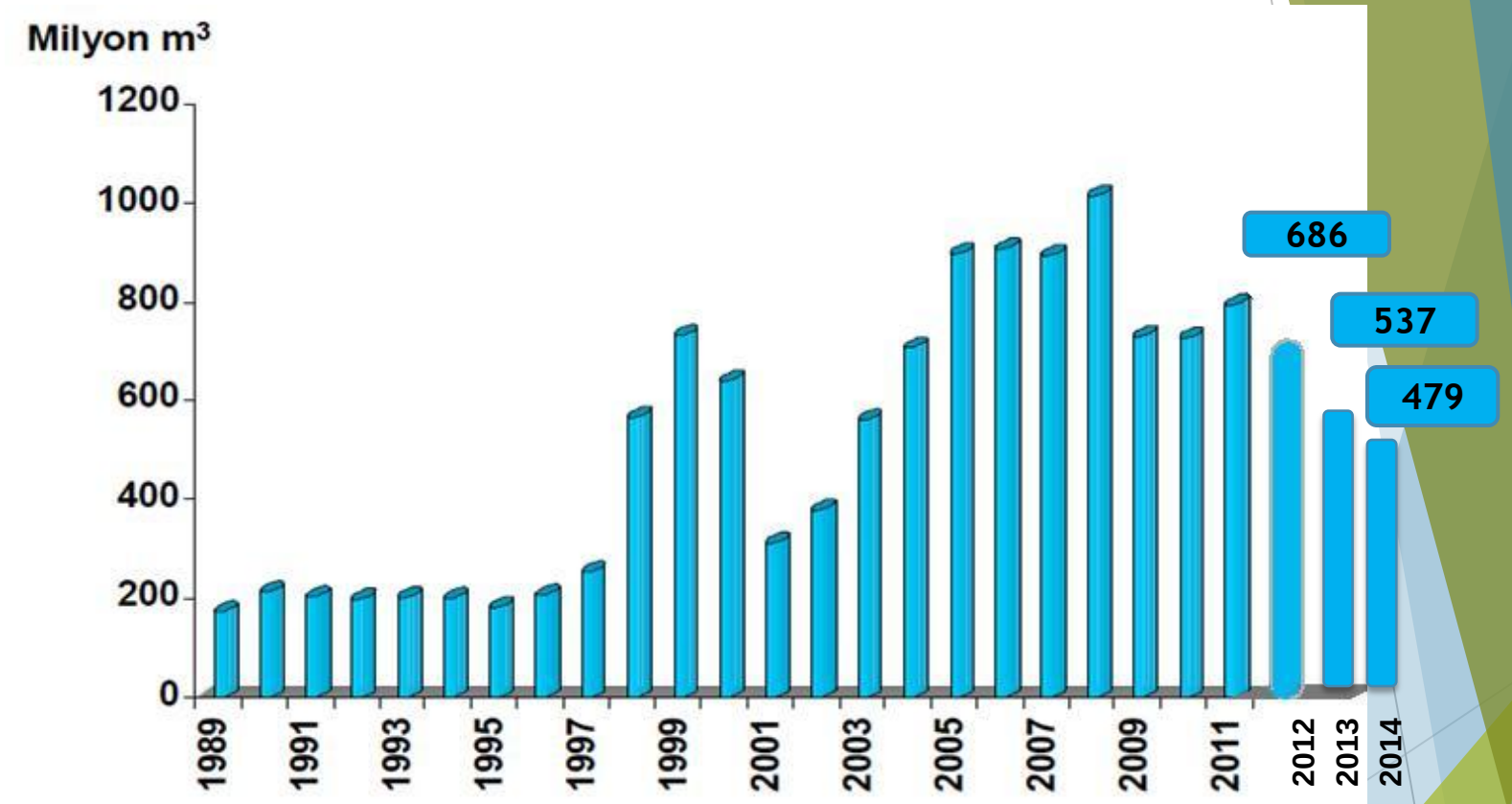
PUBLIC

PRIVATE

SOURCE: MENR

6.STATUS OF IMPORTED, DOMESTIC AND RENEWABLE ENERGY SOURCES

Domestic Natural Gas Production 1998-2014



According to 2014 data,domestic natural gas production is 479 million m^3. Share of domestic production in consumption is 1%.

Source: PAGD-EMRA

Natural Gas Imports(1987–2014)

(million m^3)

Year	Volume	
	BOTAŞ' IMPORTS	TOTAL IMPORTS
1987	433	433
1988	1.136	1.136
1989	2.986	2.986
1990	3.246	3.246
1991	4.031	4.031
1992	4.430	4.430
1993	4.952	4.952
1994	5.375	5.375
1995	6.858	6.858
1996	8.040	8.040
1997	9.874	9.874
1998	10.233	10.233
1999	12.358	12.358

Yıl	Volume	
	BOTAŞ' IMPORTS	TOTAL IMPORTS
2000	14.822	14.822
2001	16.368	16.368
2002	17.624	17.624
2003	21.188	21.188
2004	22.174	22.174
2005	27.028	27.028
2006	30.741	30.741
2007	36.450	36.450
2008	37.793	37.793
2009	33.619	35.856
2010	32.466	38.037
2011	39.723	43.874
2012	43.092	45.200
2013	38.424	45.100
2014	39.298	49.262

* EMRA 2015 FORECAST 50.900

*

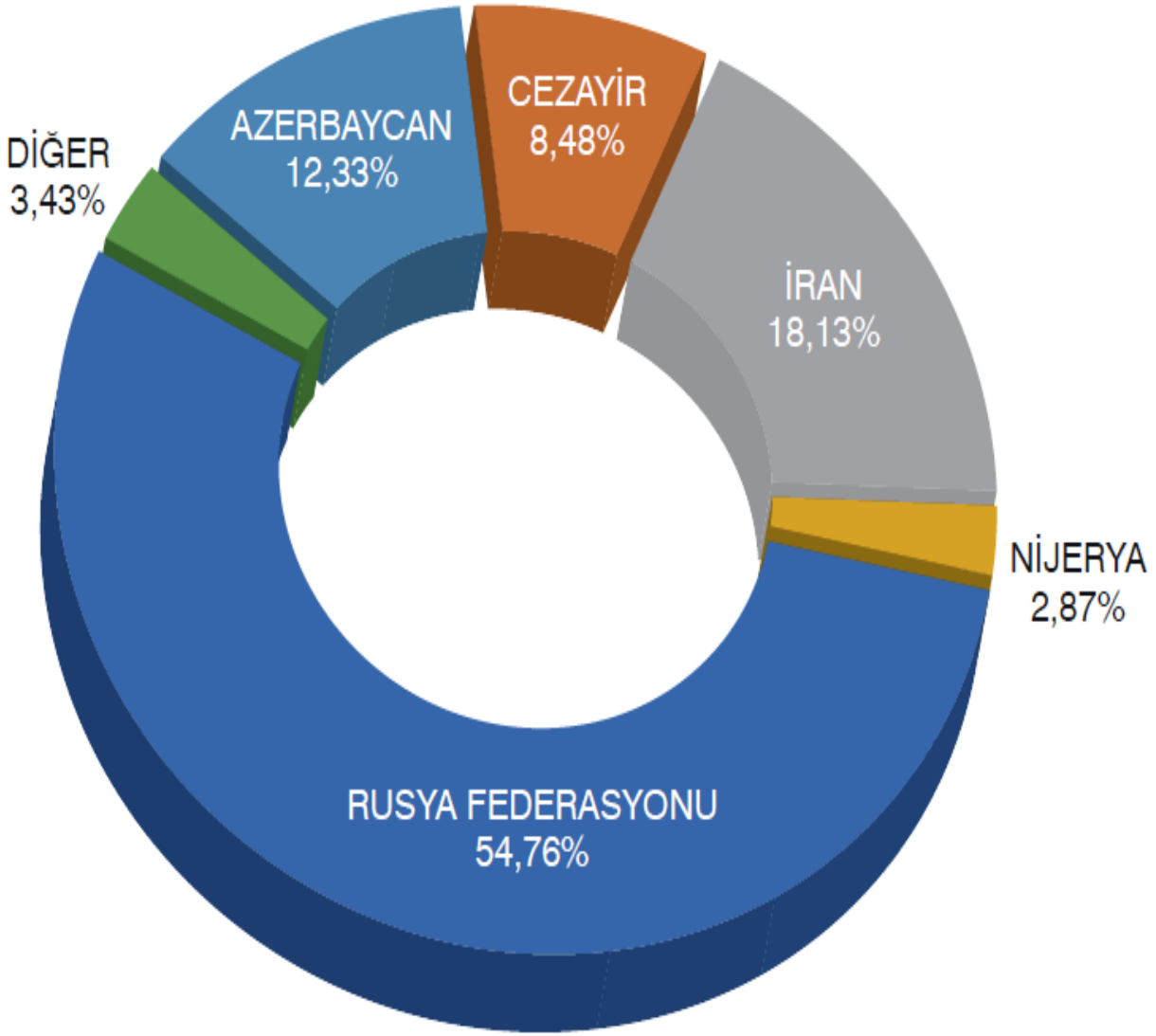
Kaynak: ETKB, BOTAŞ

Natural Gas Consumption Per Sectors(2014)

