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USAID'S TECHNICAL ASSISTANCE FOR DEVELOPING A NATIONAL STRATEGY FOR TURKMENISTAN'S OIL & GAS SECTOR

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DEVELOPING A NATIONAL STRATEGY FOR TURKMENISTAN'S OIL AND GAS SECTOR

INTRODUCTION

This report describes USAID's technical assistance to the Permanent Expert Group (PEG) established by the Competent Body for the Exploitation of Hydrocarbon Resources a Government agency with broad responsibility for the oil and gas sector, in developing a "National Strategy for the Development of Hydrocarbon Resources of Turkmenistan The technical assistance was provided by Hagler Bailly Consulting, Inc under a USAID Contract No CCN-0002-Q-00-3152, Delivery Order No 17 over a period of six months ending September 30, 1998 primarily through short-term services of Dr Bhamy Shenoy a highly qualified oil and gas professional with significant strategic planning experience with an American international oil company Hagler Bailly's Resident Advisor and a Project Assistant normally resident in Ashgabat also participated in the project

By late March 1998, when Hagler Bailly was invited to provide technical assistance on National Strategy, the PEG had already developed a skeleton outline of the strategy document The document was intended to cover (1) the purpose and tasks of the National Strategy for the development of hydrocarbon resources, (2) the basic data and the main legal, political, and economic premises, and (3) a sector-by-sector analysis and development strategy It appeared that, although the study was to be very comprehensive, the approach was more long term planning oriented and the issues of strategic nature (oil and gas markets, pipelines, etc) were not being considered adequately Hagler Bailly was invited to provide comments on the outline and to provide a step-by-step procedure for strategy development The PEG was apparently uncertain as to the "technology" of strategic planning and it needed assistance in dividing the project in small, discrete, tasks that could be assigned to various PEG members

To date, Hagler Bailly has held several discussions with the PEG on the methodology and issues related to strategic planning A two-day workshop on strategic planning was organized in early August 1998 to promote open discussion of important and potentially sensitive issues between PEG members A number of documents were submitted to the PEG and these are included in the Appendix to this report A summary of Hagler Bailly's work to date is summarized in the following paragraphs

HAGLER BAILLY'S COMMENTS ON STRATEGY OUTLINE

- Dr Shenoy provided his initial comments on the National Strategy outline and suggested a nine-step procedure for conducting strategy development He later expanded his paper to include (1) a more detailed discussion of the procedure and (2) the issues and strategies Turkmenistan needed to consider to arrive at the National Strategy This paper was edited, translated, and submitted to PEG in its entirety along with a list of environmental assumptions that needed to be developed (Attachment A) Dr Shenoy also provided comments on a SWOT analysis prepared by the PEG (Attachment B)

- Dr Shenoy provided the PEG with a spreadsheet as an illustration of a long-range planning model that needed to be built and used in evaluating alternative strategies (Attachment C) The spreadsheet included four possible environmental scenarios (planning assumptions) and the resulting government revenues from the oil and gas sector

- Dr Shenoy also presented a two-hour seminar on Turkmenistan's National Strategy development About six PEG members attended the seminar The subjects covered included the nine-step procedure and the following specific strategies to overcome Weaknesses and Threats while building on the Strengths and Opportunities identified in the SWOT analysis

  — Continue to attract increasing number of world-class oil companies by offering attractive exploration and development terms to create a favorable perception in the investor community
  — Form alliances or take interest in existing or new export pipelines
  — Streamline or restructure existing oil & gas sector companies in Turkmenistan Statoil, PDVSA, and Pertamina were offered as possible models It was proposed that modern management practices be introduced to make them more efficient and entrepreneurial It was pointed out that a reorganisation need not result in manpower reduction This is a major concern of state enterprises
  — Consider the following options regarding refinery operations and investments (a) upgrade refinery yields to optimize light ends (gasoline and distillates), (b) adopt modern computer modelling to improve refinery operations, (c) seek regional marketing opportunities, and (d) consider privatizing the operations and even ownership of refineries (which could lead to greater investment as well as improved asset utilization) It was suggested that a new refinery (and significant increase in the throughput capacity of an existing refinery) might not be justified
  — For marketing, consider privatizing the marketing operations to reduce costs and subsidies It was pointed out that, if deemed necessary, the products could continue to be sold at subsidized prices even after privatization

— Consider privatization of gas distribution to improve productivity and make better utilization of assets Consider forming alliance with leading companies like Shell Exxon or Texaco or pursue some other strategy to promote the use of latest gas-to-liquid technology These liquids will be more easily exported than gas It was suggested that LNG project is most likely not economically feasible for a land-locked country such as Turkmenistan

STRATEGIC PLANNING WORKSHOP

USAID/Hagler Bailly's next significant interaction with the PEG on National Strategy was during the August 4-5, 1998 workshop Two important organizational changes in the Government occurred in the intervening period The first was the appointment of Mr Rejepbay Arazov as the Minister of Oil and Gas Industry and Mineral Resources At a later date, he was also appointed the Executive Director of the Competent Body replacing Mr T Kurbanov The leadership of the PEG on National Strategy also shifted from Mr Kurbanov to Deputy Minister Babaev The PEG members continued to work on developing strategies for their respective sectors Hagler Bailly repeatedly offered to assist them in the process, however, for reasons not known, it was not invited to participate Hagler Bailly did have an opportunity to review three initial drafts of reports describing the existing situation in the oil and gas sector, commercial oil and gas reserves, and some potential strategies Because the reports were incomplete, it was not clear if the PEG members were going to deviate significantly from their earlier "resource" driven approach to a ' market" driven approach suggested by Hagler Bailly To increase Hagler Bailly's interaction with PEG members in the planning process and to promote an open discussion of strategies, a two-day workshop on National Strategy was proposed by Hagler Bailly It was expected that in the workshop the PEG members would present their reports and openly discuss strategy issues The August 4-5, 1998 date for the workshop was selected to allow every one ample time to complete their assigned tasks Dr Shenoy offered to prepare a report on the world oil and gas markets and lead the workshop The proposed agenda for the workshop is shown in Attachment E The Attachment F is Dr Shenoy's report summarizing the results of the workshop Dr Shenoy's studies on world oil and gas markets are given in Attachment G

Hagler Bailly has not been involved in any further work on the National Strategy It is understood that the PEG members are continuing to work on strategies for their respective sectors It is expected that, at some point in time, Hagler Bailly will be invited to provide comments on these studies

ACCOMPLISHMENTS

Hagler Bailly's technical assistance is expected to positively influence the development of Turkmenistan's National Strategy for the oil and gas sector Some of the more important contributions are as follows

- The PEG members have been exposed to the complexity of the strategic planning process The differences between strategic planning and long range planning or operational planning have been pointed out The PEG members have also been exposed to scenario planning These techniques should be beneficial as the PEG members move away from centralized, resource driven, and production quota oriented planning The strategic planning involves dealing with considerable degree of uncertainty about the future and requires a high level of expertise, creativity and new approaches in dealing with such uncertainty The PEG members were given examples of companies that have developed and implemented successful strategies and they should now have a greater appreciation for the need to undertake such a planning process

- Hagler Bailly has provided a large amount of data on world oil and gas markets to the PEG members The risks associated with oil and gas sector investments were identified through discussion of historical fluctuations in crude oil prices The difficulty in predicting future oil prices was emphasized by comparison of past forecasts by energy economists with actual prices

- It was pointed out that it is not enough to have gas reserves Turkmenistan also need to develop a marketing strategy for its reserves There are other countries (in the region) with more reserves that are vying for the same markets Turkmenistan should be aware of its competitors, their cost structure, their competitive advantage, their marketing plans etc

- The methodology for evaluating economics of Turkmenbashi Refinery upgrade (with total investment of one billion dollars) was discussed using a simplified refinery economics chart The PEG members should now be able to carry out similar economic analysis of any further expansion plans It was suggested that a post audit of refinery upgrade investment might be beneficial

- The PEG members were provided with comparative economics of long-distance transmission of gas vs electricity This information may assist the PEG in evaluating strategies for export of electricity and electrification of rural communities

- During the workshop, PEG members often mentioned restructuring as the new "mantra" to solve many of the problems faced by the State oil and gas concerns in Turkmenistan

Despite the high level of expertise possessed by the Turkmen professionals the national companies failed to win in the international tender recently floated by Mobil for oil field services This has made the Government officials realize the need to strengthen these companies It was pointed out that restructuring alone would not result in more dynamic and aggressive organizations It was also necessary to adopt a new management philosophy that will impress upon the managers and employees the need to earn a minimum rate of return on assets employed

- The PEG members were already aware of their need for foreign investment in offshore Caspian region and also for deep drilling projects In the case of the former the reason is the lack of available capital and in case of the latter it is the need for latest technology They did not feel a similar need (for foreign capital or technology) for onshore exploration and production activities However, this issue is likely to be debated further

RECOMMENDATIONS

Hagler Bailly has made significant contribution to the development of a market oriented national strategy by providing the PEG with strategic planning methodology and by identifying and elaborating on many of the important issues that the PEG should consider The process of strategic planning in the Turkmen oil and gas sector is of the highest importance and continued USAID support is recommended Hagler Bailly should continue to interact with the PEG members and assist them as necessary until they have completed the present planning cycle For the long term, it is recommended that the Turkmen Government institutionalize the process of strategic planning by creating a Department within the Competent Body or the Ministry of Oil and Gas Industry It is further recommended that USAID assist in the organizational development, the training of selected individuals who will staff such an organization, and provide the services of a long term advisor, if necessary

APPENDIX A
NINE-STEP PROCEDURE TO DEVELOP NATIONAL STRATEGY

I DEFINE MISSION STATEMENT

As a working mission statement, let us assume that we have agreed upon the following mission statement

Hydrocarbon resources of Turkmenistan should be developed quickly but in an optimal manner to raise the standard of living of all the citizens in the shortest possible time

As a part of that mission statement, let us also assume that we have agreed upon the following goals as a starting point which we may decide to change as we complete the process of strategic planning

- Turkmenistan would like to export 150 billion cubic meters of gas in 2010
- Turkmenistan would like to export at least 40 million tons of oil by 2010
- Turkmenistan would like to earn at least 15% rate of return on its refining assets
- Tkmenistan would like to earn world level netbacks for its crude oil and gas exports

We should have considerable discussion on all of the above statements though concentrating our efforts more on mission statement and less on goals I want to again stress that we should define very carefully the mission statement since it is the one which will finally decide outcome of our strategic planning process

II PREPARATION OF A DISCUSSION PAPER ON STRENGTHS AND WEAKNESS OF TURKMENISTAN IN OIL & GAS SECTOR

Let us take a look at the following energy balances for Turkmeinstan, Kazakhstan and Uzbekistan

Energy Supply/Demand for Kazakhastan 1986-1996

Supply	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Oil	23 3	24 1	25	25 4	25 8	26 6	25 8	23	20 3	20 6	23
Gas	4 9	5 3	6	5 6	6	6 6	6 8	5 6	3 8	5	5 4
Coal	65	65	65	65	67 7	66 9	65 3	57 3	53 4	42 6	39 2
Nuclear	0	0	0	0	0	0 1	0 1	0 1	0 1	0	0
Hydro	0 4	0 5	0 6	0 6	0 6	0 6	0 6	0 7	0 8	0 8	0 8
Total Supply	**93 6**	**94 9**	**96 6**	**96 6**	**100 1**	**101**	**98 6**	**86 7**	**78 4**	**69**	**68 4**
Demand											
Oil	18 7	18 1	18 2	18 6	21 5	21 7	20 3	15 7	12 3	12	11 3
Gas	9 4	9 8	10 2	10 6	11 3	11 8	12 2	11 7	9 2	9 7	9 5
Coal	40 1	41 6	43 4	41 4	40 2	38 2	39 9	36 4	34 5	27 5	27 9
Nuclear	0	0	0	0	0	0 1	0 1	0 1	0 1	0	0
Hydro	0 4	0 5	0 6	0 6	0 6	0 6	0 6	0 7	0 8	0 8	0 8
Total Demand	**68 6**	**70**	**72 4**	**71 2**	**73 6**	**72 4**	**73 1**	**64 6**	**56 9**	**50**	**49 5**
Energy Balance	**25**	**24 9**	**24 2**	**25 4**	**26 5**	**28 4**	**25 5**	**22 1**	**21 5**	**19**	**18 9**

Energy Supply/Demand for Uzbekistan 1986-1996

Supply	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Oil	2 5	2 7	2 4	2 7	2 8	2 8	3 3	4	5 5	7 5	7 5
Gas	32 4	33 4	33 5	34 5	34 3	35 2	35 9	37 8	39 6	40 8	41 1
Coal	0	0	0	0	0	0	0	0	0	0	0
Nuclear	0	0	0	0	0	0	0	0	0	0	0
Hydro	0 4	0 6	0 6	0 5	0 6	0 5	0 6	0 5	0 6	0 6	0 6
Total Supply	**35 3**	**36 7**	**36 5**	**37 7**	**37 7**	**38 5**	**39 8**	**42 3**	**45 7**	**48 9**	**49 2**
Demand											
Oil	11 7	11 1	13 7	13 1	12 6	11	9 1	8 1	7 2	6 7	6 6
Gas	28 5	29 9	29 5	31 1	33 2	33 4	33 6	36 6	37 2	38 1	40
Coal	4 2	4 2	3 4	4 1	4 1	4	2 9	1 9	1 8	1 4	1 6
Nuclear	0	0	0	0	0	0	0	0	0	0	0
Hydro	0 4	0 6	0 6	0 5	0 6	0 5	0 6	0 5	0 6	0 6	0 6
Total Demand	**44 8**	**45 8**	**47 2**	**48 8**	**50 5**	**48 9**	**46 2**	**47 1**	**46 8**	**46 8**	**48 8**
Energy Balance	**-9 5**	**-9 1**	**-10 7**	**-11 1**	**-12 8**	**-10 4**	**-6 4**	**-4 8**	**-1 1**	**2 1**	**0 4**

