HACETTEPE ÜNİVERSİTESİ
İKTİSADİ VE İDARİ BİLİMLER FAKÜLTESİ DERGİSİ
CİLT XIV SAYI 1/TEMMUZ-1996 SAYFA 41-61

ENERGY ISSUES IN THE WORLD AND IN TURKEY

*Hamide Zorlu Şenyuva**
*Ahmet Yörükoğlu***

ABSTRACT

Turkey, like some other developing nations, has been facing energy problems. Energy need has been increasing not only because of economic growth, but also because of the high population increase and cultural development. A sort of reciprocal effect between energy use and economic growth makes the societies demand more energy. Turkey has taken some steps to answer the ever increasing energy demand; but estimations show that these steps are definitely not enough to meet the need in the coming years.

She must take some additional and immediate actions before the gap between energy demand and supply starts increasing even faster. These actions may be taken on the demand and supply sides. Besides, some incentives may be applied to encourage the private enterprise and free market system; courses and researches may be implemented at universities for the renewable energy sources in order to decrease dependency of the country and for the sake of sustainable development.

ÖZET

Dünyada ve Türkiye'de Enerji Sorunu

Pek çok gelişmekte olan ülke gibi Türkiye de enerji sorunu ile karşı karşıyadır. Önümüzdeki yıllarda enerji talebi daha da artacaktır. Enerji talebi hem ekonomik büyümeden, hem nüfus artışından ve hem de kültürel gelişmeden dolayı artmaktadır. Bu yüzden de ihtiyaç ile üretim arasındaki fark gittikce artmakta, ülkenin enerji konusunda bağımlılık derecesi yükselmektedir. İhtiyacı karşılayabilmek, bağımlılık derecesini

---

* M.Sc., TÜBİTAK (Scientific and Research Council of Turkey).
** Prof. Dr., Hacettepe University, Department of Sociology.
Keywords: Energy; Economy; Turkish economy.
Anahtar Sözcükler: Enerji; Ekonomi; Türkiye ekonomisi.

azaltabilmek, çevreyi de bozmadan kalkınmayı sürdürebilmek için yetkililerin çok acil ve yapıcı önlemler alması zorunlu hale gelmiştir.

Alınacak önlemler hem üretim hem de tasarruf yönlü ve etkin olmalıdır. Bu önlemlerin içinde, yenilenmesi mümkün enerji kaynaklarının bulunabilmesi için ve enerji kullanımında ekonomik ve ekolojik anlamda etkinliğin sağlanabilmesi için üniversitelere dersler konulması ve araştırma fonları oluşturulması da tavsiye edilebilir.

1-INTRODUCTION:

The issue of energy is more important in the world today than it was yesterday. Needless to say, human beings will be facing this problem by more seriously than ever before, since some of the energy resources, like oil and coal -fossil fuels, are estimated to be used up by the middle of the next century. If it is so, human beings must find new energy resources and/or have to develop some of them other than the known fossil fuels, like solar energy, hydraulic energy etc.

It is accustomed to classify the energy resources as renewable and non-renewable. Renewable ones are solar energy, tidal, wind, wave and geothermal energy; non-renewables on the other hand, are named fossil fuels since the time period necessary for their reformation after their fully exploitation is almost endless. Different studies show that human beings have used different types of energy in the history in order to survive and maintain generation.

Among these sorts of energy we can mention about animal force, wood energy and animal dung. Human beings have been using these resources for many thousands of years. But, on the other hand, non-renewable types of energy resources are very new in the history since they were discovered not more than three hundred years ago.

The interesting and perhaps meaningful side of this development is that the non-renewable energy resources have been demanded much more than the renewable ones by both households and factories (even though their discovery is very new), since their production, delivery and consumption are easier and more practical and less polluting. Lately we have been witnessing that " natural gas" consumption has been taking place everywhere. This perhaps is a positive development for the sake of society and environment, though it is considerably more expensive than the others.

As known already, consumption of organic fuels are increasing every year much more faster than the growth rate of Gross National Product

(GNP) and population growth rate. This fact is creating not only the problem that the world will be missing the fossil fuels by the middle of the next century but also fast consumption of it is the main cause of emission of CO_2 and thus to change the global climate via green house effect.

The subject is so important that the "energy" has to be a must course at the universities in every country. Present studies and researches on the subject are certainly not enough. Economic side of it must be taken into consideration much more than what has been done so far, as well as new researches for new energy discoveries.