SECTOR	VOLUME	SHARE (%)
Power Generation	23.441,97	% 48,12
Industry	12.375,53	% 25,40
Housing	9.304,42	% 19,10
Services(Trade,Publc Buildings,Others)	3.018,49	% 6,20
Energy	367,41	% 0,75
Agriculture,ForestryOthers	121,67	% 0,25
Transportation	86,56	% 0,18
Losses	1,13	% 0,00
TOTAL	**48.717,18**	100

Source:EMRA

Sources Of Natural Gas Imports (2014)



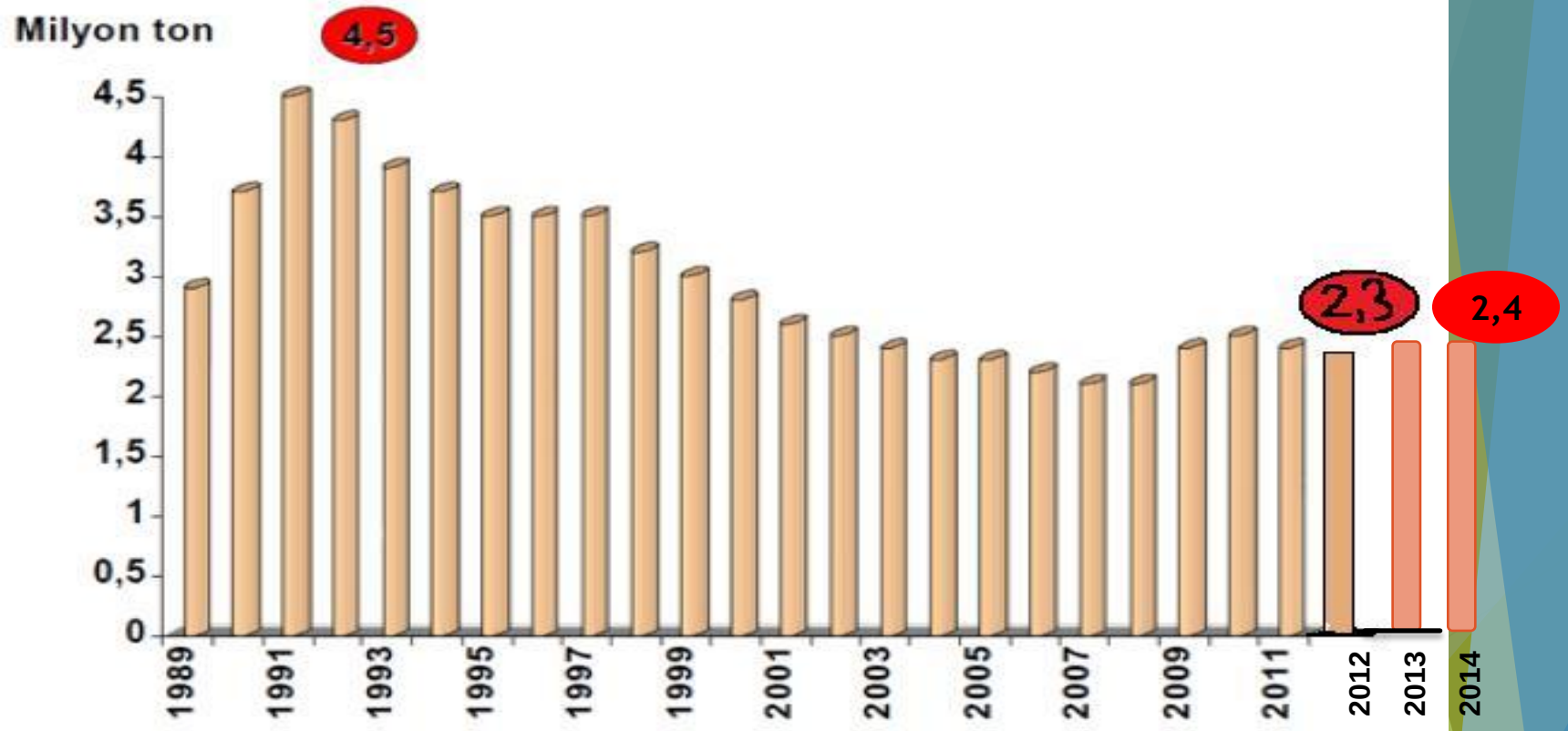
TRANSIT PIPELINES DILEMMA 1

- Concessions and rights granted to transnational companies for installing and operating crude oil and natural gas pipelines may be the reason to intervene to sovereignty of country in future.Noting this,no international pipeline project that would harm BOTAŞ monopoly and Turkey's sovereignty permitted and projects such as TANAP,TURANG must be reviewed and reevaluated.
- Whilst BOTAS charges 11 USD/1000 m/3 for transporting gas of customers via its transmission grid,is there an explanation for BOTAŞ to pay 79 USD + fuel gas for deliveries in Eskişehir and 103 USD +fuel gas for deliveries in Thrace and to pay minimum 500 million USD extra ?
- Why not consider the option of expanding,renewing and rehabilitating existing national gas transmission grid with an investment of about 3 billion USD and then carry 16 bcm gas of a partnership where BOTAŞ has 30% share with a fee? Of course, BOTAŞ would then reflect the costs of this investment to its operational costs but it would not be an astronomic price such as 79/103 USD.

TRANSIT PIPELINES DILEMMA 2

- No concession or right should be granted to another state, a company belonging to another state,or its national and/or multinational companies or transnational companies even if BOTAŞ will be a partner to these corporations.Gas and oil belonging to producers in other countries can be transported via national grid with a transport fee as long as there is no conflict with Turkey's interests and approved by BOTAŞ and MENR.However,in these contracts,Turkey should have the opportunity to purchase a significant portion of transported oil or gas with preferential rates and with the right to re-export. Such an approach will direct the question why Turkey does not propose RF to build a new offshore pipeline parallel to existing Blue Stream and expand BOTAS transmission grid and to transport to Greece through BOTAS pipelines whose capacity will be increased with new investments?It must be noted that this alternative would be significantly cheaper with shorter offshore section and mostly onshore pipelines which will be for sure far more cheaper versus proposed so called Turkish Stream.By the way,proposed context and routine by RF for Turkish Stream has no relation and advantage to Turkey other than its name.