Energy Supply/Demand for Turkmenistan 1986-1996

Supply	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Oil	5 1	5 1	5 1	5 1	5 1	5 3	5 2	3 9	3 9	3 9	4
Gas	71 1	74	74 1	75 5	73 7	70 8	50 5	54 8	29 9	27 1	29 6
Coal	0	0	0	0	0	0	0	0	0	0	0
Nuclear	0	0	0	0	0	0	0	0	0	0	0
Hydro	0	0 1	0 1	0	0 1	0 1	0 1	0	0	0	0
Total Supply	**76 2**	**79 2**	**79 3**	**80 6**	**78 9**	**76 2**	**55 8**	**58 7**	**33 8**	**31**	**33 6**
Demand											
Oil	3 5	3 5	3 5	3 5	4 4	5	4 9	3 2	3 7	3 9	3 9
Gas	12 6	12 5	12 7	13 1	8 8	8 6	8 4	8 4	9 2	7 2	7 6
Coal	0 3	0 3	0 3	0 3	0 4	0 3	0 1	0	0	0	0
Nuclear	0	0	0	0	0	0	0	0	0	0	0
Hydro	0	0 1	0 1	0	0 1	0 1	0 1	0	0	0	0
Total Demand	**16 4**	**16 4**	**16 6**	**16 9**	**13 7**	**14**	**13 5**	**11 6**	**12 9**	**11 1**	**11 5**
Energy Balance	**59 8**	**62 8**	**62 7**	**63 7**	**65 2**	**62 2**	**42 3**	**47 1**	**20 9**	**19 9**	**22 1**

A number of useful observations can be made on the above tables which may influence our strategic planning process

Uzbekistan which had a negative energy balance historically is able to achieve a balance and at the same time able to have a relatively high energy consumption level in relation to Kazakhstan and Turkmenistan both of which have been having positive energy balance

How has Uzbekistan achieved this energy balance? Since Uzbekistan does not have abundant oil reserves, it has reduced oil consumption by increasing its price Of course the price for oil products is still a long way from the international level But it is considerably higher than what it was prior to its independence However in the case of gas consumption, Uzbekistan has not adapted a similar strategy since it possesses rich gas reserves However they can conserve gas reserves, by increasing gas prices to final consumers

On a per capita basis, oil consumption in Turkmenistan is considerably high in relation to both Uzbekitsan and Kazakhstan Is it possible to reduce oil consumption by increasing prices? What are the political, economical and social implications of such a strategy? There should be no problem at least for the present to export the surplus oil to earn foreign exchange There are other ways also of reducing oil consumption Today mazut is being consumed in Turkmenistan since refineries produce them and Turkmenistan may be getting higher value for mazut by using it to

produce power However if by investing in cokers in the refineries we can reduce mazut production and use abundant supply of gas then we may improve over all economic benefits

Oil and Gas Reserves

	Proven Reserves		Potential Reserves	
	Oil (million MT)	**Gas (billion CBM)**	**Oil (million MT)**	**Gas (billion CBM)**
Azerbaijan	1000	850	3700	1000
Kazakhstan	3013	1840	11643	2493
Uzbekistan	246	1890	136	992
Turkmenistan	342	2890	4383	4475
Total	**4601**	**7470**	**19862**	**8960**

Oil and Gas Production

	1996		2010	
	Oil (million MT)	**Gas (billion CBM)**	**Oil (million MT)**	**Gas (billion CBM)**
Azerbaijan	9 1	5 9	80	20 0
Kazakhstan	23 0	6 0	100	25 0
Uzbekistan	7 5	45 7	20	60 0
Turkmenistan	4 0	32 8	35	125 0
Total	**43 6**	**90 4**	**235**	**230 0**

The above statistics (based on various sources) clearly shows the advantages of Turkmenistan both in terms of oil and gas reserves (existing and potential) with respect to many countries of the world which are trying to attract investment in oil & gas sector

With respect to other countries in Caucasus and Central Asia, Turkmenistan has another advantage in that it is the only one which has internationally accepted Petroleum Law and also production sharing model

Despite the disadvantage mentioned above and also lack of readily available transportation system to move oil and gas how has Azerbaijan and Kazakhstan succeeded in attracting many oil companies? What lessons can we learn in developing the strategy for Turkmenistan?

Let us also take a look at other countries like Mexico, Norway, Venezuela, Indonesia, India etc which have varying degree of success in developing hydrocarbon resources Contrast between

Mexico and Norway is really striking Though Mexico s oil industry is quite old and it has larger reserves than Norway and can also benefit more because of huge population both are producing similar amount of oil today Though Mexico had the advantage of rich market of US for its gas reserves which it could supply easily through pipelines in relation to Norway which had to depend upon subsea pipelines it is Norway which has greater success in exporting gas

India despite having proper legal and regulatory environment and also very attractive exploration terms has failed dismally to attract foreign investment in oil & gas sector

Both Indonesia and Venezuela have been very successful in attracting foreign investment on their terms In the case of Venezuela this has happened despite the fact it is the country which had nationalized the oil industry only few years back and also it cots a lot to develop their heavy oil reserves

While preparing this paper, we need to be brutally frank and open in trying to take an honest look at the true or the perceived problems faced by the prospective investors in Turkmenistan Let us try to answer the following questions?

1 Turkmenistan may have a good petroleum law and also good production sharing model But is the decision making transparent? Second once the terms are accepted, will the government stick to them?

2 Are the terms offered by the government attractive in relation to other countries?

3 How much interference is there from the government in day to day operations?

4 Is there an independent oil & gas regulatory body to set rules and monitor them ? How independent is that body?

5 What has been the experience of those oil companies which have been operating there?

Sometimes even if answers to all of the above questions are in the negative, oil companies may still be interested if it is perceived by them that there is money to be made However if a country can establish good reputation, then not only will it succeed in attracting foreign investment but on terms which are attractive to the government

This paper should also deal with the short and long term man power requirement of oil & gas sector What steps should be taken to improve the technical skills of the people in all different fields (engineering, accounting, managerial , information, etc)

This paper should also deal with the optimum strategy of supplying the goods and services needed for exploration and production activities

III PREPARATION OF A DISCUSSION PAPER ON WORLD OIL AND GAS MARKETS

This is relatively easy to prepare since many reports published by Department of Energy(DOE) of the USA as well as by International Energy Agency (IEA) are available

Forecasting of future world crude oil prices with any kind of accuracy is an extremely difficult exercise

When we take a look at earlier forecasts of the world oil prices it clearly shows that analysts are always influenced by the existing conditions and they project that today's conditions will prevail forever In early 70's before the first oil shock, most of the forescts were projecting that crude oil prices will be around $3 00 per barrel for the next 15 years This was the generally accepted projected despite the fact that OPEC had been able to get some concessions from the international oil companies Once the price went up in 1973 again the forecasts were for the crude oil to remain at $12 to 13 per barrel for the next 15 years However after the second oil shock, crude oil forecasts were being revised every quarter to reflect the latest quantum jumps in the world crude oil prices Almost every one was projecting that crude oil prices will always increase in real terms for the foreseeable future According to one such forecast crude oil price was projected to be more than $200 per barrel (in today s dollar) by 1990 -95 After 1986 when prices collapsed, now all the price forecasts show that they will be around $20 per barrel for the next few years

What confidence can we have in them ? Therefore it is better to have scenario planning by assuming three or four very distinct forecasts

1 Crude oil prices will remain around $ 20 per barrel till 2010 OPEC will just muddle through

2 Crude oil prices will fall to $10 to 12 per barrel within the next two or three years and then will go to $ 20 per barrel and then increase in real terms at 2% per year First OPEC will lose control, but it will regroup (even Mexico or some other coutries joining) and be able to control the market

3 Crude oil prices will remain at current level for the next three years and then increase to $ 30 per barrel and then remain at that level in real terms Some kind of price shock similar to the first two oil shocks

4 Crude oil prices will fluctuate widely for the next ten years widely within a broad brand of $10 to 20 per barrel showing that OPEC is unable to control the production

It is possible we may be able come up with some more possible scenario We need to test the robustness of our strategy under all these price scenarios

Similar to the oil price forecasts we need to come up with gas price forecasting Now there is additional level of complexity in this since we need to make a prediction of the relation between oil and gas prices

a Will gas prices command a premium over distillate? (this was the case soon after the second oil shock It was felt at during that time that we are running out of gas and it should be considered as noble fuel and gas should not be burnt under boiler)

b Will gas price equate with distillate price?

c Will gas price equate with fuel price with or without premium?

We need to quantify in this paper the potential market in Western Europe Central Europe Balkan, Turkey, Iran , Pakistan and India

IV PREPARATION OF DISCUSSION PAPER ON INFRASTRUCTURE

As a starting point I have given below some of the oil & gas pipelines along with a very brief account of the political or economical problems

1 ***Tengiz to Novorossiysk to Rotterdam through Bosporous*** This 940 miles pipeline costing about $ 2 0 billion will move crude oil from Tengiz field in Kazakhstan to Novorossiyk a Russian port on the black sea Promoter of the pipeline is Caspian Pipeline Consortium The drawback of this pipeline is the continuing dependence of Kazakhstan on Russia

2 ***Baku to Supsa to Rotterdam through Bosporous*** This 550 miles pipeline with a throughput of 5 million tons will move the so called " early crude " from Azerbaijan Promoter is Azerbaijan International Operating company (AIOC) Because of the possible environmental problem connected with the ships travelling through the already crowded Bosporous, Turkey has been raising objections regarding this pipeline Turkey wants the pipeline to go to the Turkish port of Ceyhan on Mediterranean There is a need to build a new pipeline if more oil has to be transported

3 ***Baku to Georgia to Ceyhan to Rotterdam.*** Promoter is AIOC with the support of Georgian and Turkish government Political problem with Abkhazia in Georgia and also the problem of Kurdish unrest in Turkey may hinder the development of this project There are some variations of this route of going through Armenia to Ceyhan without going through Georgia But this again has the political problem of historical enmity between Armenia and Azerbaijan

4 ***TransBalkan Pipeline project to move crude oil from Eastern coast of the Black Sea to Bulgarian port at Burgas and then on to the Greek Port of Alexandroupolis*** A new 350 miles pipeline has to be built between Burgas and Alexandroupolis This alternative is promoted by Russia to overcome the objection of Turkey regarding Bosporous This can be affected by Abkhazian unrest in Georgia

5 ***Baku to Iran to Persian Gulf to Japan or Rotterdam.*** This is one of the most efficient routes But this project is not getting any support from trans-national companies because of the US embargo on doing business with Iran

6 ***Baku to Novorossiysk to Rotterdam through Bosporous*** Promoter of 850 miles pipeline project to move " early crude " is AIOC This pipeline despite the initial problems with Chechenya has started to function since November of this year However the capacity of this pipeline is limited at present Another drawback is the continuing dependence of Azerbaijan on Russia and also the environmental objection by Turkey

7 ***Turkmenistan to Afghanistan to Pakistan to Japan both to transport oil as well as gas*** Promoters of this project are Unocal and Delta Pipeline of 1000 miles will have a capacity of 50 million tons and is expected to cost about $3 0 billion The progress of this pipeline is hindered by the unrest in Afghanistan

8 ***Caspian to China's Eastern coast to Japan*** Promoter of this pipeline is Chinese National Petroleum Company along with Mitsubishi and Exxon This pipeline is expected to cost about $ 8 to 12 billion and does not have good economics

9 ***Trans Caspian Pipeline to move oil and gas to Baku*** There is also a proposal to build pipelines under the Caspian to move crude oil and gas from Kazakstan and Turkmenistan to Azerbaijan and then to move oil through Georgia to Ceyhan In the case of gas it will be moved from Turkey to Europe through the balkan countries

10 ***Chinese pipeline to move oil from western Kazakhstan into western China*** From Uzen field in Western Kazakhstan to Chinese border and then to Chinese province of Xinjiang Though this project is not attractive economically, it is strategically important both to China (a new ally and a new source of crude oil) and to Kazakhstan (a new market where it does not have to depend upon the big brother Russia) There is the problem of unrest of Uighur ethnic minority who are in this Chinese province as well as in the eastern part of Kazakhstan

These pipelines have become another version of New Great Game and the table below shows how different countries look at them For some countries, construction of certain pipelines have become a zero sum game as can be seen from the following table

	Countries												
Pipeline Alternatives													
	Kazakh	**Uzbekist n**	**Turkmen**	**Azerbaijan**	**Iran**	**USA**	**Russia**	**Turkey**	**Georgia**	**China**	**India & Pak**	**OPEC**	**EU**
Tengiz Novorossiysk	W	W	W	W/L	L	W	W	L	L	L	N	L	W
West of Kazak to China	W	W	W	N	L	W	L	L	L	W	N	L	W
South Asia (UNOCAL)	W	W	W	W	L	W	L	L	L	N	W	L	W
Iran to PG (OIL)	W	W	W	W	W	L	L	L	L	N	W	L	W
Baku to Novorossivsk	L	N	N	W	L	W	W	L	L	N	N	L	W
Baku to Batumi	W	N	W	W	L	W	L	L	W	N	N	L	W
Baku to Georgia to Ceyhan	W	N	W	W	L	W	L	W	W	N	N	L	W
Trans-Caspian to Ceyhan	W	W	W	W	L	W	L	W	W	L	N	L	W
Novorossiysk to Greek Port	W	W	W	W	L	W	W	L	L	L	N	L	W

Since of all the factors that will have the maximum impact on the strategy, this factor of export pipeline will have the greatest impact Especially in the case of gas exploitation, availability of pipeline is the single most important strategic factor In fact, it can be argued that many foreign oil companies might not have shown interest yet in investing in Turkmenistan because of the lack of a viable pipeline to transport gas to the export market

This paper besides dealing with the economics and geo-politics of each pipeline alternative should also deal with possible steps Turkmenistan governmnet can undertake with other governments, The World Bank, EBRD, Asian Development Bank etc Just as an example let me deal with UNOCAL pipeline that now seems to be on hold because of Afghanistan, how Turkmenistan can try interest government of India in this pipeline In fact India should be as much interested in getting environmentally suitable energy at lowest possible cost as Turkmenistan is interested in finding a market for its gas