The purpose of this study is to show the importance of energy consumption for the realization of economic and social development of countries and of Turkey. To do that, the energy resources will be discussed in the following section; and later in the third section the demand for energy will be explained. In the fourth section, energy need in Turkey and future trends will be examined respectively. Eventually, in relation to the findings of this work, some suggestions will be given in the section of conclusion.

2-ENERGY RESOURCES IN THE WORLD

2.1-Energy Reserves and Production:

According to some studies (Milliyet, 1995b) total world fossil energy estimated reserves are nearly 900 billion ton of oil equivalent (Btoe). This amount is consisted of 1041 billion tons of coal; 135.4 billion tons of oil and 124.0 trillion m^3 natural gas. Of this 900 Btoe energy, 75 percent is coal and the rest is oil and natural gas. In addition to these figures, Table 1 shows also that while Middle East has no coal reserve at all, it has the largest part of the world oil reserve; i.e., 66 percent. Likewise, as North America has nearly 24 percent of the total coal; it has, on the other hand, only 4 percent of the world oil reserve and again an ignorable part, 6 percent, of the total natural gas. In general, it may not be wrong to say that a region rich in one sort of energy resource is poor in other.

Total demand in 1973, was about 5500 million tons of oil equivalent (Mtoe) of non-renewable energy; and more than half of this or more than 57 million barrels per day, was oil. By 1994, oil demand had reached 68 million barrels per day. Oil consumption in the world has increased nearly 19.3 % since 1973[1].

---

[1]Refer to Şahin (1994) as one of these studies and for more detail on the subject.

TABLE 1
World Energy Reserves (End of 1991)

	Coal (billion ton)	Oil (billion ton)	Natural Gas (trillion m3)
North America	249	5.3	7.5
South America	12	16.9	6.8
OECD Europe	99	1.9	5.1
Rest of Europe	315	8.0	50.0
Middle East	0	89.4	37.4
Africa	62	8.0	8.8
Asia and Australia	304	5.9	8.4
TOTAL	**1041**	**135.4**	**124.0**

Ref:Şahin (1994), p.76

World energy potential and production are not consisting of only these non-renewable energies; thus at this point it is necessary to mention about the renewable energy resources such as solar energy, electrical energy, wind, tidal, wood and animal dung energy. These sorts of energy may sometimes and at some sections of industries be good substitutes to some non-renewables. Without going into detail it is possible to give an example that animal dung is widely being in use for heating purposes in some countries like Türkiye and Mongolia (Askin, 1978).

Of the world total energy supply today 39 % is oil, 25 % is coal, 22 % is natural gas, 7 % is nuclear energy and 3 % is hydraulic energy. Global values on these sorts may be found in the**Table 2** below.

TABLE 2
World Commercial Energy Supply
(Mtoe) 1975-1991

	1975	1980	1985	1989	1991	% increase
Coal	1612	1898	2166	2357	2310	43.30
Oil	2652	2989	2812	3093	3130	18.02
Natural Gas	999	1230	1419	1652	1717	71.87
Nuclear	100	186	389	506	560	460.00
Hydrolic	134	156	195	207	216	61.19
TOTAL	**5497**	**6468**	**6981**	**7815**	**7933**	**44.33**

Ref :Şahin (1994), p.76

2.2-Energy-Economy Interface

Several estimates made by different organizations and academicians on the energy consumption increase in the future; on how fast the present reserves of non-renewable energy resources will be exhausted;

and suggestions have been made on substitutions. These estimates are showing us that the world economy is going to grow approximately 3 % per year until 2020. Growth rate in developing nations will be even higher during the same period. Considering the population increase together with the economic growth, it won't be difficult to imagine how high the increase in demand for energy is going to be in the near future.

With the assumption that the countries will perform steady-state growth and the growth rate will continue linearly until the years 2000 and 2020, and also assuming that the elasticity of energy demand is constant for all the countries, Dr. Bernard Gilland has made a calculation in order to estimate the primary energy consumption **(PEC)** for five different groups that are consisting of the whole world[2]. The author has defined the "primary energy " as solid, liquid and gaseous fossil fuels, hydro-electricity and nuclear electricity..and defined on the other hand the "elasticity of energy demand coefficient" as the ratio of growth rate in PEC to growth rate in GDP. Dr. Gilland is using in his work 1 million ton petroleum equivalent (Mtoe) 10.000 theracalory as a unit. The result of his study is that the world's energy need (in PEC) in 2000 will be 9.440 Mtoe and in 2020 it will reach, with about 39.4 % increase, to 13.150 Mtoe . According to the same estimation the growth rate of population will be about 29.4 % during the same period which is a lot less than the growth rate of energy need .(Gillard, 1988). **Table 3 and 4** below give the figures mentioned.