Domestic Oil Production 1998 – 2014 (Million ton)

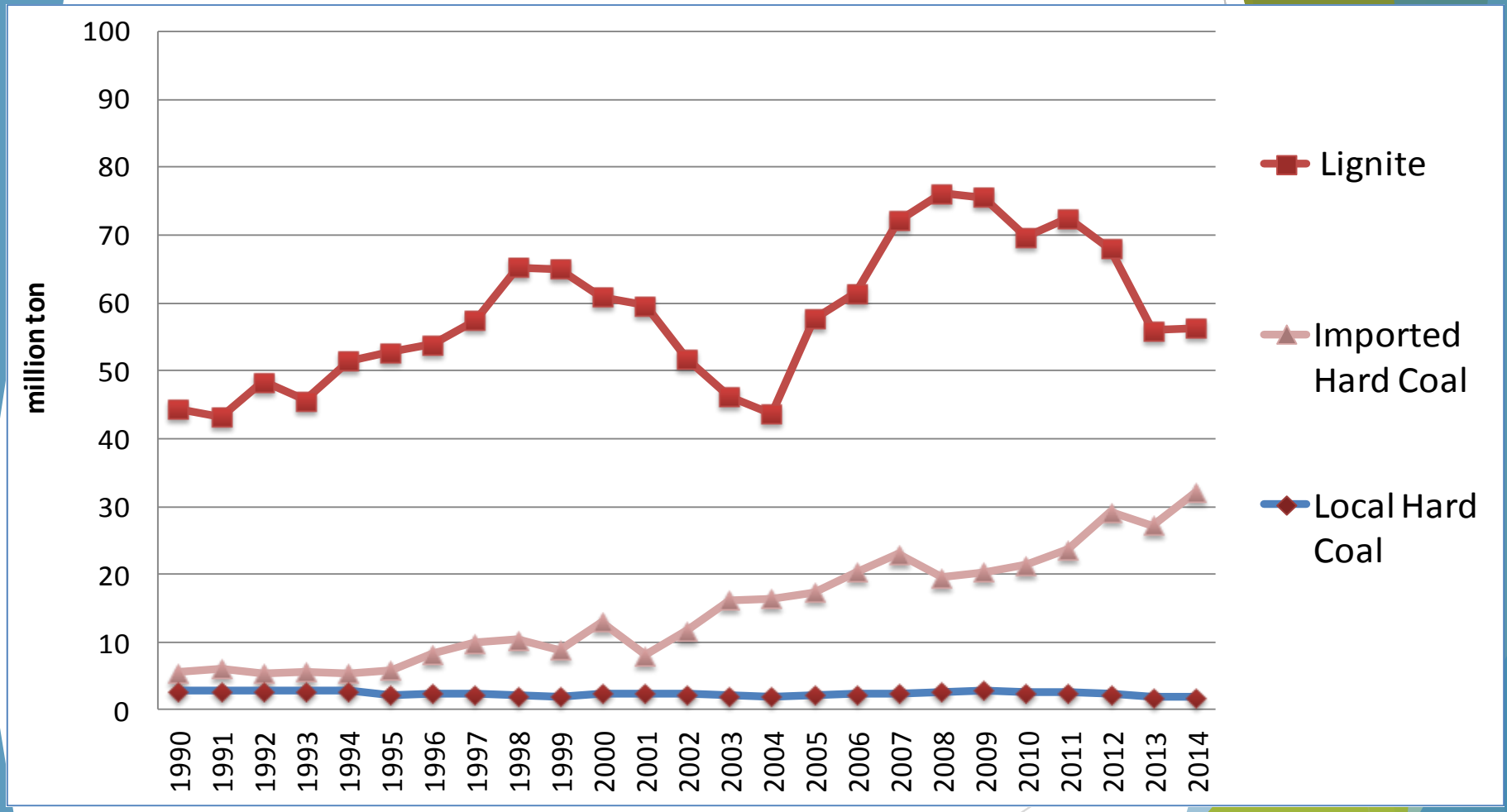


Domestic oil production in 2014 is 2.4 million ton, share in consumption is 7 %.

Source : PAGD

Turkey Coal Supply:Domestic Production And Imports

MILLION TON



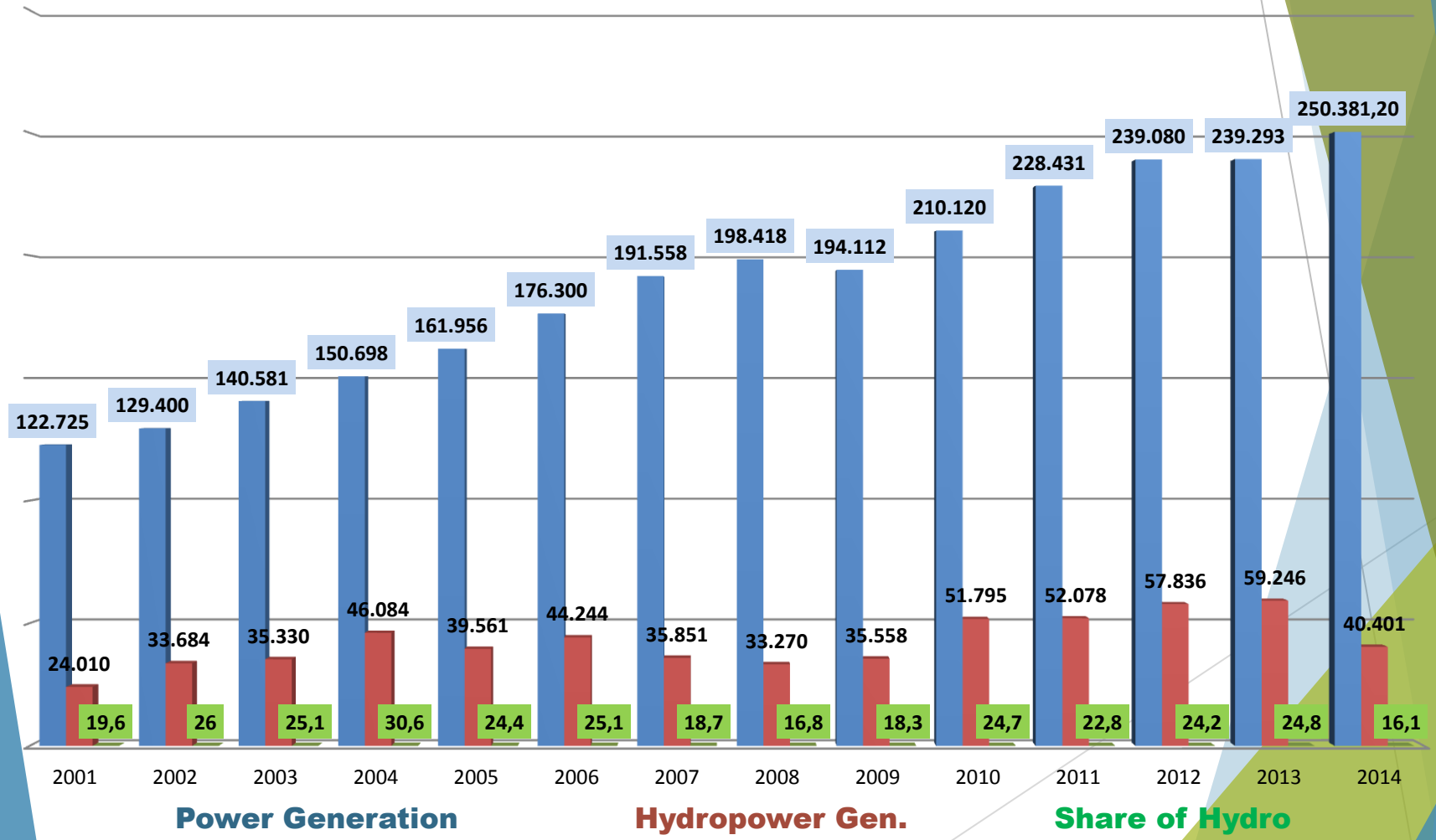
Source: Dr. Nejat TAMZOK

Power Plant Potential Capacity based On Domestic Coal Sources

Coal Mine Site	Total Reserve (MillionTon)	Reserves That Can Be Produced (Million Ton)	Power Plant Capacity (MW)
Afşin-Elbistan	**4.360**	**4.350**	**7.205**
Afşin-Elbistan	515	490	1.250
Adana-Tufanbeyli	423	350	1.050
Adıyaman-Gölbaşı	51	46	150
Ankara-Çayırhan	308	190	500
Bingöl- Karlıova	89	28	100
Bolu-Göynük	38	36	65
Bursa- Orhaneli,Keles, Dav	116	70	270
Çankırı-Orta	70	65	135
Konya-Ilgın	143	125	500
Konya-Karapınar*	**1.883**	**1.275**	**3.500**
Kütahya-Tunçbilek**	269	170	450
Kütahya-Seyitömer	176	172	150
Manisa-Soma**	752	575	1050
Tekirdağ-Saray	129	40	175
Şırnak-Asfaltit	72	65	540
TOTAL LIGNITE	9.982	8.498	17.090
Bartın-Amasra**	**407**	125	1.100
Zonguldak**	909	197	-
HARD COAL TOTAL	1.316	322	1.100
GENERAL TOTAL	**11.298**	**8.820**	**18.190**