Of all the different pipeline alternatives mentioned above, the most efficient pipeline projects are the ones going through Iran for oil and to Pakistan and India for gas and oil These are the ones which can help India in getting both crude oil and gas to meet the strategic needs of diversifying energy imports as well as to minimize energy costs But to exploit this strategic advantage, India has to rethink its relationship with Pakistan which it can do without affecting its position on Kashmir Western countries through the lending institutions like the World Bank, Asian Bank,

European Bank For Reconstruction and Development etc can also play a significant role in promoting these and other pipelines where the trans-national oil companies my not come forward because of the high risk involved

Until the relationship between Iran and the US improves the chances of the Iranian pipeline being built despite its economic attractiveness are not very bright Similarly if the Pakistani gas pipeline has to depend only upon the Pakistan gas market its chances are also not all that bright It is here India can play a major role in this New Great Game whereby not only will it be able to help Turkmenistan but also be able to get a new and economic source for securing gas

A natural and obvious strategic question that will be raised regarding the pipeline that will be built through Pakistan, is how can India rely upon a pipeline that can be shut off anytime by Pakistan By depending upon such a pipeline for a strategic commodity like gas India will be jeopardizing its national security There are a number of steps India and Turkmenistan together can take to get over this problem

First, India should try to get a commitment from Turkmenistan that if Pakistan shuts off the gas supply to India, Turkmenistan will shut off the gas supply to Pakistan also

Second, India as a precautionary step should build up strategic gas reserves to get over the possible consequences of losing gas coming through the Pakistani pipeline In addition for big gas users like the power plants, there should be facilities to use fuel oil These additional costs can be easily recovered by negotiating a slightly lower gas cost Because of the strategic nature of the contract, Turkmenistan can consider providing for this additional cost to India by discounting the gas price

Third, India and Turkmenistan should consider getting commitment from the governments of the trans-national oil companies who are participating in this pipeline that when Pakistan shuts off the gas to India that they will put embargo on their trading activities with Pakistan For example in the case of Unocal pipeline the two governments concerned are that of the USA and Saudi Arabia If these two countries were to put trade embargo on Pakistan, it will think twice before cutting off the gas supply to India If India can secure all these guarantees, then it can take the calculated risk of getting gas supplies from a pipeline coming through Pakistan

Some of the guarantees suggested above may look very outlandish today and not very practicable However when we consider the enormous benefits of this project which can bring prosperity to a developing country like Turkmenistan and help solve the energy problems of India and Pakistan, then one should think of unconventional solutions to overcome the natural security worries of India

During the strategic planning exercise, one has to think in an unconventional way to dream of all possible ways of trying to find solutions to problems

Besides the export pipelines, this paper should also deal with the existing infrastructure to transmit and distribute oil and gas Besides the investment and physical assets one also has to consider what is the best way to manage them to get maximum advantage to the country What kind of an organizational structure is required to get maximum productive use of these assets ? Since these are natural monopolies we also need to consider the appropriate regulatory structure and tariff fixing mechanism in managing them

V PREPARATION OF ENERGY SUPPLY/DEMAND TO 2015

At present(based on 1996) total energy demand of Turkmenistan is 11 5 million tons of oil equivalent, oil consumption of 3 9 million tons and gas consumption of 7 6 million tons of oil equivalent What is it likely to be in 2015 ? It depends upon a number of factors like future GNP growth, energy pricing, type of industry growth, population growth etc Different ways could be used to arrive at future energy demand But it has implication in terms of investment for oil & gas sector as mentioned earlier

For example if we decide to use only gas for power generation and release mazut for export market or completely eliminate mazut by investing in cokers, then oil demand will be less and gas consumption will be more

Since there is good demand for LPG in the export market (specially in Georgia) we should try to substitute the use of LPG by supplying gas even more extensively Of course we need to balance the cost of expanding gas pipeline system versus incremental gains secured by exporting LPG

Here again we can forecast energy demand for different scenarios as shown below

1 GNP growth of 8% per year Prices at consumption level at 70 to 80 % of international level Use of Mazut and LPG to be replaced by gas

2 GNP growth of 5% per year Prices at consumption level at 50% of the international level No substitution of Mazut or LPG

3 GNP growth at 8 to 10 % per year Prices to be decided freely by the market forces

VI DISCUSSION PAPER ON RESTRUCTURING EXISTING OIL & GAS INSTITUTIONS

1 Give a brief description of the existing oil & gas sector institutions

2 Try to develop some criteria to measure the productivity of the existing institutions

3 Come up with recommendations to improve productivity of the existing institutions

No doubt all the existing institutions in oil & gas sector today meet certain social goals in that they provide employment to some people besides producing goods or services Refineries though have 12 million tons of design capacity are run at less than 50% of its capacity Service stations meet the fuel requirements of vehicles though at highly subsidized prices Institutions connected with production, exploration, pipeline, etc are operating at some efficiency level Are they operating at maximum efficiency level ? We do not need any study to conclude that we can increase their efficiency and utilization of their assets considerably This paper should deal with all these subjects

VII DEVELOPING VARIOUS STRATEGIES TO ACHIEVE THE MISSION

This paper which is the heart of the entire strategic planning process should deal with the development of arriving at different strategies

To some extent subsidiary strategies dealing with refining, marketing, gas distribution marketing, restructuring etc which have indirect and sometimes direct impact have been dealt under various steps described above

Here we deal with oil & gas exploration and production strategies exclusively

Should we emphasize rehabilitation projects over discovering new reserves?

Should we give higher priority to offshore over onshore exploration?

Should the government be indifferent and allow the oil companies to make the choice?

What role be assigned to the national oil company in the short and long term? If the national oil companies are unable to make decisions fast and may turn out to be obstacles in the quick development of the reserves, should the foreign companies be given 100% interest and as the national oil companies become efficient, be given the opportunity to participate as joint venture partners?

Should oil exploration be given higher priority over gas exploration?

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Using computer models enough expertise should be developed to get a feel for what kind of producing terms can be offered to attract foreign investment In the beginning it may be advantageous to give some attractive terms to the investors Once Turkmenistn succeeds in attracting investors, then the terms could be tightened to improve the share of the government This was the apparent strategy adapted by Norway

It may be worth taking a look at the strategy of Azerbaijan and Kazakhstan to see if a similar or a modified strategy can be developed by Turkmenistan to get maximum advantage Azerbaijan has used the consortium AIOC very successfully in developing its strategy AIOC will have greater clout in developing an optimum pipeline route than just one or two companies Of course there is disadvantage in that the consortium may succeed in driving a hard bargain This is indeed a strategic move on the part of Azerbaijan for some other geo-political reason Kazakhstan did not use this strategy in the beginning while awarding the acreage in the case of Tengiz or Karcahaganak or Uzen fields However in the case of Caspian offshore it is leaning towards the consortium approach

VIII CONSTRUCTING DIFFERENT SCENARIOS BASED ON THE STRATEGIES OUTLINED ABOVE

Once various possible strategies are developed, attempt should be made to predict what is likely to be oil and gas development activities Then, combining with the information available form earlier steps (like oil and gas pricing, markets, transportation system etc)
resultant cash flow should be computed for different strategies

XI CHOOSING A STRATEGY USING THE INFORMATION DEVELOPED IN STEP VIII

It is in here, comes the most difficult step of choosing a strategy or a combination of strategies to achieve the mission Choice of a strategy is based on multiple criteria, both implicit and explicit Often, the tendency is to recommend that strategy which will generate the highest cash flow since that will produce higher GNP than other strategies by definition However, a decision maker who has to weigh different criteria may choose a different strategy which on the surface may look less than optimum It is important that the analyst who has the luxury of going through all the steps of the strategic planning process should inform the decision maker on all the pertinent details behind each of the strategy It is only after the decision maker feels comfortable with all the necessary details and has a good understanding of all the nuances, a final choice of the strategy should be made

APPENDIX B
SWOT ANALYSIS

Strengths

1. Considerable hydrocarbon reserves and a potential of additional exploration
2. Stable political environment
3. Modern legislative base
4. Moderate pace of economic reforms
5. Readiness of the petroleum industry management to overcome difficulties and undertake reforms for development and strengthening of the industry
6. Highly qualified workforce and engineering base
7. Low cost of exploration and production as a competitive factor
8. Reasonably well developed internal gas pipeline distribution system

Weaknesses

1. Lack of direct access to the market place
2. Lack of access to pipelines
3. Decrease in level and volume of exploration of hydrocarbon reserves
4. Unidentified role and prospects of the national producers
5. Lower productivity & lack of entreprenuership in the existing oil & gas sector institutions
6. Low asset base (material) of the industry
7. Social burden (subsidies) carried by the industry
8. Remaining internal risk of economic recession
9. Low internal demand
10. Lack of long-term plan of industry development
11. Existing difficulties of the transition period, which can halt the process of reforms
12. Insufficient experience in international marketing and management
13. Lack of proper perception on the part of outside investors regarding the profit making potential in Turkmenistan

Opportunities

1. Increasing world demand of gas due to global economic growth
2. Increasing world demand of gas due to environmental requirements

Threats

1. Political instability in the neighboring countries
2. Competition with large producers and their cartels in all prospective markets

	Strengths		Weaknesses
1	Considerable hydrocarbon reserves and a potential of additional exploration	1	Lack of direct access to the market place
3	Desire on the part of Turkey Ukraine and W Europe to diversify their supply sources of gas	3	Geographical borders with the largest energy producers
4	Regional investment boom in Caspian	4	Uncertain world crude oil markets and prices
5	Alliance with big oil companies	5	Non-regulated status of China
6	Limited opportunities of the biggest countries-competitors to satisfy the demand at the prospective markets, such as due to political problems (Iran)	6	High level of capital expenditures for the development of infrastructure
6	Attraction of modern technologies and increase in production efficiency	7	High cost of transit fees for transportation
		8	Underdeveloped infrastructure of consumption at one group of prospective markets (China, Pakistan and to a lesser degree, Turkey) and tough competition at others (Europe Ukraine Turkey)
		9	Increasing global competition in attracting investments
		10	Increase in energy production among potential competitors (Uzbekistan Azerbaijan and Kazakhstan)

APPENDIX C
LONG-RANGE PLANNING MODEL FOR TURKMENISTAN TO FORECAST CASHFLOWS

LONG RANGE PLANNING MODEL FOR TURKMENISTAN

Forecast of asset utilization, Cash Flow and Investment

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
World Brent $/B	15 00	15 00	15 00	15 00	15 00	15 63	16 26	16 88	17 50	18 12	18 74	19 36	20 00
Discount	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00
Trans-Cost	7 00	7 00	7 00	7 00	7 00	4 00	4 00	4 00	4 00	4 00	4 00	4 00	4 00
Export	7 00	7 00	7 00	7 00	7 00	10 63	11 26	11 88	12 50	13 12	13 74	14 36	15 00
Domestic	7 00	7 00	7 00	7 00	7 00	10 63	11 26	11 88	12 50	13 12	13 74	14 36	15 00
Domestic - $/1000 Cubic meters													
Residential	5 00	5 00	5 00	5 00	5 00	22 09	25 05	27 97	30 89	33 80	36 72	39 64	42 65
Commercial	5 00	5 00	5 00	5 00	5 00	22 09	25 05	27 97	30 89	33 80	36 72	39 64	42 65
Industrial	5 00	5 00	5 00	5 00	5 00	22 09	25 05	27 97	30 89	33 80	36 72	39 64	42 65
Export													
CIS	32 00	32 00	32 00	32 00	32 00	49 09	52 05	54 97	57 89	60 80	63 72	66 64	69 65
Iran	15 00	15 00	15 00	15 00	15 00	32 09	35 05	37 97	40 89	43 80	46 72	49 64	52 65
Turkey													
Other													

Product Prices	World	Export	Domestic
Gasoline	150	100	
Diesel	145	95	
Kerosene	150	100	
Bitumen			
LPG	125	75	
Mazut	60	20	
Other			

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2020
EXPLORATION MODULE													
National Oil Companies													
Exploration Investment													
Reserves discovered													
Oil %													
Gas %													
Beg Oil Reserves													

LONG RANGE PLANNING MODEL FOR TURKMENISTAN

Oil production
Oil discovered
Ending Oil reserves
Beg Gas reserves
Gas Production
Gas Discoveries
Ending Gas Reserves

Foreign Oil Companies
Exploration Investment
Reserves Discovered
Oil %
Gas %
Beg Oil Reserves
Oil Production
Ending Oil Reserves
Beg Gas Reserves
Gas Production
Ending Gas Reserves

National & Foreign Oil Companies
Exploration Investment
Reserves Discovered
Oil %
Gas %
Beg Oil Reserves
Oil Production
Ending Oil Reserves
Beg Gas Reserves
Gas Production
Gas Discoveries
Ending Gas Reserves

LONG RANGE PLANNING MODEL FOR TURKMENISTAN

PRODUCTION MODULE

National Oil Companies
Oil Production
Sales-Domestic
Sales-Export
Oil Revenues-Domestic
Oil Revenues Export
Total Oil Reserves
Gas Production
Gas Sales-Domestic
Domestic-Residential
Domestic-Commercial
Domestic-Industrial
Domestic-Power
Gas Revenues
Domestic-Residential
Domestic-Commercial
Domestic-Industrial
Domestic-Power
Domestic Gas Revenues
Gas-Export
Iran
Turkey
Russia
Ukraine
Other CIS
Pakistan
India
China
Europe
Other
Gas Revenues
Iran

LONG-RANGE PLANNING MODEL FOR TURKMENISTAN

Turkey
Russia
Ukraine
Other CIS
Pakistan
India
China
Europe
Other
Export Gas Reserves
Total Oil & Gas Revenues
Production Cost
Depreciation
Income Tax
Cashflow

Foreign Oil Companies
Oil Production
Sales-Domestic
Sales-Export
Oil Revenues-Domestic
Oil Revenues-Export
Total Oil Revenues
Gas Production
Gas Sales-Domestic
Domestic-Residential
Domestic Commercial
Domestic-Industrial
Domestic-Power
Gas Revenues
Domestic-Residential
Domestic-Commercial
Domestic-Industrial
Domestic-Power