TABLE 3

Population And GDP Per Capita in 2000 And 2020

REGION	GDP growth rate(%)	Population 2000 (Millions)	GDP Per capita 2000 (US$)	Population 2020 (Millions)	GDP Per capita 2020 (US$)
USA,Canada, Aust.,N.Zeal.	2	318	19100	353	25600
Soviet Union, Eastern Europe	2	464	7300	520	9600
European Mem.of OECD, Japan	2	488	11600	475	17700
China	4	1304	450	1545	830
All Others	3	3676	820	5193	1050
World	-	6250	-	8086	-

Ref: Gillard (1988), p.234

[2]For more detail, see Gilland (1988).

TABLE 4
Primary Energy Consumption (PEC) in 2000 And 2020

REGION	PEC 2000 (Mtoe)	PEC Per capita (toe)	PEC 2020 (Mtoe)	PEC Per capita (toe)
USA,Canada,Aust,N.Zeal	2220	6.98	2220	6.29
Soviet Union, Eastern Europe	2400	5.17	3240	6.23
European Mem. of OECD,Japan	1900	3.89	2210	4.65
China	940	0.72	1760	1.14
All Others	1980	0.54	3720	0.72
World	9440	1.51	13150	1.63

Ref Gillard (1988), p.241

There is one thing here to mention also that increasing **GDP (or GNP)** allows the energy consumption to increase; while increase in energy feeds the economy to grow more. This reciprocal impact brings the country to a higher position. Today, most of the countries are less developed and knowing the importance of energy for economic development, they are trying every possibility to obtain more energy, while the developed nations intend to increase their welfare. Obviously, this brings us to the fact that the increase in demand for energy is not only the function of population growth rate but also it is stimulated by development and GNP increase of the countries, while the reserves are not reproducible.

3-ENERGY DEMAND IN THE WORLD

3.1 Energy Economics

In order to understand the problem more accurately, we have to take a bit more closer look on the energy demand of the industries, since the reciprocality mentioned above happens between the energy sector and the others in the economic system. To see the picture more clearly let's take two less developed countries, country A and country B , which are equal in size, population, cultural level and alike, but the country A is rich in energy resources than the other; and let's assume also that these countries are living in a closed economy; in other words, there is no trade between these countries.

It is not hard to say the country A is better off, comparing with the country B, since A's energy reserves enables A to produce more economic goods and services than country B. In other words, by having energy resources, country A is superior to country B .Its superiority will continue as long as country A keeps the advantages from having energy sources, no matter the country B is better in some other factors or not.

Obviously energy is a strategic factor, since it is one of the main factors for production.

Let's now release our assumption a little , and let the countries start trading. The country B will demand energy from A for its industries. Trade will start between these countries, because both of these countries will be better off since they both will get benefit out of this trade. And, because of the "comparative advantages" of the two countries this trade perhaps will continue as long as there is peace between them. But still country A has the advantages, so it has the superiority. Thus, the more energy source a country has, the more independent it is.

Industries in both countries grow in capacity, while the trade goes on i.e both countries increase their GNP and increase their welfare. In other words, the people in both countries will have higher "purchasing power", which, as a result , leads the "effective demand" to increase. Increased effective demand turns out at the second step , to cause more energy demand. This reciprocal impact between energy sector and other sectors feed each other to grow via continuously increasing demand.

TABLE 5

World Oil Demand And Supply (Million barrels per day)

1990		2000		2010	
		CC[3]	ES[4]	CC	E
TOTAL DEMAND	**68.3**	**77.1**	**75.7**	**95.2**	**92.0**
OECD	41.6	44.9	44.1	48.3	47.5
-North America	21.5	23.3	22.8	25.4	24.7
-Europe	13.5	14.5	14.4	15.1	15.1
-Pacific	6.5	7.1	6.9	7.8	7.6
CEE	1.3	1.6	1.5	2.2	2.1
ESU	4.8	5.7	5.4	7.9	7.1
Africa	2.2	2.7	2.7	4.0	3.7
China	3.0	4.1	4.1	6.5	6.6
East Asia	5.3	6.6	6.5	10.0	9.5
South Asia	1.8	2.5	2.5	4.7	4.5
South and Central America	4.0	4.6	4.5	6.1	5.6
Middle East	4.0	4.1	4.2	5.1	5.1
Stock changes	0.2	0.2	0.2	0.3	0.3
TOTAL SUPPLY	**68.3**	**77.1**	**75.7**	**95.2**	**92.0**
OECD	20.8	20.5	20.0	21.0	17.5
FSU/CEE	7.5	7.7	7.5	10.7	10.0
Non-OPEC Row	11.4	13.2	12.8	14.9	13.2
OPEC	27.1	34.0	33.7	46.7	49.4
Processing Gains	1.5	1.7	1.7	1.9	1.9