Prepared by: Çetin KOÇAK

Hydropower ,Total Power Generation And Share Of Hydropower In Total Power Generation (GWh)(2001-2014)



Installed Capacity Of Hydropower Investments

- If it is assumed that hydropower generation would be 140 billion kWh/year and with 3 300 hours of annual operation time,capacity can be computed as 42.424 MW.Some studies refer to a generation potential of 170 billion kWh/year and installed capacity of 52000 MW.Some other analyses underline due to adverse effects of rapid urbanization,utilization of dams for water supply and irrigation, negative impacts of climate changes on water regime,actual hydropower potential will be less than assumed.Noting these,actual hydropower potential must ne recomputed with a realistic approach and low efficient projects,projects whose social costs are more than their benefits and not wanted by the people living in the region must be cancelled.

Hydropower Projects And MENR Strategy Document

- **MENR Strategy Document foresees 36% increase which means 8.514 MW capacity increase for hydropower.In order to reach this target,82.81% of all licensed hydropower projects as of January 2015 (10.281,33 MW) has to be erected,commissioned and start operation in next five years.However EMRA records regarding realization ratio of hydropower projects shows that installed capacity of hydropower projects with a realization ratio of 35% or more is 4.134,52 MW. These figures imply that it would be quite difficult to reach MENR targets.**

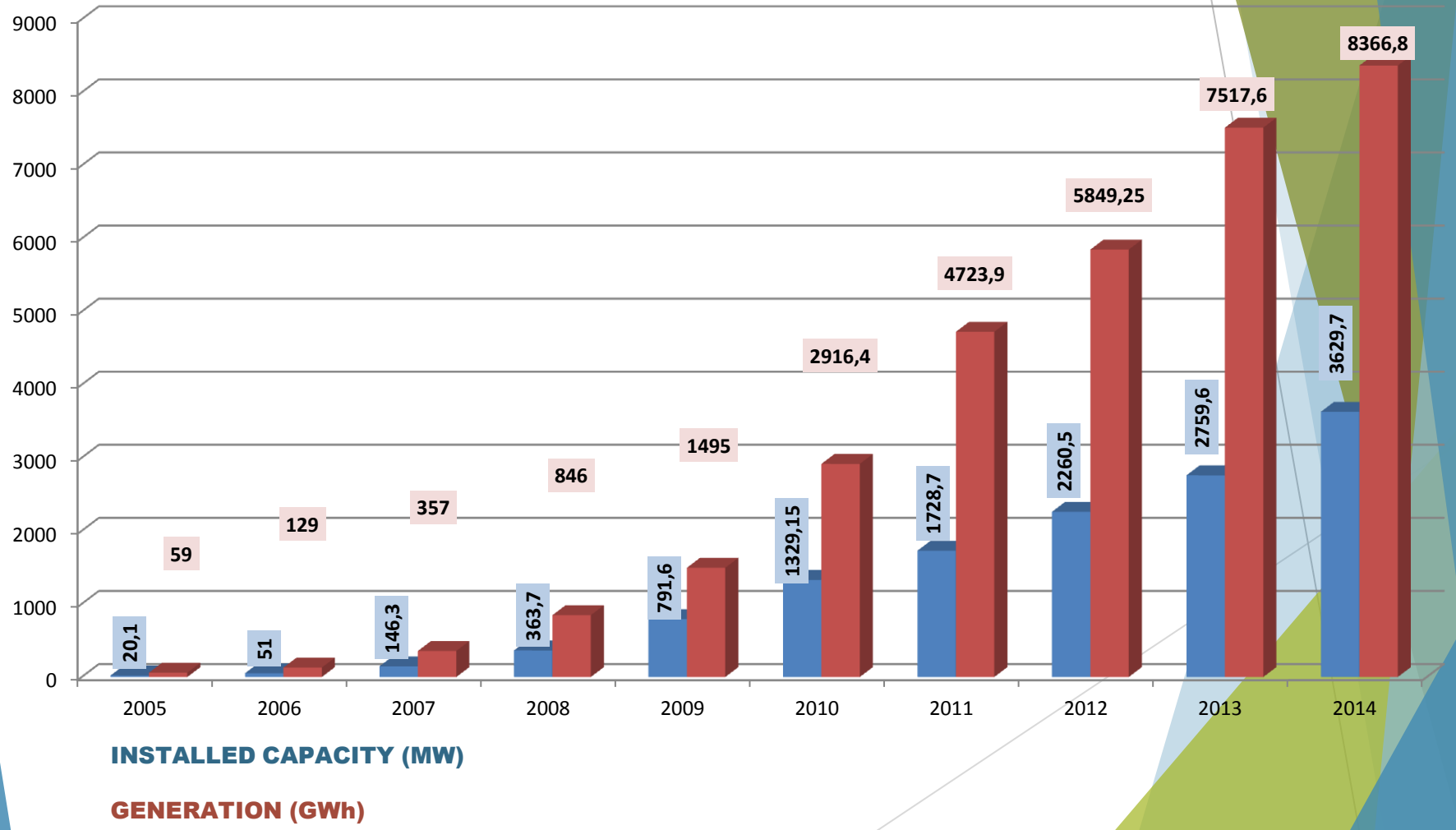
Proposals For Hydropower Projects (1)

- Some projects are based on incorrect water flow and cascade values and refer unrealistic power generation figures.These unfeasible projects should be stopped and cancelled. The facilities in the same river basin are considered and evaluated independently from each other.EIA studies should be made with an integrated approach on river basin scale and cumulative environmental impacts of all hydropower projects in the same basin should be requested,prepared and reviewed as a pre requisite of decision making.
- The information and coordination shortages between different institutions must be eliminated and multi directional information flow must be provided.All projects should be reviewed once more from the stand point of needs of the people living in the region,requirements of natural environment and social benefits and welfare.

Proposals For Hydropower Projects(2)

- Hydropower projects should be under surveillance,monitoring and control; starting from feasibility and basic engineering phases and continuing during construction and operation stages. Surveillance and control activities should take into account scientific,technical and ethical requirements as well as benefits of the society.
- All related public administration units should be sensitive and fully responsible in their surveillance and control activities for hydropower projects and apply necessary sanctions for inappropriate acts.

Development Of Wind Power in Turkey (Installed Capacity And Generation)



Status Of Projects Being Evaluated By EMRA And Future Of Wind Power

- MENR's Strategy Document targets an installed capacity of 10.000 MW for 2019.
- As of December 2014, installed capacity is 3.629,70 MW.Capacity of licensed projects at investments stage as of January 2015 is 7.459,10 MW.As of 4.11.2014,17 projects with a capacity of 1.098,05 MW are approved by EMRA.License applications of 8 projects with an installed capacity of 399,50 MW are at review and evaluation stage.

