Preliminary Draft
Not for Quotation

Discussion Paper No. 2

Energy Demand and Imports of Crude Petroleum: Some Results for Turkey

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April 1978

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SECTION — 1

OBJECTIVES

The object of this study is to find out the future petroleum requirements of Turkey, which at present, is the biggest consumer of oil among all the non-oil exporting Muslim countries. Second object is to find out the energy demand of Turkey by categories of fuel, viz solid fuels, crude petroleum and electricity. As her domestic supplies, as they appear for the time being are small and unless new discoveries are made. These are not likely to last long. They may dry up at any stage during the period covered by this study. Thus Third object is to find out the import needs of Turkey.

The future years of projection, selected for the study are 1980, 1985 and 1987 as for these years. Plan projections for G.D.P., industrialization, energy needs, etc. are available in the Third Five Year Plan of Turkey. Also some indications are there in the press about the growth and other objectives of the (Fourth Five Year Plan) (1978-1982).

This is first of the series of studies initiated by the Pakistan Institute of Development Economics to probe into the scope of economic cooperation between the oil surplus, and oil deficit Muslim countries.

SECTION — 2

METHODOLOGY

To find out the requirements of crude petroleum of Turkey from other Muslim Countries, first of all her total energy needs would be projected. For this purpose, the methodology used is the same, which was used by the former ECAFE Secretariat[1] for projecting energy needs of this region as a whole and for individual countries of the region. The ECAFE made projections for 1975. The basis of the energy consumption forecast of the ECAFE was the correlation between the compounded annual rate of increase in the gross domestic product (GDP) of the various countries and the comparable growth in the various forms of energy consumption that was recorded by them during the 1955-65 period. This correlation and resultant coefficients were applied to the forecast of annual increase in G.D.P. of individual countries, when these were available.

For instance, in respect of Pakistan, the annual growth rate of G.D.P. during 1955-65 period was 4.4 per cent and that of energy consumption was 10.1 per cent. This yielded correlation of 2.30, viz. the annual growth rate of energy consumption was 130 per cent higher than the annual growth rate of G.D.P.

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[1] Proceedings of the Fourth Symposium on the Development of Petroleum Resources of Asia and the Far East (Economics, Technical Training, United Nations Assistance, Petroleum Legislation and Pollution by Petroleum, Products). Mineral Resources Development Series No.41 (Vol.III) U.N. New York 1973.

Of course, in early stages of economic development, the annual rate of increase of energy consumption is higher than the overall growth rate of GDP. This is due to the fact that in early stages of development emphasis is laid on infrastructure facilities like transport and communications which are heavy consumer of energy especially oil. Construction activities in early stages may need coal for brick kilus and electricity for urbanisation.

TURKEY

For Turkey, the base period is 1966 to 1975. During the period the coefficient of energy growth rate to G.D.P. growth rate was 1.18 as shown below:

Co-efficient factor between the Growth rates of G.D.P. and Energy Consumption Turkey, 1966 - 1975

1.	Annual Increase in GNP between 1966 and 1975	6.7 per cent
2.	Increase in Commercial Energy Consumption	7.9 per cent
3.	Co-efficient (2) ÷ (1)	1.18

Source: Kindly see Table 1.

For solid fuels, liquid fuels and hydro-nuclear electricity these were 0.28, 1.80 and 1.16 respectively. For projecting total energy consumption, the methodology has been strictly used. However, for other fuels components, the

co-efficient factor has been changed as explained in the next sector.

SECTION - 3

PAST AND BACKGROUND

Developments in the immediate past cover the period 1966 to 1974 and preliminary figures for 1975. According to the estimates of the Turkish Institute of Statistics, annual growth rate of G.N.P. between 1966 and 1975 was 6.7 per cent a year. The growth rate of annual energy consumption was 7.9 per cent. The growth rate of the consumption of solid fuels was 1.9 per cent, of liquid fuels 12.1 per cent and hydro-nuclear electricity 7.8 per cent. These trends give correlation between the growth rate of GNP and those of total energy consumption, consumption of solid fuels, liquid fuels and hydro-nuclear electricity at 1.18, 0.28, 1.80 and 1.16 respectively. Table 1. shows these developments.