LONG-RANGE PLANNING MODEL FOR TURKMENISTAN

Domestic Gas Revenues

Gas-Export
Iran
Turkey
Russia
Ukraine
Other CIS
Pakistan
India
China
Europe
Other

Gas Revenues
Iran
Turkey
Russia
Ukraine
Other CIS
Pakistan
India
China
Europe
Other

Export Gas Revenues

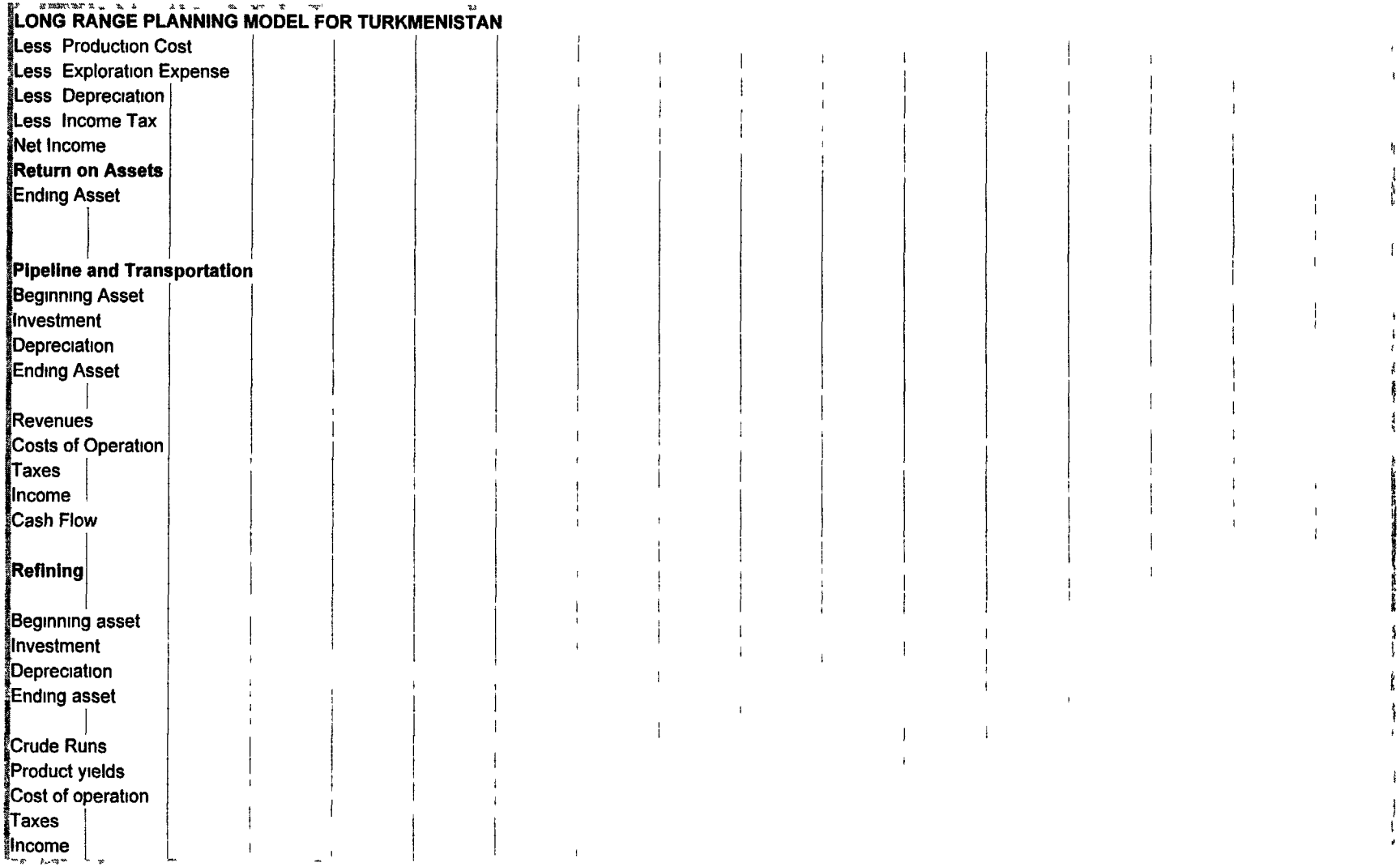
Total Oil & Gas Revenues

Production Cost
Govt Share

TOTAL CASHFLOW

EXPLORATION & PRODUCTION (National Oil Companies)

Beginning Asset
Investment
Revenues


LONG RANGE PLANNING MODEL FOR TURKMENISTAN
Less Production Cost
Less Exploration Expense
Less Depreciation
Less Income Tax
Net Income
Return on Assets
Ending Asset
Pipeline and Transportation
Beginning Asset
Investment
Depreciation
Ending Asset
Revenues
Costs of Operation
Taxes
Income
Cash Flow
Refining
Beginning asset
Investment
Depreciation
Ending asset
Crude Runs
Product yields
Cost of operation
Taxes
Income

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LONG RANGE PLANNING MODEL FOR TURKMENISTAN

Cash Flow

Marketing

Beginning asset
Investment
Depreciation
Ending asset

Revenues
Cost of operation
Taxes
Income
Cash Flow

Total Turkmenistan Petroleum Operations

Beginning asset
Investment
Depreciation
Ending asset
Income
Return on asset
Cash Flow

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APPENDIX D
CASHFLOWS FOR FOUR SCENARIOS USING THE LONG-RANGE PLANNING MODEL

LONG RANGE PLANNING MODEL FOR TURKMENISTAN

Forecast of asset utilization Cash Flow and Investment

SCENARIO I (BASE CASE)

Assumptions														
GNP Growth	2 to 3% per yr		5% per yr		8 to 9% per yr									
Inflation	20% for 5 yrs Then falling to 10%				20% in 98 then increasing to 50% for next 5 yrs Then falling to 20%									
Exchange Rate	1$ 5300 Manats in 98 Later it will reflect the exchange differential between US of 2% per yr and that of Turkmenistan													
Crude oil price ($/B)	$15/B for next 5 yrs Reaching $20/B in 2010						$15/B in 98 falling to $10/B in 99 and staying at that for next 7 yrs							
	and then to $20/B by 2010 gradually						$20/B in 99 and increasing to $35/B by 2010							
World Brent $/B			15 00	15 00	15 00	15 00	15 00	15 63	16 26	16 88	17 50	18 12	18 74	19 36	20 00
Discount			1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00
Trans Cost			7 00	7 00	7 00	7 00	7 00	4 00	4 00	4 00	4 00	4 00	4 00	4 00	4 00
Export			7 00	7 00	7 00	7 00	7 00	10 63	11 26	11 88	12 50	13 12	13 74	14 36	15 00
Domestic			7 00	7 00	7 00	7 00	7 00	10 63	11 26	11 88	12 50	13 12	13 74	14 36	15 00
Gas Prices															
Domestic $/1000 Cubic meters															
Residential			5 00	5 00	5 00	5 00	5 00	22 09	25 05	27 97	30 89	33 80	36 72	39 64	42 65
Commercial			5 00	5 00	5 00	5 00	5 00	22 09	25 05	27 97	30 89	33 80	36 72	39 64	42 65
Industrial			5 00	5 00	5 00	5 00	5 00	22 09	25 05	27 97	30 89	33 80	36 72	39 64	42 65
Export															
CIS			32 00	32 00	32 00	32 00	32 00	49 09	52 05	54 97	57 89	60 80	63 72	66 64	69 65
Iran			15 00	15 00	15 00	15 00	15 00	32 09	35 05	37 97	40 89	43 80	46 72	49 64	52 65
Turkey															
Other			0	0	0	0	35 20	53 99	57 26	60 47	63 68	66 89	70 10	73 31	76 62
Product Prices		World	Export	Domestic											
Gasoline			150	100											
Diesel			145	95											
LPG			125	75											
Mazut			60	20											
Other															
		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2020
EXPLORATION AND PRODUCTION															
Oil Production															
National Company			6	6	6	6	6	7	7	8	8	9	10	10	10
Foreign Company			1	1	2	2	3	8	9	10	12	14	16	18	20
Gas Production															
National Company			30	30	35	35	40	55	60	70	70	70	70	70	70
Foreign Company			0	0	0	0	5	5	10	15	20	25	30	30	30
Oil Sales Domestic			4 00	4 20	4 41	4 63	4 86	5 11	5 36	5 63	5 91	6 21	6 52	6 84	7 18
Oil Sales Export			3 00	2 80	3 59	3 37	4 14	9 89	10 64	12 37	14 09	16 79	19 48	21 16	22 82
Gas Sales Domestic			8 5	8 93	9 37	9 84	10 33	10 85	11 39	11 96	12 56	13 19	13 85	14 54	15 26
Gas Sales Export			21 50	21 08	25 63	25 16	34 67	49 15	58 61	73 04	77 44	81 81	86 15	85 46	84 74
Revenues from Public Sector															
Oil Revenues			315 00	315 00	315 00	315 00	315 00	558 08	591 15	712 80	750 00	885 60	1030 50	1077 00	1125 00
Gas Revenues			696 50	685 03	832 98	820 33	967 04	2372 78	2781 47	3490 87	3678 99	3866 31	4052 77	4238 35	4429 58

Cost of operation	240 00	255 00	295 00	295 00	360 00	525 00	590 00	695 00	750 00	820 00	890 00	920 00	950 00

Revenues			771 50	745 03	852 98	840 33	922 04	2405 85	2782 62	3508 67	3678 99	3931 91	4193 27	4395 35	4604 58
Revenues from Private Sector															
Oil Revenues			52 50	52 50	105 00	105 00	157 50	637 80	760 05	891 00	1125 00	1377 60	1648 80	1938 60	2250 00
Gas Revenues			0 00	0 00	0 00	0 00	176 00	269 97	572 55	906 98	1273 51	1672 13	2102 86	2199 16	2298 56
Cost of operation			15 00	15 00	30 00	30 00	70 00	145 00	185 00	225 00	280 00	335 00	390 00	420 00	450 00
Net Revenue			37 50	37 50	75 00	75 00	263 50	762 77	1147 60	1572 98	2118 51	2714 73	3361 66	3717 76	4098 56
Govt Share		0 65	24 38	24 38	48 75	48 75	171 28	495 80	745 94	1022 44	1377 03	1764 58	2185 08	2416 54	2664 06
TOTAL REVENUES			795 88	769 40	901 73	889 08	1093 32	2901 65	3528 56	4531 11	5056 02	5696 48	6378 35	6811 89	7268 65
		TOTAL													
Revenues from other operations															
Pipeline distribution															
Refining															
Marketing															
Other															
TOTAL REVENUES		46622 11	795 88	769 40	901 73	889 08	1093 32	2901 65	3528 56	4531 11	5056 02	5696 48	6378 35	6811 89	7268 65
Exploration Investment		500 00	20 00	20 00	20 00	20 00	20 00	50 00	50 00	50 00	50 00	50 00	50 00	50 00	50 00
Developmental Expenditure		1615 00	50 00	50 00	75 00	100 00	100 00	120 00	120 00	150 00	150 00	175 00	175 00	175 00	175 00
Net Revenues	**$18,724**	**44507 11**	**725 88**	**699 40**	**806 73**	**769 08**	**973 32**	**2731 65**	**3358 56**	**4331 11**	**4856 02**	**5471 48**	**6153 35**	**6586 89**	**7043 65**
	NPV at 10%														

Assumptions
Domestic crude oil price is equal to export netback
Turkmen crude is expected to be discounted by $1 00 from Brent Crude This may be optimistic if it has to be sold in the Persion Gulf Market
The first few years of crude transportation cost is based on rail/marine amounting to $7 00/B If swap can be arranged with Iran then it will be considerably less
After five years some export pipeline access with $4 00/B of cost is assumed
Gas netback for residential commercial and industrial is assumed to be the same at $5 00/1000 cbm When the domestic crude price increases gas netback changes using the following formula
New Gas Price = Old gas price + (New oil price Old oil price)/ 6 * 35 3 * 0 8
Gas export netback to CIS market is assumed to be $32 00/1000 cbm for the first five years When the export crude oil price goes up it will change using the following formula
New Gas Price = Old gas price + (New oil price Old oil price)/ 6 * 35 3 * 0 8
Gas netback to OTHER markets is 10% more than that of the netback realized in CIS market
Iranian gas netback for the first five years is assumed to be $15/1000 cbm
Domestic gas and oil sales are forecast to increase at the rate of 5% per year
Domestic crude and gas requirements are met from the national production
Operating cost is assumed to be $15 per ton of oil and $5 per 1000 cbm
National exploration and developmental expenditures have been assumed These are likely to be higher to maintain production rates
Revenues generated by the foreign national companies are assumed to be generated in the ratio of 65 to 35 Though this is quite realistic in the beginning years as the companies recover their costs the government may get less revenues This is not reflected
No attempt is made to forecast the cash flows from other sectors like refining marketing and pipelines They are likely to be drain on the sector

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LONG RANGE PLANNING MODEL FOR TURKMENISTAN

Forecast of asset utilization, Cash Flow and Investment

SCENARIO II (LOW CASE)