(*) except U.S.S.R; Ref :Altaş, Fikret, Çelebi (1994b), p.31

---

[3]Capacity Constraints(CC): Trends in past behaviour are assumed to continue to dominate future energy consumption patterns.

[4]Energy Savings(ES): Exogenously imposed additional energy efficiency improvements are assumed to be greater than those suggested by past behaviour.

As may easily be seen from the **Tables 5 and 6** some countries are good in solid fuel production while others are better in liquid and gaseous fuels production. Those that are not developed are not good in electrical energy production and consumption, and also they are not good in crude oil consumption, even though some of them like Nigeria, Algeria, and Libya in Africa, Colombia, Venezuela in South America, Iran, Saudi Arabia, Syria in Asia are good in liquid fuel production.

They don't have enough energy demand for development, because the reciprocity has not started in these countries yet, for the lack of industrial improvement and the cultural level of the population both of which determine the size and the type of energy demand.

TABLE 6

Energy Production and Consumption in the Continentals (1991)

Continentals	Solid Fuels		Liquid Fuels		Gaseous Fuels		Primary Electric		Total	
	Prod.	Cons.	Prod.	Cons.	Prod.	Cons.	Prod.	Cons.	Prod.	Cons.
Africa	98.4	71.3	343.2	80.6	62.0	30.6	6.0	5.5	509.6	188.0
Asia	772.4	88.5	140.0	693.8	216.4	219.6	124.7	124.7	2253.5	1919.6
Europe	365.1	443.4	223.1	604.3	207.5	322.6	263.2	265.5	1058.9	1635.8
U.S.S.R	303.8	288.4	518.5	375.6	654.7	569.4	75.4	73.7	1552.4	1307.1
N.America	571.4	501.1	687.9	935.5	598.4	602.5	255.3	255.5	2113.0	2294.6
S.America	21.3	17.8	234.3	117.4	58.3	58.1	33.4	33.4	347.3	226.7
Antarctica	106.4	40.4	29.5	39.2	24.4	20.0	4.7	4.7	164.0	104.3
World	2237.8	2243.9	3176.5	2846.4	1821.7	1822.8	762.7	763.0	7998.7	7676.1

Ref : IEA (1995), p:29

3.2- World Energy Production And Consumption

It is not only that energy is an inevitable input for any type of production one can imagine; but also, it is the essential factor for higher living standard. Statistics are showing us that increase in demand for energy in developing nations is very high comparing with the other countries, parallel to their growth rate.

This leads us to come to the point that in the near future the rate of increase in demand for energy will be even higher than what it is today. These relations are shown in Table 7 below.

TABLE 7
Development in World Energy Demand (Mtoe)

	OECD			% change (1990-2010)	WORLD			% change (1990-2010)
	1990	2000	2010		1990	2000	2010	
Coal	1036	1142	1263	21.9	2286	2647	3283	43.6
Oil	1723	1936	2037	18.2	3061	3558	4248	38.8
Nat. Gas	785	991	1277	62.7	1678	1974	2785	66.0
Nuclear	425	496	515	21.2	524	608	690	31.7
Hydro.	98	120	134	36.7	184	252	329	78.8
Others	21	53	88	320.0	34	91	143	320.6
TOTAL	4089	4738	5314	30.0	7768	9129	11478	47.8

Ref : Şahin (1994), p:77.

Taking into consideration that the largest part in the total of commercial energy supply today is belonging to petroleum with the record of nearly 39 %; the arguments about that the present reserves will be totally exhausted by the middle of next century may be accepted as a bitter fact. On the other hand, solid fuel has 29 % share in the world total commercial energy supply, while natural gas, nuclear energy and hydraulic energy have 22 %, 7 % and 3 % respectively. As a result fossil fuel energy covers 90 % of the total energy supply. And most of this is being consumed by the **OECD** countries.

Demand for energy is subject to be increased not only because of the economic growth of the countries but because of the population growth and also because of the cultural improvement that effects the quality and sort of the need of the people. This is what we have been experiencing lately and this is why the energy prices are increasing faster. In Table 8 energy price projections were done for the period between years 1990 and 2010.