Status Of Projects Being Evaluated By EMRA And Future Of Wind Power2

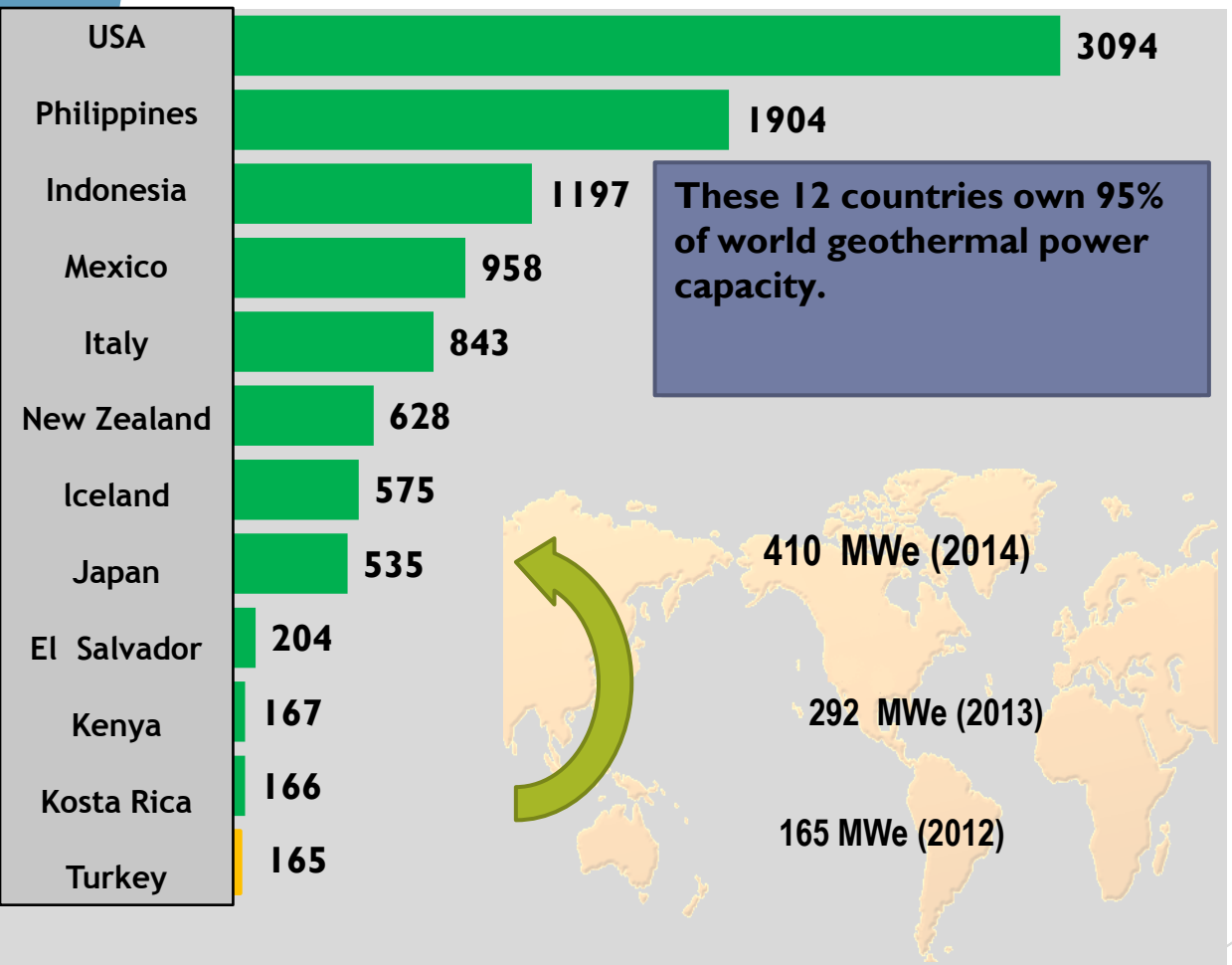
- *According to Wind Power Atlas,wind power capacity classified as "Good " and "Extra-ordinary" is 47.849,44 MW'dır.All projects alreday licensed by EMRA and those at license process total up to 12.586,35 MW only constitute one quarter of Turkey's wind potential.When it is noted that as of June 2015, only 4,024,40 MW is in operation,major portion of wind power potential is waiting to be evaluated*. TEİAŞ,has declared wind power capacity that can be connected to national transmission grid in 2015 in country vise scale based on provinces and this capacity is 3 000 MW.This is the capacity that will be the basis for pre-license applications for 2015.

Site Location Of Wind Power Plants

- There has been many disputes recently about sites of some wind power projects.In touristic towns like Bodrum, Çeşme, Karaburun,inhabitants of sites made protests against wind power plants stating that they don't want the turbines in their back yards.
- Physical and social environment must be taken into account during site location selection,construction of access roads and connections to transmission grid. Negative effects to settlements,productive agricultural lands,forests,protected areas,natural,historical and cultural assets should be at minimum level.The trees should not be cut but removed,new forestation suitable to vegetation of the site and region should be made,investor should be hold responsible for planting,growing and sustaining ten times of the number of the trees they have cut or removed during license period.

Turkey's Rank In Geothermal In World (2014)

Geothermal Production Capacity In Selected 12 Countries
(Gross MWe, 2014)



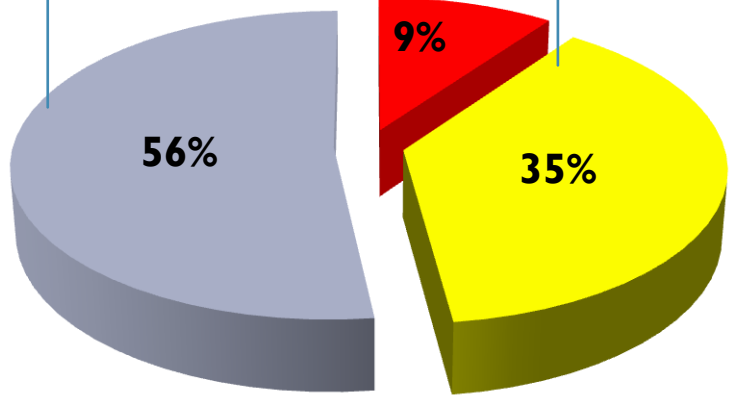
Source: Tevfik KAYA (Schlumberger)

Start Year Of Countries For Geothermal Power Production

Country	Year
Italy	1916
New Zealand	1958
USA	1960
Japan	1966
Russian Federation	1966
Mexico	1973
El Salvador	1975
İceland	1978
Phililippines	1979
China	1981
Kenya	1981
Indonesia	1983
Nicaragua	1983
France	1984
Turkey	1984
Kosta Rica	1994
Portugal	1994
Guatemala	1998
Ethopia	1999
Papua New Guina	2001
Germany	2008

Usage Of Geothermal Sources in Turkey

- Direct Usage(Heating etc)- 35%
- Thermal Usage(spa) - 56%
- Power Generation- 9%



Geothermal Applications In Turkey			
	2002	2013	2014
Power Generation	15 MWe	308 MWe	410 MWe
Heating Of Houses	30000 RE	89000 RE	89,000 RE~
	~ 275 MWt	~ 813 MWt	813 MWt
Greenhouse Heating	500000- 500 acre (100 MWt)	2,985,000 - 3.000 acre(~600MWt)	2,985,000 m2 ~600MWt
Thermal Usage	175 pc	350 pc	350 pc
	(~300 MWt)	(~600 MWt)	(~600 MWt)

Source: Tevfik KAYA (Schlumberger)

Turkey's Geothermal Potential (1)

- Turkey's geothermal energy potential is estimated as 31.500 MW. Proven effective technical capacity is 4.078 MWt and currently 34% (1.306 MWt) is used.Potential for power generation was assumed as 600 MWe.However Energy Institute of Istanbul Technical University forecasts 2.000 MWe capacity with new surveys and explorations.Capacity of geothermal power plants in operation is 431,2 MW as of end of June 2015.Capacity of projects at construction stage is 395,44 MW.As of 4.11.2014,22 projects with a capacity of 402,87 MW are at various stages of license procedures.For 150-200 MW projects site surveys are continuing. If all these projects aiming power generation are realized ,then government's 700 MW target for 2019 will be doubled.Nevertheless,even this figure will be behind 2000 MW forecast of Energy Institute of Istanbul Technical University. MENR has to revise and update its target figures for geothermal power generation.

Turkey's Geothermal Potential(2)

- There is not valid nation wide code of practice and standards for heating and power generation applications based on geothermal energy.
- There is not an independent public organization responsible for planning,realizing,following,surveillance and control of investments in geothermal sector.There is not enough coordination between activities of related public organizations such as MİGEM, MTA, İl Özel İdareleri, YEGM etc. for geothermal sector and projects.There is a need for an independent public organization such as Geothermal General Directorate that will plan,regulate,direct,monitor,control and develop geothermal sector.
- Due to lack of appropriate reservoir computations and engineering,it is very likely that the investors who use the same reserves and reservoirs will face problems with each other and relevant public entities.
- Discharges should be made taking into account both preservation and protection of reserves and also with minimum effects to the environment.Discharges should be monitored and controlled.