Assumptions														
GNP Growth	2 to 3% per yr	5% per yr	8 to 9% per yr											
Inflation	20% for 5 yrs Then falling to 10%	20% in 98 then increasing to 50% for next 5 yrs Then falling to 20%												
Exchange Rate	1$ 5300 Monats in 98 Later it will reflect the exchange differential between US of 2% per yr and that of Turkmenistan													
Crude oil price ($/B)	$15/B for next 5 yrs Reaching $20/B in 2010	$15/B in 98 falling to $10/B in 99 and staying at that for next 7 yrs												
	and then to $20/B by 2010 gradually	$20/B in 99 and increasing to $35/B by 2010												
World Brent $/B		15 00	10 00	10 00	10 00	10 00	10 00	10 00	10 00	12 00	14 00	16 00	18 00	20 00
Discount		1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00
Trans Cost		7 00	7 00	7 00	7 00	7 00	4 00	4 00	4 00	4 00	4 00	4 00	4 00	4 00
Export		7 00	2 00	2 00	2 00	2 00	5 00	5 00	5 00	7 00	9 00	11 00	13 00	15 00
Domestic		7 00	2 00	2 00	2 00	2 00	5 00	5 00	5 00	7 00	9 00	11 00	13 00	15 00
Gas Prices														
Domestic $/1000 Cubic meters														
Residential		5 00	5 00	5 00	5 00	5 00	19 12	19 12	19 12	28 53	37 95	47 36	56 77	66 19
Commercial		5 00	5 00	5 00	5 00	5 00	19 12	19 12	19 12	28 53	37 95	47 36	56 77	66 19
Industrial		5 00	5 00	5 00	5 00	5 00	19 12	19 12	19 12	28 53	37 95	47 36	56 77	66 19
Export														
CIS		32 00	21 73	21 73	21 73	21 73	21 73	21 73	21 73	26 08	30 43	37 31	46 72	56 13
Iran		15 00	15 00	15 00	15 00	15 00	15 00	15 00	15 00	24 41	33 83	43 24	52 65	62 07
Turkey														
Other		0	0	0	0	23 91	23 91	23 91	23 91	28 69	33 47	41 04	51 39	61 75
Product Prices	World	Export	Domestic											
Gasoline		150	100											
Diesel		145	95											
LPG		125	75											
Mazut		60	20											
Other														
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2020
EXPLORATION AND PRODUCTION														
Oil Production														
National Company		6	6	6	6	6	7	7	8	8	9	10	10	10
Foreign Company		1	1	2	2	3	8	9	10	12	14	16	18	20
Gas Production														
National Company		30	30	35	35	40	55	60	70	70	70	70	70	70
Foreign Company		0	0	0	0	5	5	10	15	20	25	30	30	30
Oil Sales Domestic		4 00	4 20	4 41	4 63	4 86	5 11	5 36	5 63	5 91	6 21	6 52	6 84	7 18
Oil Sales Export		3 00	2 80	3 59	3 37	4 14	9 89	10 64	12 37	14 09	16 79	19 48	21 16	22 82
Gas Sales Domestic		8 5	8 93	9 37	9 84	10 33	10 85	11 39	11 96	12 56	13 19	13 85	14 54	15 26
Gas Sales Export		21 50	21 08	25 63	25 16	34 67	49 15	58 61	73 04	77 44	81 81	86 15	85 46	84 74
Revenues from Public Sector														
Oil Revenues		315 00	90 00	90 00	90 00	90 00	262 50	262 50	300 00	420 00	607 50	825 00	975 00	1125 00
Gas Revenues		696 50	489 19	590 39	582 55	682 98	1153 52	1260 77	1476 61	1853 08	2235 83	2762 53	3424 42	4094 66

Cost of operation			240 00	255 00	295 00	295 00	360 00	525 00	590 00	695 00	750 00	820 00	890 00	920 00	950 00
Revenues			771 50	324 19	385 39	377 55	412 98	891 02	933 27	1081 61	1523 08	2023 33	2697 53	3483 42	4269 66
Revenues from Private Sector															
Oil Revenues			52 50	15 00	30 00	30 00	45 00	300 00	337 50	375 00	630 00	945 00	1320 00	1755 00	2250 00
Gas Revenues			0 00	0 00	0 00	0 00	119 53	119 53	239 07	358 60	573 76	836 73	1231 12	1541 76	1852 40
Cost of operation			15 00	15 00	30 00	30 00	70 00	145 00	185 00	225 00	280 00	335 00	390 00	420 00	450 00
Net Revenue			37 50	0 00	0 00	0 00	94 53	274 53	391 57	508 60	923 76	1446 73	2161 12	2876 76	3652 40
Govt Share		0 65	24 38	0 00	0 00	0 00	61 45	178 45	254 52	330 59	600 44	940 38	1404 73	1869 89	2374 06
TOTAL REVENUES			795 88	324 19	385 39	377 55	474 43	1069 46	1187 78	1412 20	2123 52	2963 70	4102 26	5353 31	6643 72
Revenues from other operations															
Pipeline distribution															
Refining															
Marketing															
Other															
TOTAL REVENUES		27213 39	795 88	324 19	385 39	377 55	474 43	1069 46	1187 78	1412 20	2123 52	2963 70	4102 26	5353 31	6643 72
Exploration Investment		500 00	20 00	20 00	20 00	20 00	20 00	50 00	50 00	50 00	50 00	50 00	50 00	50 00	50 00
Developmental Expenditure		1615 00	50 00	50 00	75 00	100 00	100 00	120 00	120 00	150 00	150 00	175 00	175 00	175 001	175 00
Net Revenues	**$9,803 54**	**25098 39**	**725 88**	**254 19**	**290 39**	**257 55**	**354 43**	**899 46**	**1017 78**	**1212 20**	**1923 52**	**2738 70**	**3877 26**	**5128 31**	**6418 72**
	NPV at 10%														

Assumptions
Domestic crude oil price is equal to export netback
Turkmen crude is expected to be discounted by $1 00 from Brent Crude This may be optimistic if it has to be sold in the Persion Gulf Market
The first few years of crude transportation cost is based on rail/marine amounting to $7 00/B If swap can be arranged with Iran then it will be considerably less
After five years some export pipeline access with $4 00/B of cost is assumed
Gas netback for residential commercial and industrial is assumed to be the same at $5 00/1000 cbm When the domestic crude price increases gas netback changes using the following formula
New Gas Price = Old gas price + (New oil price Old oil price)/ 6 * 35 3 0 8
Gas export netback to CIS market is assumed to be $32 00/1000 cbm for the first five years When the export crude oil price goes up it will change using the following formula
New Gas Price = Old gas price + (New oil price Old oil price)/ 6 * 35 3 * 0 8
Gas netback to OTHER markets is 10% more than that of the netback realized in CIS market
Iranian gas netback for the first five years is assumed to be $15/1000 cbm
Domestic gas and oil sales are forecast to increase at the rate of 5% per year
Domestic crude and gas requirements are met from the national production
Operating cost is assumed to be $15 per ton of oil and $5 per 1000 cbm
National exploration and developmental expenditures have been assumed These are likely to be higher to maintain production rates
Revenues generated by the foreign national companies are assumed to be generated in the ratio of 65 to 35 Though this is quite realistic in the beginning years as the companies recover their costs the government may get less revenues This is not reflected
No attempt is made to forecast the cash flows from other sectors like refining marketing and pipelines They are likely to be drain on the sector

LONG RANGE PLANNING MODEL FOR TURKMENISTAN

Forecast of asset utilization Cash Flow and Investment

SCENARIO III (HIGH CASE)

Assumptions														
GNP Growth	2 to 3% per yr	5% per yr	8 to 9% per yr											
Inflation	20% for 5 yrs Then falling to 10%	20% in 98 then increasing to 50% for next 5 yrs Then falling to 20%												
Exchange Rate	1$ 5300 Monats in 98 Later it will reflect the exchange differential between US of 2% per yr and that of Turkmenistan													
Crude oil price ($/B)	$15/B for next 5 yrs Reaching $20/B in 2010 and then to $20/B by 2010 gradually			$15/B in 98 falling to $10/B in 99 and staying at that for next 7 yrs $20/B in 99 and increasing to $35/B by 2010										
World Brent $/B		15 00	20 00	21 50	23 00	24 50	26 00	27 50	29 00	30 50	32 00	33 50	35 00	35 00
Discount		1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00
Trans Cost		7 00	7 00	7 00	7 00	7 00	4 00	4 00	4 00	4 00	4 00	4 00	4 00	4 00
Export		7 00	12 00	13 50	15 00	16 50	21 00	22 50	24 00	25 50	27 00	28 50	30 00	30 00
Domestic		7 00	12 00	13 50	15 00	16 50	21 00	22 50	24 00	25 50	27 00	28 50	30 00	30 00
Gas Prices														
Domestic $/1000 Cubic meters														
Residential		5 00	5 00	5 00	5 00	5 00	26 18	33 24	40 30	47 36	54 42	61 48	68 54	68 54
Commercial		5 00	5 00	5 00	5 00	5 00	26 18	33 24	40 30	47 36	54 42	61 48	68 54	68 54
Industrial		5 00	5 00	5 00	5 00	5 00	26 18	33 24	40 30	47 36	54 42	61 48	68 54	68 54
Export														
CIS		32 00	55 53	62 59	69 65	76 71	97 89	104 95	112 01	119 07	126 13	133 19	140 25	140 25
Iran		15 00	38 53	45 59	52 65	59 71	80 89	87 95	95 01	102 07	109 13	116 19	123 25	123 25
Turkey														
Other		0	0	0	0	84 38	107 68	115 45	123 21	130 98	138 75	146 51	154 28	154 28
Product Prices	World	Export	Domestic											
Gasoline		150	100											
Diesel		145	95											
LPG		125	75											
Mazut		60	20											
Other														

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2020
EXPLORATION AND PRODUCTION														
Oil Production														
National Company		6	6	6	6	6	7	7	8	8	9	10	10	10
Foreign Company		1	1	2	2	3	8	9	10	12	14	16	18	20
Gas Production														
National Company		30	30	35	35	40	55	60	70	70	70	70	70	70
Foreign Company		0	0	0	0	5	5	10	15	20	25	30	30	30
Oil Sales Domestic		4 00	4 20	4 41	4 63	4 86	5 11	5 36	5 63	5 91	6 21	6 52	6 84	7 18
Oil Sales Export		3 00	2 80	3 59	3 37	4 14	9 89	10 64	12 37	14 09	16 79	19 48	21 16	22 82
Gas Sales Domestic		8 5	8 93	9 37	9 84	10 33	10 85	11 39	11 96	12 56	13 19	13 85	14 54	15 26
Gas Sales Export		21 50	21 08	25 63	25 16	34 67	49 15	58 61	73 04	77 44	81 81	86 15	85 46	84 74
Revenues from Public Sector														
Oil Revenues		315 00	540 00	607 50	675 00	742 50	1102 50	1181 25	1440 00	1530 00	1822 50	2137 50	2250 00	2250 00
Gas Revenues		696 50	1180 99	1617 05	1767 69	2293 61	4572 16	5446 33	6949 22	7400 53	7849 70	8296 62	8741 17	8689 05

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Cost of operation			240 00	255 00	295 00	295 00	360 00	525 00	590 00	695 00	750 00	820 00	890 00	920 00	950 00
Revenues			771 50	1465 99	1929 55	2147 69	2676 11	5149 66	6037 58	7694 22	8180 53	8852 20	9544 12	10071 17	9989 05
Revenues from Private Sector															
Oil Revenues			52 50	90 00	202 50	225 00	371 25	1260 00	1518 75	1800 00	2295 00	2835 00	3420 00	4050 00	4500 00
Gas Revenues			0 00	0 00	0 00	0 00	421 92	538 41	1154 49	1848 22	2619 61	3468 67	4395 38	4628 36	4628 36
Cost of operation			15 00	15 00	30 00	30 00	70 00	145 00	185 00	225 00	280 00	335 00	390 00	420 00	450 00
Net Revenue			37 50	75 00	172 50	195 00	723 17	1653 41	2488 24	3423 22	4634 61	5968 67	7425 38	8258 36	8678 36
Govt Share		0 65	24 38	48 75	112 13	126 75	470 06	1074 72	1617 35	2225 09	3012 50	3879 63	4826 50	5367 93	5640 93
TOTAL REVENUES			795 88	1514 74	2041 67	2274 44	3146 17	6224 38	7654 93	9919 31	11193 03	12731 83	14370 62	15439 11	15629 98
Revenues from other operations															
Pipeline distribution															
Refining															
Marketing															
Other															
TOTAL REVENUES		102936 1	795 88	1514 74	2041 67	2274 44	3146 17	6224 38	7654 93	9919 31	11193 03	12731 83	14370 62	15439 11	15629 98
Exploration Investment		500 00	20 00	20 00	20 00	20 00	20 00	50 00	50 00	50 00	50 00	50 00	50 00	50 00	50 00
Developmental Expenditure		1615 00	50 00	50 00	75 00	100 00	100 00	120 00	120 00	150 00	150 00	175 00	175 00	175 00	175 00
Net Revenues	**$42 211 55**	**100821 1**	**725 88**	**1444 75**	**1946 67**	**2154 44**	**3026 17**	**6054 38**	**7484 93**	**9719 31**	**10993 03**	**12506 83**	**14145 62**	**15214 11**	**15404 98**
	NPV at 10%														

Assumptions
Domestic crude oil price is equal to export netback
Turkmen crude is expected to be discounted by $1 00 from Brent Crude This may be optimistic if it has to be sold in the Persion Gulf Market
The first few years of crude transportation cost is based on rail/marine amounting to $7 00/B If swap can be arranged with Iran then it will be considerably less
After five years some export pipeline access with $4 00/B of cost is assumed
Gas netback for residential commercial and industrial is assumed to be the same at $5 00/1000 cbm When the domestic crude price increases gas netback changes using the following formula
New Gas Price = Old gas price + (New oil price - Old oil price)/ 6 * 35 3 * 0 8
Gas export netback to CIS market is assumed to be $32 00/1000 cbm for the first five years When the export crude oil price goes up it will change using the following formula
New Gas Price = Old gas price + (New oil price Old oil price)/ 6 * 35 3 * 0 8
Gas netback to OTHER markets is 10% more than that of the netback realized in CIS market
Iranian gas netback for the first five years is assumed to be $15/1000 cbm
Domestic gas and oil sales are forecast to increase at the rate of 5% per year
Domestic crude and gas requirements are met from the national production
Operating cost is assumed to be $15 per ton of oil and $5 per 1000 cbm
National exploration and developmental expenditures have been assumed These are likely to be higher to maintain production rates
Revenues generated by the foreign national companies are assumed to be generated in the ratio of 65 to 35 Though this is quite realistic in the beginning years as the companies recover their costs the government may get less revenues This is not reflected
No attempt is made to forecast the cash flows from other sectors like refining marketing and pipelines They are likely to be drain on the sector

LONG RANGE PLANNING MODEL FOR TURKMENISTAN

Forecast of asset utilization Cash Flow and Investment

SCENARIO IV (WORST CASE)