TABLE 8
Energy Price Projections

(1990 US $)

	1990	1995	2000	2005	2010	Percentage change 1990-2010
Coal (/Ton)	60	63	65	65	67	11.7
Steam coal(/Ton)	45	50	50	52	55	22.2
Oil (Barrel)	25	23	28	30	35	40.0
Natural Gas(1000m3)	90	90	110	120	140	55.6
Uranium(1000$/Ton)	600	600	650	700	750	25.0

Ref : Şahin (1994), p.79.

According to some estimations use of natural gas as an input on the production of electrical energy will increase steadily (Şahin, 1994) and share of it will be 22 % in comparison with coal and crude oil, since it is cleaner and more practical.

Prices of uranium are comparatively cheaper and it will keep its rank until insecurity that the people feel about nuclear energy is changed.

As a result, the societies today are facing the fact that the energy in general is the one that has the highest price increase among the other inputs and this will continue steadily as long as they don't discover new and cheaper and also renewable resources.

Additionally, the authorities as well as consumers, must consider the energy saving side of the problem, since the capacity constraint side, for the time being at least , seems not sufficient to reduce the degree of the problem.

People and the industries may be directed for energy savings via some tax policies. According to a study done on California economy, imposing a certain amount of tax on energy consumption and energy production is creating negligible amount of effect on aggregate economic activity; but the taxes on the other hand have a substantial impact on energy use. In the study it is found out that a uniform 10 % tax reduces the energy consumption by 7 %, a 50 % tax reduces it by just over 26 %; a 5 %

severance tax cuts domestic (California) oil production by up to 19 %, a 10 % tax by 37 %, and creates some negligible effect on the economy. This study may be a useful tool to direct the household and companies for energy savings.(Fisher, Despotakis, 1989, p,153-157)

Besides, it is important today to apply some incentives as a policy tool on institutions and universities to concentrate their effort more on research for new energy resources. New energy may be produced out of solar energy, wave energy, wind energy and alike, but should be considerably cheaper and anti-polluting. Thus, nations should be more careful on both saving and production, and the authorities should produce more effective energy policies. Energy questions have to be taken by the countries in a sufficient cooperation since it is after all a problem of the whole world. Needless to say, such a cooperation between nations may be more effective and more productive.

Within the same cooperation between the nations it is perfectly possible

a)to set up some courses in related departments of the universities, and even at other schools, to give education on the subject;

b)to organize conferences, seminars etc.,

c)to prepare films for the TV - channels to give the people some practical knowledge on energy savings, and to explain them the importance of the matter.

4-ENERGY NEED IN TURKEY

4.1. General Information

Turkey has been experiencing improvement in almost every aspect necessary for breaking up its underdevelopment chain since the Atatürk era; and lately she has shown a considerably high rate of growth in spite of some political and social unrest. With her large territory (nearly 780.000km^2 = 296.184 mil^2) and almost 65 million population she is a big country. Approximately 2.2 % population increase and average 6 % annual economic growth, suitable climate, a strong political and economic link between Europe, Asia, and America are her main potentials for more and faster development.

More than the half of the population is young and the people are aware of the fact that catching the European level of technology, economic welfare and civilization is vitally important for them. We can say

that this eagerness and strong aim may be shown as the strongest factor for acceleration of economic growth and social progress.

TABLE 9
Changes in the Energy Production and Consumption (tousand tep)

Years	Production (ttep)	Percent Change	Consumption (ttep)	Percent Change	Production / Consumption
1970	14.493	-	18.849	-	77
1975	16.417	2.5	27.381	7.8	60
1980	17.298	1.1	31.913	3.1	54
1985	21.703	4.6	39.167	4.2	55
1990	25.824	3.5	53.334	6.4	48
1991	25.847	0.1	54.624	2.4	47
1992	27.132	5.0	57.022	4.4	48
1993	26.863	(-)1.0	61.018	7.0	44
1970-93	-	2.7	-	5.2	-

Ref: Altaş, Fikret, Çelebi (1994b)

Increase in energy need in Turkey is greater than the population growth rate and also greater than per capita income.

Evaluation of the figures in Table 9 explains the development of energy production and consumption in Turkey, between 1970 and 1993. Percentage increase in production is only 85.35 during 24 years; but consumption shows 223.72 percent increase during the same period which is a lot higher than the world average. This gap between consumption and production may be seen easily from the last column of the table. The ratio between production and consumption has been decreasing every year. This fact brings us to the point that Turkey is heavily depending upon energy importation; and the degree of the dependence of Turkish economy is increasing each year.