According to the methodology, the future requirements of energy for Turkey should be worked out on the basis of the correlation established in table 1. However, there has been a big change in the Turkish economy since the beginning of 1974, when prices of oil were increased. The following paragraphs explain these developments and the need to deviate from the actual methodology.

i) In the Third Five Year Plan, the development Strategy of the Turkish Government was to achieve compound annual growth rate of 8.7 per cent for the economy between 1972 and 1987. According to latest estimates of the Turkish State Institute of Statistics actual growth rate between 1970 and 1975 was 7.7 per cent. Between 1966 and 1975 it works out at 6.7 per cent a year. For the Third Plan period 1973-1977, it is provisionally placed at 7.3 per cent a year.

ii) The Turkish Government places great reliance on national own resources. This objective has been the corner stone in the past and it has been included in the preliminary draft of the Fourth Five Year Plan 1978-1982, as reported in the press. Some of the objectives of the Fourth Plan are given below:-

a) Raising overall living standard of the people;
b) Decreasing dependence on external resources;
c) Accelerating industrialization;
d) Solving the problem of unemployment; and
e) Improving the distribution of income.

iii) The rise in oil prices, economic recession in Europe and the worsening balance of payment have upset all plan projections for future made in the

past. For the Fourth Plan period the annual growth rate of 7 per cent has been projected. This also looks uncertain. This projection is based on the assumption that besides normal project aid from the donor countries, Turkey would need extra borrowing of $ 13 billion over the five years of the Fourth Plan period.

iv) Due to increase in oil prices and economic recession in Western Europe, the Turkish Balance of payments is already under pressure. According to provisional estimates there was a deficit of $ 2.1 billion in 1976. This was due to import-export gap of $ 3.3 billion (imports $ 5 billion, exports $ 1.7 billion) and decline in home remittances of Turkish workers abroad from $ 1.3 billion in 1975 to $ 1.1 billion in 1976.

v) Above developments have already affected significantly the consumption pattern of energy during 1974 and 1975 and its components with the following results.

a) The growth rate of consumption of energy declined sharply from 12.3 per cent in 1973 to 4 per cent in 1974 and 2.25 per cent (estimated) in 1975.

b) The growth rate of the consumption of liquid fuels, which are mostly imported, declined from 13.8 per cent in 1972 and 17.9 per cent in 1973 to 2.8 per cent in 1974 and 1.3 per cent in 1975. On the other hand the growth rate of the consumption of solid fuels an indigenous product, increased from 0.7 per cent in 1973 to 5.8 per cent in 1974 and 3.2 per cent (estimated) in 1975. Similarly, the growth rate of the consumption of hydro-nuclear electricity increased from 7.1 per cent in 1972 and (-) 7.7 per cent in 1973 to about 28 per cent in 1974 and 22 per cent in 1975 (1975 estimated).

c) There is no other indication of the growth rate of the consumption of liquid fuels in future except that the refining capacity is projected to be increased at an annual rate of 8.2 per cent. This rate has been taken as the growth rate of the consumption of liquid fuels.

vi) Thus projections for the period 1975 to 1980, 1985 and 1987 have been prepared on the basis of following assumptions:

a) The GNP would grow at an annual rate of 7 per cent a year;

b) Total energy consumption would grow in relation to GNP as established during the preceding nine years 1966-75;

c) The Turkish Government would overcome her balance of payments difficulties and the refining capacity and the consumption of liquid fuels would increase at an annual rate of 8.2 per cent between 1975 and 1987.

d) Solid fuels and hydro-nuclear electricity would fill the gap. Hydro-nuclear electricity would increase at annual rate of 25 per cent and rest of the needs would be met by solid fuels.