Assumptions														
GNP Growth	2 to 3% per yr	5% per yr	8 to 9% per yr											
Inflation	20% for 5 yrs Then falling to 10%	20% in 98 then increasing to 50% for next 5 yrs Then falling to 20%												
Exchange Rate	1$ 5300 Monats in 98 Later it will reflect the exchange differential between US of 2% per yr and that of Turkmenistan													
Crude oil price ($/B)	$15/B for next 5 yrs Reaching $20/B in 2010	$15/B in 98 falling to $10/B in 99 and staying at that for next 7 yrs												
	and then to $20/B by 2010 gradually	$20/B in 99 and increasing to $35/B by 2010												
World Brent $/B		15 00	10 00	10 00	10 00	10 00	10 00	10 00	10 00	12 00	14 00	16 00	18 00	20 00
Discount		1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00
Trans Cost		7 00	7 00	7 00	7 00	7 00	4 00	4 00	4 00	4 00	4 00	4 00	4 00	4 00
Export		7 00	2 00	2 00	2 00	2 00	5 00	5 00	5 00	7 00	9 00	11 00	13 00	15 00
Domestic		7 00	2 00	2 00	2 00	2 00	5 00	5 00	5 00	7 00	9 00	11 00	13 00	15 00
Gas Prices														
Domestic $/1000 Cubic meters														
Residential		5 00	5 00	5 00	5 00	5 00	19 12	19 12	19 12	28 53	37 95	47 36	56 77	66 19
Commercial		5 00	5 00	5 00	5 00	5 00	19 12	19 12	19 12	28 53	37 95	47 36	56 77	66 19
Industrial		5 00	5 00	5 00	5 00	5 00	19 12	19 12	19 12	28 53	37 95	47 36	56 77	66 19
Export														
CIS		32 00	21 73	21 73	21 73	21 73	21 73	21 73	21 73	26 08	30 43	37 31	46 72	56 13
Iran		15 00	15 00	15 00	15 00	15 00	15 00	15 00	15 00	24 41	33 83	43 24	52 65	62 07
Turkey														
Other		0	0	0	0	23 91	23 91	23 91	23 91	28 69	33 47	41 04	51 39	61 75
Product Prices	World	Export	Domestic											
Gasoline		150	100											
Diesel		145	95											
LPG		125	75											
Mazut		60	20											
Other														
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2020
EXPLORATION AND PRODUCTION														
Oil Production														
National Company	6	6	6	6	6	7	7	7	7	7	7	7	8	
Foreign Company	1	1	2	2	3	4	4	4	4	4	4	4	4	
Gas Production														
National Company	30	30	35	35	35	35	35	35	35	35	35	35	35	
Foreign Company	0	0	0	0	0	0	0	0	0	0	0	0	0	
Oil Sales Domestic	4 00	4 20	4 41	4 63	4 86	5 11	5 36	5 63	5 91	6 21	6 52	6 84	7 18	
Oil Sales Export	3 00	2 80	3 59	3 37	4 14	5 89	5 64	5 37	5 09	4 79	4 48	4 16	4 82	
Gas Sales Domestic	8 5	8 93	9 37	9 84	10 33	10 85	11 39	11 96	12 56	13 19	13 85	14 54	15 26	
Gas Sales Export	21 50	21 08	25 63	25 16	24 67	24 15	23 61	23 04	22 44	21 81	21 15	20 46	19 74	
Revenues from Public Sector														
Oil Revenues	315 00	90 00	90 00	90 00	90 00	262 50	262 50	262 50	367 50	472 50	577 50	682 50	900 00	
Gas Revenues	696 50	489 19	590 39	582 55	574 31	718 85	717 43	715 94	940 28	1170 89	1456 79	1793 22	2130 00	

Cost of operation			240 00	255 00	295 00	295 00	310 00	340 00	340 00	340 00	340 00	340 00	340 00	355 00
Revenues			771 50	324 19	385 39	377 55	354 31	641 35	639 93	638 44	967 78	1303 39	1694 29	2135 72	2675 00
Revenues from Private Sector															
Oil Revenues			52 50	15 00	30 00	30 00	45 00	150 00	150 00	150 00	210 00	270 00	330 00	390 00	450 00
Gas Revenues			0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
Cost of operation			15 00	15 00	30 00	30 00	45 00	60 00	60 00	60 00	60 00	60 00	60 00	60 00	60 00
Net Revenue			37 50	0 00	0 00	0 00	0 00	90 00	90 00	90 00	150 00	210 00	270 00	330 00	390 00
Govt Share		0 65	24 38	0 00	0 00	0 00	0 00	58 50	58 50	58 50	97 50	136 50	175 50	214 50	253 50
TOTAL REVENUES			795 88	324 19	385 39	377 55	354 31	699 85	698 43	696 94	1065 28	1439 89	1869 79	2350 22	2928 50
Revenues from other operations															
Pipeline distribution															
Refining															
Marketing															
Other															
TOTAL REVENUES		13986 22	795 88	324 19	385 39	377 55	354 31	699 85	698 43	696 94	1065 28	1439 89	1869 79	2350 22	2928 50
Exploration Investment		500 00	20 00	20 00	20 00	20 00	20 00	50 00	50 00	50 00	50 00	50 00	50 00	50 00	50 00
Developmental Expenditure		1615 00	50 00	50 00	75 00	100 00	100 00	120 00	120 00	150 00	150 00	175 00	175 00	175 00	175 00
Net Revenues	**$5,083 73**	**11871 22**	**725 88**	**254 19**	**290 39**	**257 55**	**234 31**	**529 85**	**528 43**	**496 94**	**865 28**	**1214 89**	**1644 79**	**2125 22**	**2703 50**
	NPV at 10%														

Assumptions
Domestic crude oil price is equal to export netback
Turkmen crude is expected to be discounted by $1 00 from Brent Crude This may be optimistic if it has to be sold in the Persion Gulf Market
The first few years of crude transportation cost is based on rail/marine amounting to $7 00/B If swap can be arranged with Iran then it will be considerably less
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New Gas Price = Old gas price + (New oil price Old oil price)/ 6 * 35 3 * 0 8
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Revenues generated by the foreign national companies are assumed to be generated in the ratio of 65 to 35 Though this is quite realistic in the beginning years as the companies recover their costs the government may get less revenues This is not reflected
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APPENDIX E
PROPOSED WORKSHOP ON STRATEGIC PLANNING FOR TURKMENISTAN

Objective To train and develop 10 to 15 decisions makers connected with the oil and gas sector in various government agencies to think and plan strategically to solve the problems facing the country in the energy sector in general and oil and gas sector in particular for the next 25 years

An immediate outcome of such a workshop will be either a blue print or a full blown **National Strategy** for development of hydrocarbon resources of Turkmenistan

Strategy to be adapted to achieve the objective Workshop will be conducted in an unique way in that the trainees will play a more active role in the workshop through greater involvement than the resource people giving the training The participants will not be just passive listeners They will be motivated to define problems that are likely to be faced by the country in the future in oil and gas sector and also to develop solutions for them from their vantage point through active discussion among themselves

Strategic planning is often misunderstood today both by those who claim to practice it in real life as well as by those who teach it at management schools and seminars Just by learning some techniques or by following elaborate processes one cannot hope to become a strategic planner There are neither simple or sophisticated formulae to master the art or the science of strategic planning It is true that the founders of the successful organizations like J C Penny, Sears IBM, Hewlett-Packard, Sony, Wal-Mart etc , have been very good at strategic planning without the benefit of any formal training

All of them were visionary leaders with a deep insight of the business in which they were competing Does it mean that only those born with insight can do strategic planning? The answer is definite no Or can any ordinary manager develop such insights to do the strategic planning? My answer though is in the negative, there are some managers with unusual analytical ability can do strategic planning provided they are given proper training on strategic planning What is actually meant by strategic planning?

Strategic planning is a process through which an individual or an institution can plan in advance in a formal way to achieve the mission even when there is little or no information on the unfolding of the scenario in the future Strategic planning is very different from operational planning Let me illustrate these two concepts through an example What type of

refinery to build or whether to build a refinery at all to meet future requirements of a country involves strategic planning However how to operate a refinery or which crude oils to run in the refinery or how much crude to run to meet the product requirements involves only operational planning It is not that there is no uncertainty involved in operational planning or we have all the information to plan for the future while doing the operational planning It is just that the degree of uncertainty in the case of operational planning situation of operating a refinery is considerably less in comparison to situations where we need to do strategic planning Using operations research techniques like linear programming, one can determine an optimum way to operate the refinery to maximize profit However in situations involving strategic planning one is usually faced with multiple criteria optimization problem with a lot of uncertainty

The workshop organized to give training in strategic planning cannot be expected to make the participants instant strategic planners In fact during the workshop the trainees will at best be given the " mantra " to start them on a long and arduous road to train themselves to be strategic planners

Because of the kind of education we have received in schools and also the implicit or explicit training we have been made to undergo to do most of the routine jobs in work places most of us are conditioned to think in a linear and deductive manner This kind of reasoning is not very helpful while doing strategic planning What we need to do effective strategic planning is inductive logic Also, most of us because of force of habit are influenced while doing planning by the recent events and it is very difficult for us even to imagine alternative scenarios If crude oil prices are soft and petroleum supplies are plentiful, it is difficult for most to imagine that there could be certain conditions under which there could be scarcity of petroleum supplies and crude oil prices could go up to stratosphere level as during the early part of 80s By discussing various case studies where managers made wrong decisions as a result of failing to overcome such problems of being unduly influenced by recent events, the workshop participants will be conditioned to think in a creative way about various possible scenarios

HOW WORKSHOP WILL BE CONDUCTED?

The workshop will be conducted over a period of three or five days Every day, the resource person will talk about the world scenario concerning the subject of that day The participants will then discuss what impact the world environment will have on Turkmenistan and will also try to draw up different scenarios to define what kind of problems Turkmenistan will face under different scenarios and then develop alternatives to solve them

Day 1 - World Energy Supply and Demand through 2010

Using the 1997 International Energy Outlook report of the US government, we will study future different world energy supply/demand scenarios We will also study how it has changed during

the last twenty years in different parts of the world This will give an insight into various factors influencing the energy choice in different part of the world
In this background the participants will try to make a strategic forecast of energy supply/demand for their country and also try to develop different alternatives to meet the energy requirement in an optimal manner

During the day, we shall study the strength and weakness of Turkmenistan in developing its vast hydrocarbon resources It is expected that before holding this workshop, papers connected with the following subjects would have been prepared and discussed

1 Long Range Planning Finacial Model of Turkmenistan Oil & Gas sector
2 Strengths and weakness of Turkmenistan in developing its hydrocarbon resources
3 Present status of oil & gas infrastructure in Turkmenistan and how it is likely to develop in the future
4 Turkmenistan's view of possible development of oil & gas export pipeline projects
5 What will be the future energy supply/demand for Turkmenistan (1997-2015)?
6 Restructuring of oil & gas sector institutions in Turkmenistan
7 Possible strategies Turkmenistan can adapt to achieve its mission What are the resultant financial implications of such strategies for different scenarios? Here the LRP model can be used to effectively to compute the cash flows and asset utilization

Day 2 - World Crude Oil Supply/Demand - Long Term Crude Oil Price Forecast

As a starting point we will take up the long term crude oil supply/demand developed in the 1977 International energy Outlook to develop different long term crude oil price forecast We will also discuss how energy economists have fared dismally in the past to forecast the long term crude oil forecast and the reasons for such a dismal performance Forecasts of long term crude oil prices made by various consultants and institutions will also be discussed We will also study what impact different supply/demand scenario may have in attracting foreign investment in exploration and production projects We will also study the future of institutions such as OPEC and IEA in shaping the long term crude oil prices

Day 3 - World Refining Supply/Demand, Gas Supply/Demand, Gas Pricing, LNG Economics and LNG Trading

Combining the statistics form BP Statistical Review Of World Energy 1997 & 1997 International Energy Outlook, we will try to forecast the need for constructing additional refining capacity in the world We will also study using the historical product prices, the refining profitability In this background we will attempt to develop refining scenario for the country

We will also study the world gas supply/demand scenario and also gas pricing issues to develop different scenarios for exporting gas to the world market We will also study the future development of LNG in meeting the world gas demand

Why was the petroleum industry forced to adapt vertical integration during its early development ? Why are some private sector oil companies now changing their strategy of vertical integration when some national oil companies (from Venezuela Kuwait Libya etc) seem to be adapting that ? These issues will also be discussed

Day 4 - Transportation requirements for crude oil, petroleum products and natural gas

For land locked countries of Central Asian Republics and Caspian Sea, export pipelines are the most significant strategic factor Below find some of the potential pipeline projects being considered to move crude oil from CAR and Caspian region to the outside world We will try to develop a strategic approach to study these projects and also to choose the optimum combination This may turn out to be completely a theoretical exercise But this will be a good case study subject to understand the significance of doing strategic planning

POSSIBLE PIPELINE PROJECTS TO MOVE CRUDE OIL FROM CAR

1 *Tengiz to Novorossiysk to Rotterdam through Bosporous*
940 miles costing about $4 5 billion initial throughput of 25 million tons increasing to 62 MT in 2014 Initial throughput cost of $25 per ton Promoter of the pipeline is Caspian Pipeline Consortium (**continuing dependence on Russia and Turkey raising objection environmental problem at Bosporous**)

2 *Baku to Supsa to Rotterdam through Bosporous*
550 miles pipeline Throughput of 5 million tons to move " early crude " Promoter is Azerbaijan International Operating company (AIOC) (**Turkey raising objection environmental problem at Bosporous Turkey wants pipeline to go to Ceyhan**)

3 *Baku to Georgia to Ceyhan to Rotterdam*
Promoter is AIOC with the support of Georgian and Turkish government (**Political problem with Abkhazia and also the problem of Kurdish unrest**)

4 *Baku to Iran to Persian Gulf to Japan or Rotterdam*
One of the most efficient routes but no support for this project **because of the US embargo**

5 *Baku to Novorossiysk to Rotterdam through Bosporous*

Promoter of 850 miles pipeline project to move " early crude " is AIOC Capacity is 5 million tons (**continuing dependence on Russia and also the civil unrest in Chechnya**)

6 *Turkmenistan to Afghanistan to Pakistan to Japan*
Promoters are Unocal and Delta Pipeline of 1000 miles will have a capacity of 50 million tons and is expected to cost about $3 0 billion (**unrest in Afghanistan**)

7 *Caspian to China's Eastern coast to Japan*
Promoter is Chinese National Petroleum Company This pipeline of 3900 miles is expected to cost about $ 8 to 12 billion (**extremely expensive**) Exxon and Mitsubishi are also reported to be doing a feasibility study on this pipeline project

8 *Pipeline under Caspian to Baku*
There is also a proposal to build a pipeline under the Caspian to move crude oil from Kazakhstan and Turkmenistan to Azerbaijan and then through Georgia to Ceyhan

9 *Kazakhstan to China*
This pipeline will move crude oil from western crude oil fields in Kazakhstan by extending the existing crude oil pipeline system to Chinese border and then building a new pipeline to move crude oil to the consumption centers in China

In this session we will also study different pipeline systems to move natural gas to Western Europe and Asian Markets of Pakistan, India etc

We will also study the strategic importance of having a viable pipeline system to transport crude and product internally and also the optimal strategy to be employed to achieve it

Day 5 - Miscellaneous Subjects

Environmental Protection (Green House Gases and Global Warming), Free market economy and petroleum product pricing, Is there a need for government interference in energy industry?, etc

During the final day discussions, we will cover the impact of the above mentioned topics Depending upon how the world community decides to attack the problem of global warming, it will have tremendous impact upon the future demand for different forms of energy resources Though there are many compelling reasons to allow the free market to decide petroleum product prices, there are many strategic factors to be considered before taking such a decision especially in the case of developing countries We will study the examples of a developing country like India and also that of developed economies of the USA, Western Europe etc to find out the impact of government interference in fixing petroleum prices on economy

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During the final day we will try to draw up a blue print of a National Strategy based on the discussions of earlier days

WHAT FACTORS WILL DECIDE THE SUCCESS OF THIS WORKSHOP?