10TH DEVELOPMENT PLAN AND BIOFUELS

ACCORDING TO ENERGY PRODUCTION PLAN BASED ON DOMESTIC SOURCES:

Mobilizing existing potential of biomass sources for primary energy production

Following bioethanol and biodiesel blending with gasoline and diesel oil from the stand point of food security,environmental impacts and developing plant capacities are the targets.

MENR STRATEGY DOCUMENT FOR 2015-2019

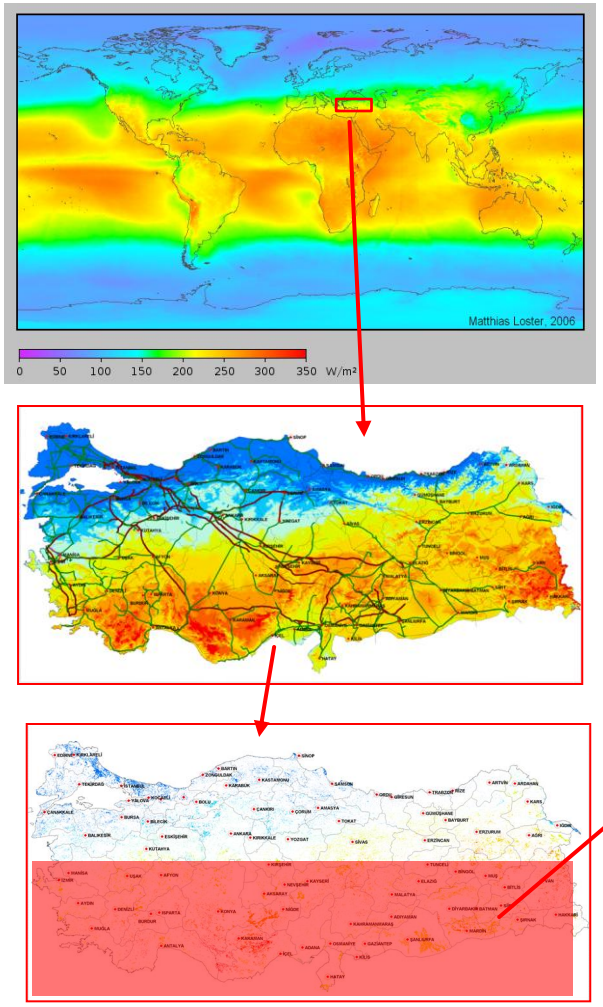
POWER GENERATION FROM BIOMASS :

In accordance with the aims of increasing share of renewable energy sources in power generation,it is also aimed to utilize biomass as a source for heating.It is targeted to increase existing installed capacity which is 239 MW in 2013 to

380 MW in 2015
540 MW in 2017
700 MW in 2019

LIQUID BIOFUELS (BIODIESEL, BIOETHANOL) ARE NOT DEALT AND REFERRED IN STRATEGY DOCUMENT.

Turkey's Solar Energy Potential



Land Required For Utilizing Potential? *

For 1 MW app. 20.000 square meters area Installed Capacity (MW)	Land Requirement (1 dönüm = 1000 m^2)	Number of Sites	Total Area of Sites (Dönüm)
<10	<150	28.467	1.281.128
10-50	150-750	5.077	1.606.095
50-100	750-1500	847	883.769
100-200	1500-3000	445	937.045
>200	>3000	493	6.643.312
TOTAL		35.329	11.351.349

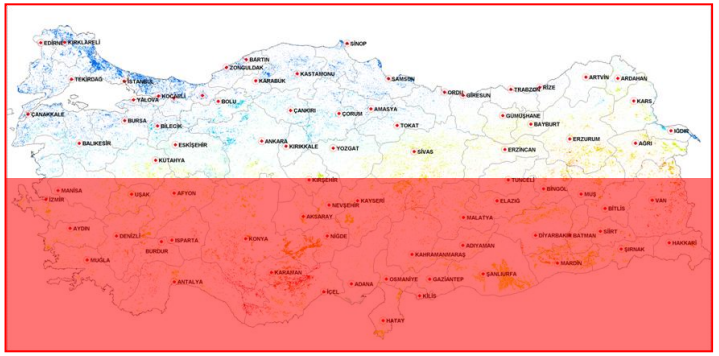
(11.351 km^2)

Prepared by Şenol Tunç of Proje Enerji based on review of more than 2.000'den sites.

Utilizing Solar Energy Potential For Power Generation

Existing Adequate Sites

(All are below TR 38.5 parallel , total approximate 11.000 km^2 area)



In these sites,it is possible to install 287.500 MW capacity and to generate minimum 363 TWH electricity per annum..

With additional 10% generation possibility with un-licensed roof top and garden applications,the generation could increase to 400 TWH

However,installed capacity of all solar power projects that would be given license is only 600 ME,2019 target is 3.000 MW,2023 target is 5.000 MW.Active facilities which don't require license have a capacity of 107.4 MW.These figures point out that government policies are at a very far distance to solar power.

Source: Şenol Tunç,Proje Enerji

Domestic And Renewable Energy Sources Potential Awaiting To Be Evaluated For Power Generation

Hydropower	: 60-80 Billion KWh
Wind Power	: 100-120 Billion KWh
Geothermal Power	: 16 Billion KWh
Solar Power	: 400 Billion KWh
Local Lignite	: 105-120 Billion KWh
Biogas	: 35 Billion KWh
TOTAL	: 716-771 Billion KWh

At least 25% additional capacity that can be supplied by utilization of efficient energy savings must be added to above figure.

7.Incentives To Renewable Energy Sources

Renewables-Incentive Scheme

- Feed-in-Tariffs
- Purchase guarantees
- Connection priorities
- Lower license fees
- License exemptions in exceptional circumstances
- Various practical conveniences in project preparation and land acquisition

Feed-in Tariffs For Electricity Generated By Renewable Energy Sources

RENEWABLE ENERGY SOURCE	FEED IN TARIFF (USD CENT /KWh)
HYDROPOWER	7.3
WIND POWER	7.3
GEOTHERMAL POWER	10.5
BIOMASS POWER (INCL.WASTE GAS)	13.3
SOLAR POWER	13.3