4.2 Need For Energy

Economic growth and social progress mean as it was mentioned earlier, increase in need of energy ; i.e., increase in demand for energy. Turkey is now at the stage that the energy sector and industrial sector are doing reciprocal effects upon each other. Thus increase in demand, in the near future, is not only the result of the population growth but also it is because of the fact that Turkish economy is moving fast towards industrialization. Lately the industrial sector has shown the highest growth rate compared with agriculture and service sectors. Among these industrial sector is the one that requires input from the energy sector the most. Because industrial sector is the one that has **backward and forward linkages effects**(Hirschman, 1958) the highest.[5]

Turkey has some different sorts of resources, like coal ,lignite, petroleum, natural gas, etc.; but, they are negligible when compared with the world reserves. Not only the reserve size but quality of the reserves are also very poor. Thus, it is not always economical to exploit them. For example lignite and coal reserves are being exploited because of the social and political reasons mostly, and even sometimes because of lack of foreign currency to import good quality solid fuels.(Şahin, 1994)

Some of the reserves, on the other hand, are restricted by the international agreements and by the law, because of the enviromental reasons[6]. In this country, coal is in use heavily on the production of steel and iron ; while lignite is on electrical energy production. But exploitation of these two are planned to be reduced in the future, because of the reasons mentioned above.

Production of crude petroleum has reached to 3.5 million tons; and it will increase by 500.000 tons additionally each year.(Şahin, 1994)

In **Table 10 and 11** for the years 1990, 2000 and 2010 energy demands and production are given.

---

[5]Backward and forward linkages effect: Industries have input-output relations with each other. And each industry has this relationship to a certain degree. It is found out that product of heavy industry is giving $Fj=\Sigma A_{ji}/D_j$ where ΣA_{ji} stands for total intermediate demand for output j and Dj stands for total demand for output j. Backward linkage coefficient is found as: $bi=\Sigma A_{ji}/A_j$ where ΣA_{ji}=total input of sector(i) A_i=total output of sector (i).

[6]Member countries of the IEA, including Turkey have already accepted the regulations about the matter and thus, they started to prepare appropriate laws and restrictions.

TABLE 10
Changes in the Primary Energy Demand

	1990	2000	2010	% Change (1990-2010)
Coal	5500	7129	10142	84.4
Steamed Coal	990	3917	15648	1480.6
Lignite	9888	16590	23270	135.3
Oil Derivatives	19665	34794	54818	178.8
Natural Gas	3130	11932	32370	934.2
Renewable	43	245	2231	5088.4
Nuclear	0	0	4135	∞
Hydraulic	5787	10193	15787	172.8
Wood	5362	4661	3519	- 34.4
Animal and plant lefts	2548	2401	1895	- 25.6
TOTAL	**52913**	**91862**	**153815**	**209.6**
Koe per capita	937	1324	1972	110.5

Ref Şahin (1994), p.89

TABLE 11
Changes in the Production of Primary Energy (Ttoe)

	1990	2000	2010	%Change (1990-2010)
Coal	1674	1525	1220	- 27.1
Lignite	9888	16590	23270	135.3
Oil Derivations	3197	3440	4300	34.5
Natural Gas	191	720	2250	1078.0
Renewables	43	245	2231	5088.4
Hydraulic	5787	10193	15787	172.8
Wood	5362	4661	3519	- 34.4
Animal and plant waste	2548	2401	1895	- 25.6
Wood	5362	4661	3519	- 34.4
Animal and plant lefts	2548	2401	1895	- 25.6
TOTAL	**28690**	**39775**	**54472**	**89.9**

Ref Şahin (1994), p.92

Production of lignite, renewables, hydraulic, wood, and animal and plant waste are so planned that they will meet the need in 1990, 2000 and 2010. The gap between total demand and total production comes out that the production of coal, oil derivations and natural gas are very weak because of the conditions of their reserves. Besides, nuclear energy production and steamed coal production are accepted to be zero during the same period, although there is a big amount of demand for these two. Last but not least, demand for hydraulic energy and production of it are equal according to the same tables. It means that the investment necessary for realizing the needed energy during the period is planned. However, since the society already started to face the electricity cuts, it

simply means that either the estimation of demand is wrong or the authorities are not taking care of the planned investment.

Comparison of the values in Tables 10 and 11 brings us to the result that if there will not be prepared a new energy policy by the authorities urgently, the present energy gap will continue to increase faster.