The most significant factor deciding the success of this workshop is the care with which the participants are selected for this workshop The more diverse the group is and also the more qualified they are academically with each having expertise in some related energy sector the greater the success will be

The second obvious factor is the amount of efforts put in by the resource persons to prepare for this workshop and also the level of their practical experience in oil and gas sector

The third factor is the amount of preparation the participants will make in terms of reading on the subjects pertaining to Kazakhstan and collecting information on different energy related subjects

REFERENCE BOOKS

1 International Energy Outlook 1997 by U S Department of Energy
2 The Prize by Daniel Yergin
3 The Rise And Fall Of Strategic Planning by Henry Mintzberg
4 Strategic Planning by George Steiner
5 The Profit Zone by Adrian Slywotzky and David Morrison
6 The Genie Out Of The Bottle by M A Adelman
7 BP Statistical Review of World Energy 1997
8 Brent Crude Prices by Oxford Energy Studies
9 Asian Crude Market by Oxford Energy Studies
10 Papers Presented During Almaty Export Pipeline Conference of March 31st and April 1st 1998

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APPENDIX F
REPORT ON STRATEGIC PLANNING MEETING, AUGUST 4TH AND 5TH

The above workshop was held as a part of giving technical assistance to the Permanent Expert Group on the development of a national strategy for the hydrocarbon sector of Turkmenistan We had been working with the then chairman of Mr Kurbonov of the PEG in outlining the steps involved in developing such a strategy, holding a short symposium to the PEG members on the strategic planning process, developing scenarios etc As we were making progress, Mr Kurbonov transferred his responsibility to Mr Arazov the Minister of Oil & Gas He in turn asked us to work with his deputy Minister Mr Babaev After having two meetings with him, we realized that we were not making much progress Also after promising to gather his PEG members together to draw up a plan of action to develop the plan, he failed to do so We were also given three papers on exploration strategy which had been developed as a part of this committee Those papers were mere recital of reserves and production and they had very little to do with the strategy To overcome the problem of meeting PEG members and also to help them develop the strategy paper, we recommended to Mr Babaev to hold a two-day workshop on the strategic planning

We suggested that I will write a report on the World Oil and Gas Market and present it to the group and other PEG members can prepare their presentations to discuss the possible strategies and operations of their respective departments on subjects like exploration, production, gas marketing strategies, energy demand forecast for Turkmenistan, export pipelines etc I was also to make a presentation on strategic planning concepts and also on refinery economics and refinery supply/demand balance in the region

By giving different examples of international oil companies where there have been able to achieve spectacular successes (example of Conoco constructing a coker refinery in Humber in early 70s when most were constructing hydro-skimmers) to equally spectacular failures (example of the US oil companies continuing to spend huge amount in the US in exploration during the early and middle 80s), I tried to convey both the concepts as well as the difficulty involved in developing a successful and visionary strategic plan I also pointed out how one can reap rich rewards through a successful strategic plan

While discussing the World Oil market, I showed to them how OPEC will continue to play a dominant role in the future and how without their controlling the market, crude prices can collapse to a very low level of less than eight dollars per barrel Still it will not be easy for

them to control crude oil prices since non-OPEC will also succeed in increasing their supplies The discussion on the actual behavior of the crude oil prices (1970 –1998) and also the failure of energy economists in making oil price forecasts convinced them the difficulty in predicting the crude oil prices In my report I had given four different price scenarios and suggested that PEG should develop their own price scenarios However overwhelmed by the uncertainty and wide fluctuations in the crude oil prices no PEG member came forward with any recommendation We decided to take up this important subject later

By showing the crude oil supply/demand for 2010 for Western Europe I tried to make a point that Turkmenistan is likely to get more or less the same crude oil netback whether they sell in the Mediterranean market or Far East market It is true that the Far East market will expand significantly because of the huge demand increase in China and India and there is also very little market growth in Western Europe In addition the crude production will continue to increase in the North Sea as well as in Western Africa Still Western Europe will continue to need crude supplies from the Middle East and since the Middle East crude producers will set the price in both the markets, but for a small transportation cost differential, Turkmen crude will get more or less the same netback

While discussing the gas market, I impressed upon them the fact that there are more than ten countries in the world who have significantly larger reserves than Turkmenistan and many have reserve/production ratio of greater than 100 Some of them have cost advantage in selling gas to the very markets in which Turkmenistan is also trying to sell Therefore what is important and critical for Turkmenistan is an ability to market its gas reserves For this it should try to convince multinational oil companies like Enron or Shell or try to attract European companies like British Gas, Gasunie, Ruhr gas, Gaz de France etc Under the most optimistic scenario, Turkmenistan can sell 100 billion cubic meters (bcm) and in the low case the sales may be even less than 30 bcm Just nine years back, Turkmenistan could export more than 70 bcm This was only because of the market provided by the old Soviet Union when Turkmenistan did not have to face the free market conditions and economics did not have any role to play By showing the cost numbers quoted in the IEA study, I pointed out how the gas supplies to Western Europe from Turkmenistan are at a cost disadvantage This was the case even in the case of LNG supplies from Algeria and Libya

After discussing the surplus refining capacity in the Caucasus and the Central Asia, I analyzed the world refining capacity Then I dealt with different kind of refineries (hydro skimmers, catalytic cracking and coking) and their economics I was able to show how even on incremental cost basis hydro skimmers and cat cracking refineries could lose money if coking refineries have surplus capacity Using the actual product prices, full cost and incremental cost margins for these three kind of refineries were calculated to show how the incremental cost consideration make it difficult to earn a decent return on refining investment when there is a surplus capacity This led to an interesting discussion on the one billion dollar investment Turkmenistan has undertaken at Turkmenbashi refinery

Mr Baimurad Hodjamuhamedov, the head of Department for export of gas at the State Trading Corporation gave a presentation on historic sales and also on the potential sales in 2005 During his presentation, not once was there a mention of netback or margin He did talk about the transportation cost but only in general terms When I asked the question about the profitability of running incremental crude the first answer given by one of the participants was that the consultants in their study have shown that it was economical Another member pointed out that since it is their own crude production costing very little it makes sense to process it I pointed out that the consultants were using hypothetical product values based on their projection of future profitability and they need to calculate the incremental economics using what they could get in today's market I also pointed out that since they always have the option of selling crude oil, they need to compare the economics of alternate cases

Based on the refinery profitability discussion, many started to have doubts about the attractiveness of investing such huge amount at Turkmenbashi refinery During a private conversation with Mr Babaev when I suggested that they could learn many things by doing a post auditing of their refining investment, he reacted positively to my suggestion Many oil companies undertake such post auditing exercise routinely to learn lessons from their experience of investing in large projects

To our surprise no one else was prepared to present any paper When I requested the PEG member for exploration activities to present the exploration strategy paper, he turned around and asked me how he should prepare such a paper and what it should contain Having realized that many members were not prepared adequately to discuss strategies for their respective department, I presented a list of factors which we should consider while preparing a strategic plan to involve them in a discussion The list I suggested contained factors and topics such as the need for restructuring, need to train their managers on modern management philosophy, how to attract foreign investment, what emphasis should be given to gas versus oil exploration, need to develop transportation alternatives, technology, cost of exploration, cost of developing reserves, operating cost, developing cashflows for different scenarios etc

Mr Babaev dealt briefly about their present strategy of allowing the national oil companies to explore onshore and inviting international oil companies for off shore exploration and even for onshore where deep drilling is required He also talked about the need to develop the national oil services companies who have not been able to win tenders even in Turkmenistan According to him there are far too many companies in the oil & gas sector and there is a need for restructuring He also talked about the new National Oil Company being organized to work with the international oil companies and the problems they are facing of manning it with qualified people who are familiar with the modern management They are looking forward to the return of their people who are being trained by Mobil in the US

There was considerable discussion on potential gas export and the role of Russia and of Iran When I pointed out that $32 per thousand cubic meters offered by Russia for their gas to export it to Ukraine was really a good offer considering the fact that they have no other means to export gas they readily accepted how they are put in the corner According to them Russia was not going to pay really that amount since the transaction did not involve the payment of hard currency but payment in goods and that too at exorbitant prices They also mentioned that negotiations are continuing with the Russians to solve the impasse In the case of Iran, they first argued that there is good scope to sell gas to them since Iran will find it more advantageous to buy from them rather than supply from their distant fields However when we did some quick calculation to estimate what it may cost Iran to supply from their own fields when they develop their gas infrastructure they seem to accept the limited opportunities to sell gas in that market There was considerable discussion on the export potential to markets such as Turkey, Eastern and Western Europe, Russia Georgia Armenia China, India and Pakistan

When it was pointed out how expensive it is to sell gas into Chinese market and Russia is better placed to supply that market from Eastern Siberia, Mr Babaev argued that there may be a break through in pipeline technology, which would reduce cost of transportation I pointed out how we have been dreaming of different ways of developing vast gas reserves of Alaska to bring to lower 48 states without any success Our discussion on gas export market might have convinced the participants that it is not enough to have gas reserves What is needed is marketing expertise
Along with the views of IEA on the Caspian production (based on the recent IEA study titled Caspian Oil And Gas), I presented a forecast on future production potential that I had prepared I also talked on the economics of different pipeline alternatives There was consensus of opinion that it is in the best interest of Turkmenistan to have multiple pipeline alternatives It became apparent that PEG is hopeful that the pipeline to Pakistan will be started within two years despite the civil unrest in Afghanistan, they will succeed in getting the cooperation of Russia to transport gas to Ukraine and Trans-Caspian and Trans-Iranian pipelines will be built to transport their gas to Turkey and European market

Mr Babaev ended the meeting by suggesting that the PEG members will now develop the strategy papers for their respective department and they would meet with us in smaller groups to clarify their doubts He also mentioned that he would try to get the date extended to complete the project by two months

LESSONS LEARNED

Prior and during the workshop we had distributed a number of reports (steps involved in strategic planning, background material on strategic planning, cash flow tables for four different scenarios, BP Statistical Review etc, and report on World Oil and Gas Market) to all

the PEG members It was sad to see that despite the fact that the task of developing the National Strategy is a high visible project of national importance and that too requested by the President s office, members were not familiar with the reports Even when we asked them to bring these reports (with the exception of BP Report all were available in Russian) to the meeting since we will be going over them, only one or two brought them to the meeting It was not apparent that any PEG member or even Mr Babaev the chairman was taking the project all that seriously Perhaps we may be misreading their interest Though it was difficult to deal with Mr Kurbonov, the former chairman of PEG he was more interested in the development of the strategy and had greater appreciation for it

It became obvious that though all the PEG members are senior level bureaucrats they are still not familiar with the basic economic concepts despite being exposed to them through various seminars and workshops Though, we might have communicated through many examples the need for economic analysis before investing in any project during this workshop it is very doubtful that we have succeeded in changing their mindset

Our questioning the economics of Turkmenbashi refinery might have succeeded in sowing the seed in the minds of many to doubt the viability of that project It is even possible that it may even lead to the cancellation of the planned three million tons expansion of that refinery which will give just hydro skimming yields

CONCLUSION

Over all the workshop was a great success in that it gave an opportunity to discuss various sensitive topics like the economics of Turkmenbashi refinery investment, gas exports through Russia, gas sales potential of Iran, possibility of Turkmenistan not being able to sell more than 30 bcm of gas (mere gas reserves, however huge, does not end up in creating market) because of the high cost of transportation, need for restructuring the oil and gas sector etc We were also able to communicate strategic planning concepts and give some tools and techniques to develop the national strategy

APPENDIX G
THE WORLD OIL AND NATURAL GAS MARKET

THE WORLD OIL MARKET

As shown below the total world energy consumption is forecast to increase from 365 6 quadrillion Btu (Quads) or 183 million BD to 519 5 Quads or 260 million BD in 2010 as per the International Energy Outlook 1998 published by the Energy Administration Agency (EIA) of the Department of Energy of the USA

World Energy Consumption by Region (in Quads)