SECTION - 4

FUTURE DEMAND PROJECTION

Demand for commercial energy in 1975, 1980, 1985 and 1987 has been shown in table 2. If non-commercial energy is taken static at 7 million metric tons of crude petroleum equivalent. Total energy demand for above years is given below:

Demand for total energy
(Million metric tons of
Crude Petroleum equivalent)

Years	Commercial	Non-Commercial	Total
1975	16.7	7.0	23.7
1980	24.9	7.0	31.9
1985	37.0	7.0	44.0
1987	43.4	7.0	50.4

DEMAND FOR CATEGORIES OF FUEL

Liquid fuels rising at 8.2 per cent a year, would account for major part of the demand. Throughout the period, its share is likely to be about 70 per cent of the entire commercial energy demand. In the past, it has been on the increase but in future, the balance of payments problems and rise in the prices of crude petroleum are the major constraints. The use of solid fuels and hydro-nuclear electricity would increase to fill the gap between total commercial energy and liquid fuel supply. Future demand by fuel categories is given below.

Demand for Commercial Energy
by fuel categories

(Million metric tons of crude petroleum equivalent

Years	Total	Liquid Fuels	Solid Fuels	Hydro-nuclear electricity
1975	16.7	11.7	4.6	0.3
1980	24.9	17.4	6.4	1.0
1985	37.0	25.8	8.0	3.2
1987	43.4	30.2	8.1	5.0

Note: Slight difference between the total and sum total of components is due to rounding.

DEMAND FOR CRUDE PETROLEUM

A sizeable part of the crude petroleum is consumed in Turkey for the production of non-energy petroleum products such as naphtha and betumen and road oil. The production of such items in the past has been increasing at an average rate of 200 per cent in 5 years between 1950 and 1974, as shown below.

Production of Non-Energy/Petroleum Products in Turkey 1950-1974 (000 metric tons)

Years	Production	% increase over preceding figure
1950	5	-
1955	17	240
1960	38	135
1965	194	410
1970	394	103
1974	656	67
1975 (estimated)	800	22

For 1980, 1985, and 1987, it may be roughly estimated at 1.6 million tons, 3.2 million tons and 4.4 million tons respectively. In this way, the annual demand for crude petroleum for energy and non-energy products is projected below.

Future Demand for Crude Petroleum

(Million metric tons)

Years	Energy purposes	Non-Energy purposes	Total
1975 (Estimated)	11.7	0.8	12.5
1980	17.4	1.6	19.0
1985	25.8	3.2	29.0
1987	30.2	4.4	34.6

REFINING CAPACITY

In 1974, the refining capacity in Turkey was 16.050 million tons a year. It is proposed to be increased by 8.2 per cent a year in the Fourth Five Year and presumably thereafter. The capacity cannot be increased regularly in each year. Big units are set up once to meet a big part of the demand for many years. Estimated capacity in above years may be projected as under.

Estimated Future Refining Capacity in Turkey

(Million metric tons)

Years	Estimate Capacity
1975	17.4
1980	25.8
1985	38.2
1987	44.7

Turkey is already active in expanding her refining capacity. One oil refinery is already being set up in co-operation with Romania. Total cost would be $ 350 million. One refinery is planned to be set up at Iskandrun in collaboration with Iraq. Its capacity would be 10 million tons a year and cost $ 500 million. Another refinery of the same capacity is proposed to be set up at the Baltie Sea Coast in collaboration with Russia. Existing refineries are proposed to be expanded. Total investment in all projects is estimated at $ 4 billion upto 1995.

SUPPLY OF OIL

Supply of oil domestic as well as import is no problem for Turkey. The domestic production is 3 million tons a year. Future is uncertain about domestic production unless new discoveries are made. Thus her import need would be as under.

Import of Crude Petroleum

(Million metric tons)

Years	Domestic	Imports	Total
1975 (Actual)	3	10	13
1980	3	16	19
1985	3	26	29
1987	3	32	35

Imported supply is likely to be smooth if foreign exchange is available. The Turkish - Iraq Pipeline completed in January 1977, would initially pump 25 million tons a year. Later its pumping capacity will increase to 35 million tons a year. Two thirds of its capacity would be exported to Europe through the Turkish Port of Iskandrun and one third would be available for the use of Turkey. Thus, the availability from this source would be from 8 to 11.5 million tons a year. In case of need, supplies can be increased by mutual consent. Three million tons of oil a year has been contracted from Libya for the future. About 10 million tons a year has been arranged with private companies to be imported from Arab countries in addition to supplies from Iraq and Libya.