According to the above tables all the energy resources except wood, and animal and plant wastes are showing increase year by year until 2010; but their percentage in total are changing.Among them percentage of steam coal, natural gas, renewables, and nuclear energy show increase, while the rest decrease. Primary energy need will be three times as high in 2010 as what we have presently.

Turkey has all the possibilities to increase electrical energy production. Progress in the subject during recent years slowed down because of financial reason ; however it is planned to put more investment on **GAP**[7] project ; and also lately **DAP**[8] project is being considered to be started.

4.3 Questions Arise

Apparently more and more energy need is confronting the country at the eve of joining the European Union. How much and what kind of energy resources does the country need? What sort of steps should be taken in order to overcome the problem? What kind of policies should the government pursue in this respect?

There may be some additional questions on this very important subject. Energy production must be good enough for the realization of the planned growth rate. This requirement may be sufficient but certainly not efficient. The needed energy production must be economical and also environmental at the same time ,for the sake of the future of the country.

Thus, increase in the production of electrical energy must be realized every year, since it is clean, and hydraulic potential of the country is very convenient for building new jenerators. According to one of the leading newspapers of the country (Milliyet, 1995a, 1995b) The Ministry of Energy and Natural Resources has prepared 58 projects for electrical energy production under the method of Build-Operate-Transfer **(BOT).**

---

[7]GAP: Güney Anadolu Project

[8]DAP:Doğu Anadolu Project

Lately, according to the same newspaper, a report has been sent from the Presidence Office to the Prime Minister's Office warning on the energy shortage that the country will face soon seriously if necessary steps are not taken on time. The newspaper is on the other hand giving a small statistical data (on **Table 12**) of electrical energy production.

TABLE 12

Projections on Demand for and Production of Electrical Energy

Billion Kwh

	1995	1996	1997	1998	1999
Production	96	96	97	98	100
Demand	85	93	101	110	120
Difference	11	3	-4	-12	-20

Ref: Milliyet (1995a)

Starting from 1997, electrical energy production will end up with shortage and it will increase every year.

The authorities should take actions and set up their energy policies on two main points. One of them is about investment, the other one is about savings.

Investment is directly related to increase the capacity of the energy production. As it was mentioned earlier, energy production should be sufficient and efficient. Considering the fact that any production may accept to a certain degree substitution between inputs, except energy (for instance labor may be substituted for the place of a machine at a textile factory, but without, say, electrical energy it is hard to expect the factory be running), the authority should choose the projects suitable to the main energy policy, set up and finance alternative programs for energy production. Since non-renewable energy sources are very poor in the country, Turkey should take an immediate action to start new electrical energy projects. Besides, the authorities

- should set up a right price policy, and more effective open market policy
- should set up code of laws in order to prevent misuse of the resources

- should levy right taxation
- should set up some incentives; and privatization in energy sector should be realized.

Setting up some codes and regulations is not enough at all to accomplish the aim, but necessary to follow and control strictly. This way it is possible to protect and save some wealth of the country.(For example, 1% of the total amount of the trees are being cut carelessly and without permission every year for heating) .

Mismanagement in energy use and wrong energy policies have been a source of budget deficit which inevitably causes additional effect on the high inflation. On the other hand bilaterally, the high inflation burdens the high inflation's effect on energy production through misallocation of resources.

The other point is saving. Energy savings may be achieved by reconstructing the present system which allows energy loss in many ways in electricity, in petroleum, in wood production and consumption (Şahin, 1994) etc.; but also by educating and training the people on the subject, since the people in this society are showing the same characteristics of the people in newly developing countries. Shortly, efficiency is lacking both in construction of the energy system (i.e. energy production) and energy use (i.e.energy consumption).

According to the same estimations (Erdoğan, 1995) the amount of energy loss is reaching 20 % every year, just because of the inefficiency of the system in general, while it is even 33 % in some of the plants. Some of the reserves are not being operated economically but wasted. The amount of dung used for heating and cooking has reached to a level that is equal to 80 million tons of fertilizer. Illegal tree cuts from the forests have exceeded 1 %. Thus. there are many reasons for which the authorities must take effective actions. Regulations, taxations and control mechanism may be prepared in order to prevent misuse of the resources and to give incentives for an efficient use. An accurate and sound price policy is important here too.

5.DISCUSSION AND CONCLUSION

The issue of energy is as important for a country as industrialization. Nations today are paying more attention on the matter than ever before. They are doing researches to find new energy resources since the fossil fuels reserves are projected to be exhausted in approximately 50 years. This serious problem directed the attention of the nations not only on discovering new resources, but also on how to use the present resources more effectively.