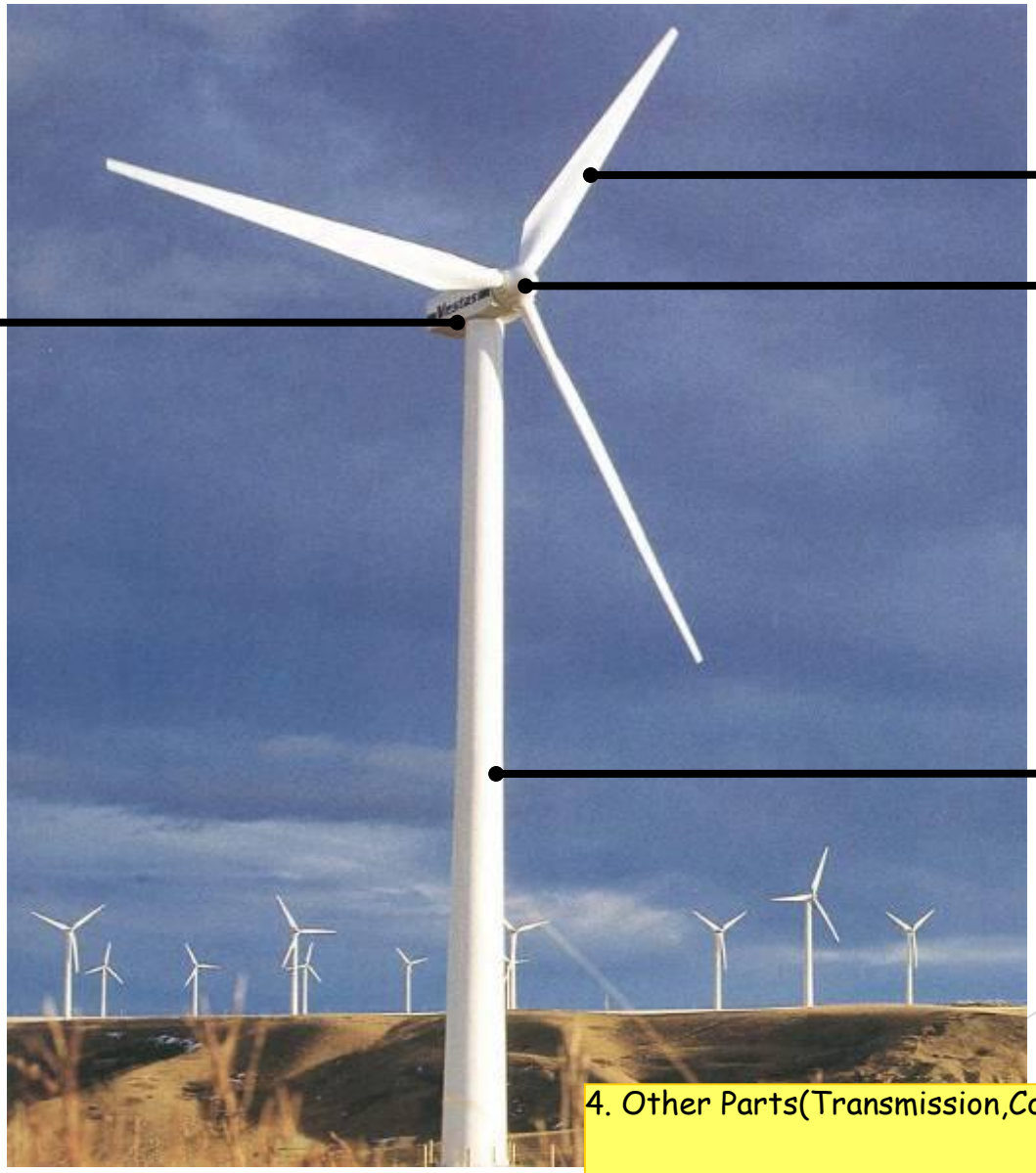
Table 2:Local Manufacture Support

Schedule II (Provision of the law dated 29/12/2010 and numbered 6094)		
Type of Facility	**Domestic Production**	**Domestic Contribution (US Dollar cent/kWh)**
A-Hydroelectric production facility	1- Turbine	1,3
	2- Generator and power electronics	1,0
B- Wind power based production facility	1- Wing	0,8
	2- Generator and power electronics	1,0
	3- Turbine tower	0,6
	4- All of the mechanical equipment in rotor and nacelle groups (excluding payments made for the wing group and the generator and power electronics.)	1,3
C- Photovoltaic solar power based production facility	1- PV panel integration and solar structural mechanics production	0,8
	2- PV modules	1,3
	3- Cells forming the PV module	3,5
	4- Invertor	0,6
	5- Material focusing the solar rays onto the PV module	0,5
D- Intensified solar power based production facility	1- Radiation collection tube	2,4
	2- Reflective surface plate	0,6
	3- Sun chasing system	0,6
	4- Mechanical accessories of the heat energy storage system	1,3
	5- Mechanical accessories of steam production system that collects the sun rays on the tower	2,4
	6- Stirling engine	1,3
	7- Panel integration and solar panel structural mechanics	0,6
E- Biomass power based production facility	1- Fluid bed steam tank	0,8
	2- Liquid or gas fuel steam tank	0,4
	3- Gasification and gas cleaning group	0,6
	4- Steam or gas turbine	2,0
	5- Internal combustion engine or Stirling engine	0,9
	6- Generator and power electronics	0,5
	7- Cogeneration system	0,4
F- Geothermal power based production facility	1- Steam or gas turbine	1,3
	2- Generator and power electronics	0,7
	3- Steam injector or vacuum compressor	0,7

7.LOCAL MANUFACTURE OF ENERGY GENERATION EQUIPMENT

- In addition to high import bills of energy goods ,Turkey also pays 7-9 billion USD annually for import of energy generation equipment.
- HYDROPOWER PLANT EQUIPMENT
- In the costs of a hydropower plant,construction costs of hydrostructures correspond approximately 70% of investment costs.A decree which was put in force in the sixties, ,made it compulsory to supply of all shutters,penstock,valves ,command mechanisms,cranes and other lifting equipment locally and by such a mechanism,local content share for these lines reached 100%.
- Although TEMSAN was formed in 1977,due to lack of R and D,qualified staff,long term perspective;generators and turbines have not been manufactured in Turkey after past 38 years.
- WIND TURBINE EQUIPMENT
- Major parts such as towers,blades,blade materials,gear boxes, couplings, reducers,electrical motors,bolts,nuts,studs are locally manufactured.However costly items such as turbines,generators are imported.

Wind Turbine Parts



1. Rotor
(3 Blades + Hub)

Blade

Hub

3. Nasel

(Part which includes main parts of turbine power units)

2. Tower

4. Other Parts(Transmission,Communication etc)

- **SOLARPOWER GENERATION EQUIPMENT**
- **For solar power generation,main items are silicone,ingot,cell,glass,eva,backsheet,inverter,ribbon,connection box.**
- **Supplementary products are installation kits,cables,regulator,batteries.**
- **There are domestic manufacturers of solar glass,inverter and modules.There is raw material and technology for domestic manufacture of eva,backsheet,ribbon and junction box.However,local industry needs to be supported.**
- **Important electronic items such as semi conductors,condensators,integrated circuits which constitute 50% of cost are not manufactured locally currently and imported.**
- **POLICY PROPOSALS**
- **In order to build power plants with local goods and technology ,a long term road map must be prepared with participation of government,related public and private corporations and companies,professional associations and universities.**

- Clustering of plants and industries manufacturing of equipment for energy sector must be promoted and cooperation networks must be developed.Next step should be supporting organization and realization of "Energy Equipment Manufacturers Special Organized Industrial Estates" and public sides should be guiding and directing through a new organization such as Undersecretary Of Energy Equipment"
- Doctoral and postdoctoral programs and joint works with international centers must be supported.
- Research and development studies of public and private sector must be coordinated and supported.
- For strengthening and developing scientific and technogical infrastructure,TUBITAK'S energy institute and connected organizations should be re-structured as Turkey Energy Science and Technology Development Center.

8.NUCLEAR POWER PLANTS

A FEW WORDS ABOUT NUCLEAR POWER PLANT(NPP) PROJECTS IN TURKEY (1)

- Turkey has not prepared National Nuclear Energt Strategy Document and Action Plan.
- There are serious missing issues in the laws and secondary regulation regarding utilizng nuclear energy for peaceful purposes.
- Technical knowledge and experience accumulation of Turkey in general for nuclear technologies,specific for nuclear power plants is not enough.
- There is not a road map regarding how nuclear technology transfer will be made.There are not adequate and suitable arrangements in the contracts signed with Russian company and Japan-French Consortium for Akkuyu and Sinop NPP.
- Regulatory changes aiming to transform "TAEK' (Turkey Atom Energy Corporation) into an entity enabling it to act as fully authorized and efficient status,with a structure and organization that will enable TAEK to make decisions regarding all issues relevant to NPP including licensing is not done.
- The corporations that will follow,monitor and control Akkuyu and Sinop NPP projects have not been formed and activated.Qualified staff in EÜAŞ and TAEK are inactive and their potential is not being utilized.

A FEW WORDS ABOUT NUCLEAR POWER PLANT(NPP) PROJECTS IN TURKEY(2)

- In addition to above pointed problems and limitations,there are other technical issues.In the NPP's operated with existing technologies,risk and waste problems have not been solved till today.
- Akkuyu NPP Project is dependent on Russian companies in all aspects including fuel,technology,construction and operation.In addition to these above referred negative aspects,Akkuyu NPP Project will increase foreign dependency in general and dependency to Russian Federation in specific.
- It is not possible to accept transfer of all decision making procedures to Russian company and to refrain from Turkish legal structure with a bilateral international agreement.Same logic and reasoning is applied to Sinop and other new NPP Projects and must be changed.
- In Akkuyu and Sinop NPP Projects,the plans to use reactors that have not been used elsewhere will make Turkey a trial and error application land.This is also not acceptable.