TABLE -1 Turkey-Relation of GNP Growth Rate to Consumption of Commercial Energy Growth Rate 1966-1975 (In terms of million metric tons of crude petroleum equivalent).

Year	Gross National Prod. (TL Million		Energy Consumption						Hydro-nuclear Electricity		Co-efficient Factor % increase Energy consumption =			
					Solid Fuels		Liquid Fuels				%increase in G.N.P.			
	Total	%increase over preceding year	Total	%increase over preceding year	Total	%increase over preceding year	Total	%increase over preceding year	Year	%increase over preceding year	Total Energy	Solid Fuels	Liquid Fuels	Hydro-nuclear Electricity
1966	101,204	-	8.470	-	3.969	-	4.309	-	0.193	-				
1967	105,460	(+) 4.2	9.103	(+) 7.5	3.518	(-)11.4	5.389	(+) 25.1	0.197	(+) 2.1				
1968	112,493	(+) 6.7	10.218	(+)12.3	3.824	(+) 8.7	6.128	(+) 13.7	0.266	(+)35.3				
1969	118,594	(+) 5.4	10.698	(+) 4.7	4.063	(+) 6.2	6.346	(+) 3.6	0.289	(+) 8.7				
1970	125,243	(+) 5.6	11.355	(+) 6.1	4.080	(+) 0.4	7.020	(+) 10.6	0.254	(-)12.0				
1971	138,582	(+)10.7	12.752	(+)12.3	4.121	(+) 1.0	8.409	(+) 19.8	0.222	(-)12.6				
1972	149,119	(+) 7.6	14.014	(+) 9.9	4.206	(+) 2.1	9.570	(+) 13.8	0.237	(+) 6.8				
1973	157,308	(+) 5.5	15.735	(+)12.3	4.237	(+) 0.7	11.279	(+) 17.9	0.219	(-) 7.6				
1974	169,172	(+) 7.5	16.357	(+) 4.0	4.482	(+) 5.8	11.595	(+) 2.8	0.280	(+)27.9				
1975 (est)	181,522	(+) 7.3	16.726	(+) 2.25	4.639	(+) 3.5	11.746	(+) 1.3	0.341	(+)21.8				
Compound Annual Average		(+) 6.7		(+) 7.9		(+) 1.9		(+) 12.1		(+) 7.8	1.18	0.28	1.80	1.16

Source: (1) GNP. Turkish State Institute of Statistics - Monthly Economic Indicators and the Financial Times London, Supplement on Turkey dated 16.12.76 (for 1975).

(2) Energy Consumption - U.N. World Energy Supplies 1950 - 1974 Exports. Figures have been converted from coal equivalent to crude petroleum equivalent in the ratio of 1.47=1.00.

TABLE - 2 Turkey - Projection of Commercial Energy Consumption 1976 to 1982 and (In terms of million metric tons of crude petroleum equivalent.

Year	Total Energy		Liquid Fuels		Solid Fuels		Hydro-nuclear Electricity	
	Volume	Annual growth rate	Volume	Annual growth rate	Volume	Annual growth rate	Volume	Annual growth rate
1975	16.726	8.26	11.746	8.2	4.639	-	0.341	25 %
1976	18.108	"	12.709	"	4.973	7.2	0.426	"
1977	19.604	"	13.751	"	5.320	7.0	0.535	"
1978	21.223	"	14.879	"	5.738	7.9	0.666	"
1979	22.976	"	16.099	"	6.044	5.3	0.833	"
1980	24.974	"	17.419	"	6.414	6.1	1.041	"
1981	26.929	"	18.847	"	6.773	5.6	1.301	"
1982	29.153	"	20.392	"	7.135	5.3	1.626	"
1983	31.561	"	22.064	"	7.464	4.6	2.033	"
1984	34.160	"	23.873	"	7.754	3.9	2.541	"
1985	36.990	"	25.831	"	7.983	3.0	3.176	"
1986	40.045	"	27.949	"	8.126	1.8	3.970	"
1987	43.353	"	30.241	"	8.149	0.3	4.963	"