However, until the new findings, nations must take some steps to use the present resources more effectively and to save energy. To do that, governments should prepare some codes and regulations; and should set up a taxation and pricing schedule, should follow open market policies, and must direct the universities and even other schools to prepare programs on the subject. Turkey is facing the energy problem which may be much severe in comparison to many other nations because of its fast development. Economic development requires more energy consumption in addition to the effect of the population increase. Increase in energy demand has been causing the degree of dependency of the country to increase, since she is not rich enough in energy resources to meet the need of the economy and the households. Turkey should take some urgent and effective steps in order to decrease the level of dependency. These steps may be grouped into two parts; production and consumption. On the production side;

- to start new investments for more electrical and nuclear energy production,
- to set up a right price policy, and follow open market policy,
- to set up code of laws and regulations,
- to set up right taxation,
- to set up incentives and start privatization;

and on the consumption side:

- to reconstruct the present system to prevent energy losses,
- to enlighten the people on the effective way of energy consumption and savings.
- to increase the budget of the universities for implementation of courses on the subject and researches may be recommended.

In one of the periodicals, a new discovery is explained. Some Japanese scientists found out that a type of plankton is able to convert CO_2 to C_2H_5OH (ethanol). According to these Japanese scientists this monocell green may be an important energy resource in the future. Ethanol is only alternative fuel that has been used extensively anywhere in the world. Neverthless, there are many problems associated with using ethanol today. (Bilim Teknik, 1995)

Today, energy is a subject to be considered together with pollution since these two always have a cause and effect relation. For example

CO_2 emission has been increasing lately and the temperature has increased in the atmosphere because of the greenhouse effect and certainly this brings us to the onset of climatic changes.

On the other hand, there may be radioactive releases; such as ^{85}Kr are released into the atmosphere. When the coal burns, some of the radioactive decay products of ^{235}U and ^{232}Th are released to the environment (Kraushaar, Ristinen, 1993). Nuclear energy production may be considered in order to overcome the energy shortage in the country, but it appears that the storage of nuclear wastes is very expensive, even though it is possible

The oxide of nitrogen is another subject to be mentioned. The major sources of NO_x are motor vehicles (gasoline) , railroads, coal, total fuel combustion from wood etc. Also there is SO_2 in the atmosphere. The major sources of SO_2 are coal, total final combustion in wood and fuel oil. Finally it is necessary to mention of the water pollution. Oil from various sources like wells, ships, tanker accidents; natural organic matters like leaves, animal droppings are the main causes for the water pollution.

REFERENCES

Altaş, M., H.Fikret, E.Çelebi, (Ed), **Enerji İstatistikleri** Türkiye 6. Enerji Kongresi, (17-22 Ekim, 1994) İzmir.

Altaş, M., H.Fikret, E.Çelebi, (Ed), **Türkiye Enerji Sèktörünün Gelişimi ve Arz Talep Projeksiyonları** ; Türkiye 6. Enerji Kongresi, (17-22 Ekim, 1994) İzmir.

Askin, A.B. (Ed), **How Energy Effects the Economy**, Lexington Books, Lexington, 1978

Bilim Teknik Dergisi, No 337, TÜBİTAK, Aralık 1995.

Derrick, A., Mongolia: Renewable Energy in a transitional Economy, **Energy World**, November 1993, pp:13-16

Erdoğan, Ü., Enerji Politikaları, **Konferans**, EMO (30-11-1995)

Fisher, A.C., K.A. Despotakis, Energy Taxes and Economic Performance: A Regional General Equilibrium Analysis, **Energy Economics** (1989), V:11. No:2 pp 153-157

Gilland, B., Population Economic Growth, and Energy Demand **Population and Development Review**, V:14, No:2 (June, 1988), pp: 153-157

Hirschman, A.O , **The Strategy of Economic Development**, Newhaven, Yale Univ. Press, (1958)

IEA, **Energy Policies of the Republic of Korea**, OECD, Paris, 1994

IEA, **World Energy Outlook**, OECD, Paris, 1995.

Kraushaar, J.J., R.A.Ristinen, **Energy and Problems of a Society**, 2nd Ed. New York, 1993.

Milliyet Gazetesi, 9-12-1995.

Milliyet Gazetesi, 17-12-1995.

Şahin, V., Enerji Sektöründe Geleceğe Bakış , TÜSİAD (1994).