A FEW WORDS ABOUT NUCLEAR POWER PLANT(NPP) PROJECTS IN TURKEY(3)

- Especially for Akkuyu NPP,have there been enough studies regarding,regarding whether if a unit is of NPP is damaged during an earthquake, what would be the potential and possible consequential effects of the subject damage?Why the Russian company only focuses on magnitude of earthquake and g-value(maximum ground acceleration coefficient) is not considered?
- In general, all energy projects and investments,in specific NPP Projects should not be the agenda of negotiations and bargains behind closed doors and beyond the information, knowledge and access of public opinion.All procedures should be open,transparent,accessible and controllable.
- Noting the probability that domestic and renewable energy sources may not meet energy demand in future, Turkey,should increase its knowledge regarding nuclear energy and in energy planning,should foresee utilizing nuclear energy in the conditions when new technologies are developed, risks are eliminated,waste problem is solved.

A FEW WORDS ABOUT NUCLEAR POWER PLANT(NPP) PROJECTS IN TURKEY(4)

- National Nuclear Energy Strategy Document and Action Plan must be prepared in a participatory and transparent manner with participation of all relevant sides and must be applied.
- In accordance with the aims and principles of above referred National Nuclear Energy Strategy Document and Action Plan,scientific and academic studies must be carried,developments in the world and new NPP technology implementation projects must be followed and Turkey should participate to scientific works and platforms such as CERN.
- Against adverse effects of probable NPP accidents to Turkey and her people,Emergency Action Plans should be submitted to review of public opinion and should be upgraded to applicable world wide standards noting the views and remarks of relevant sides.Activities of NPP's with old technogies and low safety standards in neighbor countries should be followed closely and any event that will constitute a risk to Turkey should be reacted.

BASIC PROPOSALS

Basic Assesments and Proposals (1)

- To benefit from energy is a fundamental human right. Thus,supply of enough,good quality,continuous,low cost,reliable energy; to all consumers should be a fundamental energy policy.

Energy generation should base on mostly to domestic,new and renewable energy sources.

Energy planning should target:

-Protection of national,public and social benefits,

-Increasing social gains and advantages,

-Enabling citizens to access continuous,low cost,reliable energy easily

-Minimizing negative effects to environment

Basic Assesments and Proposals : Planning Again(2-1)

- Integrated planning is a must for energy sector.Planning,should be made taking into account: election of sources that will be used for energy generation,review of energy consumption trends,concentrating on demand management,utilizing energy more efficiently,minimum negative environmental effects.
- Planning is not an old and worn out functional tool and has helped as a lever to many countries who base their policies on their decision making mechanisms to develop.

Basic Assesments and Proposals : Planning Again(2-2)

- Planning should be considered and applied again.Planning,by, making a reliable inventory of sources, concentrating on domestic and renewable sources,using reliable input-output analyses,forming a new functional organizational structure,preparing and applying Strategy Documents,Five Year Plans,Road Maps,action Plans that protects and develops social,public and country benefits and gains.
- Planning should be made in a participatory and transparent style and in addition to related public corporations,participation of universities,scientific research institutions,professional chambers,expertise associations,trade unions and consumer associations to all stages of activities in an efficient and functional manner must be realized.

Basic Assesments and Proposals :Planning Again(2-3)

- Strategy Documents should be prepared for all sub sectors of energy (oil, gas, coal, hydropower, geothermal, wind,solar,biomass).Then considering all these studies,Renewable Energy Strategy and Action Plan and Turkey General Energy Strategy and Action Plan must be prepared and applied.Energy source,generation,distribution planning should be made in national,regional and provincial level.
- Strategy Documents should be binding and guiding for all sides and must be fully applied . "NATIONAL ENERGY PLATFORM" must be formed with very wide participation so that all sides can express their views and analyze and discuss all aspects regarding energy planning in general,and planning production and consumption of all energy sources,in specific.

Basic Assesments and Proposals :Planning Again(2-4)

- "NATIONAL ENERGY STRATEGY CENTER" that will cooperate and coordinate with "NATIONAL ENERGY PLATFORM" must be formed within the organization of MENR. This center should prepare energy demand and supply forecasts and projections for 5,10,20,30,40 year periods should be made taking into account domestic and renewable sources and aiming to direct energy investments.
- MENR is responsible for developing and applying fundamental strategies and policies in alignment with benefits of society.For this purpose,MENR should employ proficient and efficient staff.

Basic Assesments and Proposals (3)

- Cost benefit analysis studies noting social benefits and gains must be made and include below activities:
- 1) When generation/distribution licenses are issued,when license criterion are specified and evaluating license applications,while making a selection between multiple applications,during monitoring and controlling licensed activities.
- 2) When resources such as water,coal,geothermal,forest,lands etc. belonging to society/public/state are allocated.
- Benefits and gains of society can be considered from two standpoints:
- a)With efficient and productive usage without misspending
- b)Guaranteeing benefits and gains are more than costs to the society and by distributing benefits and gains and costs between relevant sides in an equitable manner

Basic Assesments and Proposals (4)

- 3)During evaluation of environmental impacts of energy investments
- 4) While making a selection between alternative investment projects appllying for same site
- 5) While planning energy supply and making preferences for using alternative sources
- 6) During developing subsidies for energy sector and energy machinery and equipment,pricing of energy,taxing of energy and financing energy investments

Basic Assesments and Proposals (5)

- With such an understanding, “Social Impact Assessment “ must be included in EIA study and people living in the region should be informed about possible positive and adverse social impacts as well as environmental impacts and they must participate to pre-investment works as well as activities for monitoring/controlling for subject investment.
- Relevant regulation should be re-named,”Environmental And Social Impact Assessment Regulation “ and its context must be enriched with criterion that will measure and evaluate social impacts of projects.

Basic Assesments and Proposals (6)

- Privazations should be stopped.Public institutions active in production,transmission and distribution of energy should be capable to operate in a self-governing,efficient and transparent status where the employees are influential in management,control and audit.
- Energy projects which don't comply to plans and not wanted by people living in the region and whose social costs are more than their gains should be stopped.Power plants should not be installed in and next to settlements, productive agricultural lands ,historical sites,forests.Projects which are not wanted by the people living in the region must be canceled.
- Policies aiming to decrease share of imported sources such as natural gas,oil,imported coal in primary energy consumption and power generation,must be applied.
- High taxes on energy sources and products should be lowered.

Final Proposal

- By applying policies (Strategies,Road Maps,Action Plans) to maximize share of domestic sources in both meeting primary energy demand and power generation,it will be possible to decrease dependency in power generation eventually and in medium term target a portfolio where natural gas will have 25% share,imported coal 5%,local coal 25%,hydropower 25% and other renewables 20%.In long term,share of fossil fuels can be diminished and bigger portion of power generation will be based on renewable sources and final target would be only to use renewable sources.
- Present "ELECTRICAL ENERGY SUPPLY SECURITY DOCUMENT" should be revised noting long term plans,above referred targets and giving priority to domestic and renewable sources and should be applied.

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With my sincere thanks to below named colleagues who have their valuable studies with us:
Electrical and Electronic Engineers Arif Künar, Barış Sanlı, Budak Dilli, Erdinç Özen, Olgun Sakarya, Osman Nuri Doğan,Zerrin Taç Altuntaşoğlu,

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Members of Energy Commission OF Chamber of Mechanical Engineers; Can Özgiresun,Barış Levent, Fuat Tiniş, H.Caner Özdemir, Haluk Direskeneli, Şayende Yılmaz, Tülin Keskin,

Mechanical Engineers Arif Aktürk, Muzaffer Başaran, Canip Sevinç and Prof. Dr. İskender Gökalp

Mathematician Yusuf Bayrak,

Meteorology Engineer İsmail Küçük,

Translator/Interpreter Elif Naz Arslan,

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Thanks !

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