	1970	%	1995	%	2010	%	Annual Change 70-95	Annual Change 95-2020
Developed	135 1	65 3	199 1	54 5	247 5	47 6	1 6	1 2
Developing	32	15 5	113 3	31 0	203	39 1	5 2	3 8
EE/FSU	39 7	19 2	53 2	14 6	69	13 3	1 2	1 7
Total	**206 8**		**365 6**		**519 5**		**2 3**	**2 3**

World Energy Consumption by Energy Source (in Quads)

	1970	%	1995	%	2010	%	Annual Change 70-95	Annual Change 95-2020
Oil	97 8	47 3	142 5	39 0	195 5	37 6	1 5	2 1
Natural Gas	36 1	17 5	78 1	21 4	133 3	25 6	3 1	3 3
Coal	59 7	28 9	91 6	25 1	123 6	23 8	1 7	2 2
Nuclear	0 9	0 4	23 3	6 4	24 9	4 8	13 9	-0 4
Renewables	12 2	5 9	30 1	8 2	42 4	8 2	3 7	2 1
Total	**206 7**		**365 6**		**519 7**		**2 3**	**2 3**

(one quad is approximately equal to 25 million tons or 500000 barrels per day)
As can be seen from the above table, the long-term world energy demand is forecast to increase at the same rate of 2 3% as it was during the last 25 years between 1970-1995 But the pattern of energy growth in terms of region and sources is quite different

Energy demand growth will fall from 1 6% to 1 2% per year in the developed (industrialized) countries Though the same will happen in the case of the developing countries the demand growth is considerably higher at a level of 3 8% In the case of Eastern European (EE) and Former Soviet Union (FSU), growth rate is forecast to increase from 1 2% to 1 7% per year

In absolute terms, total world energy demand will increase by 154 Quads (77 million BD) and 58% of this increase is contributed by the developing countries and that too by the developing countries in Asia as shown below

Increase in Energy Demand by Region (2010 vs 1995)

	Quads	%
Developed	48 4	31
Developing	89 7	58
China	44 4	29
India	14 9	10
Others	30 4	19
EE/FSU	15 8	11
Total	**153 9**	**100**

All sources of energy except nuclear are expected to grow over the forecast period Despite the concern on environmental protection, surprisingly renewables are not expected to grow as quickly during the forecast period as they have during the last 25 years Still the largest share of the growth in the energy pie will be enjoyed by natural gas

Increase in Energy Demand by Fuels (1995 vs 2010)

	Quads	%
Oil	53 0	34
Gas	55 2	36
Coal	32 0	21
Nuclear	1 6	1
Renewables	12 3	8
Total	**154 1**	**100**

Some of the significant factors that will influence the world energy demand are

Gross Domestic Product (GDP) growth rate

Energy elasticity (correlation between GDP and Energy demand)

Kyoto Protocol
Oil price movement and its impact on other sources of energy

In arriving at the world energy demand, the following assumptions regarding GDP growth were made

GDP Growth Rates (% per year)

	70-80	80-90	90-2000	95-2010
Developed	3 1	2 9	2 0	2 3
Developing	5 6	3 1	4 8	**5 2**
EE/FSU	2 6	1 9	-3 8	3 7
Total World	**3 4**	**2 8**	**2 1**	**3 1**

Economies of the developing countries are expected to grow at 5 2% per year which is higher than that for the developed countries and EE/FSU Because of the recent Asian crisis and especially the melt down of the economies like Indonesia and South Korea and to lesser extent that of Japan, Malaysia, Taiwan and Thailand, it is difficult to predict how soon they will recover and also what impact they will have on other countries Thus there is certain amount of uncertainty regarding the above GDP growth rates

World Energy Consumption by Region and Fuel (Quads) 1995-2010)

	1995		2010		Avg Annual % Change (Long Term Growth)
Western Europe					
Oil	29 2	45 1	30 8	38 9	0 3
Natural Gas	12 5	19 3	23 3	29 5	3 8
Coal	9 7	15 0	9 6	12 1	-0 1
Nuclear	8 2	12 7	8	10 1	-1 2
Other	5 1	7 9	7 4	9 4	2 1
Total	64 7		79 1		1 2
Total Industrialized Countries					
Oil	85 1	42 8	102 3	41 3	1 2
Natural Gas	42	21 1	63 3	25 6	2 7
Coal	35 4	17 8	40 9	16 5	1 0
Nuclear	19 3	9 7	18 6	7 5	-1 1
Other	17 1	8 6	22 6	9 1	1 8
Total	198 9		247 7		1 4
Developing China					
Oil	23 6	32 8	41 6	30 3	3 8

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World Energy Consumption by Region and Fuel (Quads) 1995-2010)

Natural Gas	5 1	7 1	20 0	14 6	7 4
Nuclear	1 2	1 7	2 7	2 0	4
Other	4 0	5 6	8 6	6 3	4 1
Total	71 9		137 3		4 2
EE/FSU					
Oil	12 4	23 4	16 5	23 9	2 2
Natural Gas	21 4	40 3	32 2	46 7	2 4
Coal	13 8	26 0	13 2	19 1	-0 6
Nuclear	2 5	4 7	3 1	4 5	0 5
Other	3 0	5 6	4 0	5 8	2 1
Total	53 1		69 0		1 7
Total World					
Oil	142 5	39 0	195 5	37 6	2 1
Natural Gas	78 1	21 4	133 3	25 6	3 3
Coal	91 6	25 1	123 6	23 8	2 2
Nuclear	23 3	6 4	24 9	4 8	-0 4
Other	30 1	8 2	42 4	8 2	2 1
Total	365 6		519 7		2 3

EIA has considered a high and low case depending upon faster and slower economic growth In the High Economic Growth Case, the world energy demand will be 585 5 quads (65 9 quads higher than the reference case) and in the Low Economic Growth case, it will be 460 quads (59 6 quads lower than the reference case) This sensitivity analysis clearly shows that the world energy demand will be very much influenced by what path the economic growth will follow in the coming years

The second factor that will influence the world energy demand is the correlation between economic growth and energy demand The following table shows the historical energy elasticities as well as the forecasts

Energy Elasticity by Region (1970-2010)

	1970-75	**75-80**	**80-85**	**85-90**	**90-2000**	**2000-2010**
Developed	0 74	0 69	0 03	0 55	0 84	0 54
Developing	0 98	0 94	1 77	1 33	1 03	0 74
EE/FSU	1 27	2 89	1 39	0 39	0 68	0 49
Total World	**0 95**	**0 94**	**0 69**	**0 69**	**0 89**	**0 72**

There has been close correlation between economic growth and energy demand However this correlation varies depending upon the stage of economic development In developed countries this correlation was very strong when their economies were getting industrialized However as their services sector started to dominate in its contribution to the overall GDP the link between economic growth and energy demand has started to weaken After certain stage in economic development incremental income is spent more on goods and services that require less energy In developing countries, energy demand and economic growth have been more closely correlated with the elasticity being closer to 1 0 In the case of the developing countries many may be switching from non-commercial energy sources to commercial energy sources as well as buying goods and services for the first time which are energy intensive

In the case of EE/FSU which have the problem of transition economies it has been difficult to fathom this link Until 1990, increases in economic activities were more than matched by increased energy consumption From 1990 to 1995, both GDP and energy consumption were both declining But GDP fell more rapidly, causing a rise in energy intensity In many of these countries, consumers are still not exposed to the real prices for their energy consumption On the other hand neither did they have the higher standard of living of the developed world Therefore projecting future energy elasticity for EE/FSU is more problematic with greater uncertainties than in the case for other regions

IMPACT OF KYOTO PROTOCOL

In 1992, a Framework Convention on Climate Change was endorsed in Brazil, with a stated aim of stabilizing atmospheric concentrations of greenhouse gases The initial agreement called for voluntary actions by Annex I countries (including all the developed countries, many countries from EE/FSU but excluding countries from CAR and Transcaucasus) to stabilize greenhouse gas emissions at 1990 levels by 2000 On December 11, 1997, in Kyoto, the Annex I countries agreed to a new set of commitments for reducing greenhouse gas emissions The following table gives some statistics on what Annex I country has to do meet Kyoto protocol

Carbon Emissions in the Annex I Countries, 1990-2010 & The Impact of Kyoto Protocol in 2010
(in million metric tons of carbon)

Country	1990 Emissions	Forecast 2010	Kyoto Target	Reduction from 2010	% Change from 1990	% Change from 2010
U S	1346	1803	1252	552	-7	-31
Canada	126	170	118	52	-6	-30
Japan	274	342	258	85	-6	-25
West Europe	971	1101	893	208	-8	-19
Australasia	90	119	97	22	8	-18

Carbon Emissions in the Annex I Countries, 1990-2010 & The Impact of Kyoto Protocol in 2010
(in million metric tons of carbon)

Country	1990 Emissions	Forecast 2010	Kyoto Target	Reduction from 2010	% Change from 1990	
					-7	-26
FSU	991	792	991	-199	0	-2[illegible]
EE	299	280	277	3	-7	-1
Annex I	4097	4607	3886	721	-5	-16

To achieve the carbon emissions target under the Kyoto Protocol, emissions in 2010 would have to be 26 percent lower than those currently projected for the developed countries of Annex I in the reference case In contrast emissions in EE/FSU are much lower than they were in 1990 There are many possible alternatives to reach these targets Non fossil energy may be substituted for fossil fuels Alternatively high-carbon fuels like coal may be replaced by oil or by gas Further, improved end-use efficiency or reduced reliance on energy intensive activities may serve to reduce the link between rising economic activity and increased energy consumption Actions not related to energy may also promote programs toward the goals set out by the Protocol by reducing other greenhouse gases If the developed industries were to achieve the targets set by the Protocol solely by reducing the consumption of fossil fuels, then the forecast energy demand will be lower by 40 to 60 quads (20 to 30 million BD) by 2010

This forecast does not address the uncertainty arising from the consequences of implementing the Kyoto Protocol The Kyoto Protocol could prompt changes in the fuel use characteristics of motor vehicles, which could result in the decrease of oil demand by 8 0 million BD

WORLD OIL DEMAND

Long term oil world oil demand is forecast to grow at an average rate of 2 0 % per year During the last ten years between 1987-1997 world oil demand has been growing at the rate of 1 5% per year, the same rate as it was between 1970 and 1995 As can be seen from the following table, the largest increase in oil consumption is forecast to take place in developing countries of Asia Of the total increase of 24 4 million BD (1220 million tons) between 1996 and 2010, 8 1 million BD (or 31%) is because of the increase in oil demand in Asia Even after considering the recent turmoil in Asia Pacific, it can be argued that the demand increase in Asia could exceed 19 9 Million BD in 2010 Former Asian Tiger economies like South Korea, Taiwan, Hongkong and Singapore had registered a growth of 7 to 9% per year during the last ten years Between 1987 and 1997, India's demand has almost doubled But this forecast shows what can be considered as a modest growth of just 3 6 % for India

World Oil Consumption (million barrel per day)

	1996	2010	Avg Annual Change (%)
U S	18 3	22 7	1 3
Canada	1 8	2 2	1 4
Mexico	1 9	2 7	2 3
W Europe	14 3	14 9	**0 3**
Japan	5 9	7 0	1 4
Australasia	1 2	1 6	1 4
DEVELOPED	43 4	51 1	**1 1**
FSU	4 4	5 9	1 9
EE	1 3	1 9	2 9
China	3 5	7 0	**5 0**
Other Asia	6 6	10 2	3 1
Middle East	4 2	5 6	2 2
Africa	2 4	4 1	3 2
Brazil	1 5	2 8	3 8
Other C&S America	2 5	4 5	3 8
DEVELOPING	22 5	36 9	3 5
Total World	**71 5**	**95 9**	**2 0**

Although oil is the most important energy source in the majority of the industrialized countries, its share of total energy consumption is forecast to fall by 1 5 % between 1995 and 2010 This is most pronounced in Western Europe where the decline is as much as 6 2 % The decline reflects a continuation of trends in these countries where newer technologies use oil more efficiently and natural gas and other energy sources replace oil for many uses The major portion of oil=s growth within the developed economies is in fuels used for transportation, where it has no substantial competition In Western Europe, oil use for power generation and home heating is being replaced by natural gas Even in many industrial uses, oil is losing market share to natural gas and electricity

The greatest potential for growth in transportation energy demand is in the developing world Passenger car ownership rates are very low in the developing countries in comparison to the developed world South Korea has a passenger car density of 132 cars per 1000 inhabitants both China and India have rates between 3 to 4 per 1000 inhabitants When income rises above the subsistence level, demand for vehicle ownership tends to be highly income-elastic Vehicle ownership in some of the developed countries are as follows US 750, Japan 525, UK 475 and Australia 600

WORLD OIL SUPPLY

World Oil Supply by Region 1996-2010 (in million BD)

	1996	2010
Iran	3 9	4 5
Iraq	0 6	3 2
Saudi Arabia	10 6	13 5
Persian Gulf OPEC	20 9	28 6
Nigeria	2 2	3 1
Libya	1 5	1 7
Algeria	1 4	2 2
Venezuela	3 2	5 2
Total Other OPEC	10	13 7
OPEC	30 9	**42 3**
U S	9 4	8 9
Canada	2 5	3 3
Mexico	3 3	4 1
North Sea	6 3	7 1
China	3 1	3 6
FSU	7 1	12 1
C & S America	3 3	4 7
Middle East	2	2 2
Africa	2 6	4
Asia	2 1	3 2
Total Non-OPEC	43 5	**55**
Total World	**74 4**	**97 3**

During the last ten years between 1987 and 1997, OPEC has increased its production from 19 2 million BD to 29 9 million BD whereas the production from Non-OPEC has gone up slightly from 41 9 million BD to 42 3 million BD during the same time period For the forecast period to 2010, OPEC production is forecast to increase to 42 3 million BD and Non-OPEC production to 55 million BD This is a significant increase in the Non-OPEC production OPEC lost considerable market share after 1978 when crude prices went up considerably However after 1986 when OPEC lost considerable power in controlling crude prices, OPEC started to gain market share Its market share which was only 32% in 1987 increased to 41% and forecast to continue to increase to 43% by 2010-a small increase of just 2%

Despite the lower crude oil price forecast, the long-term outlook for Non-OPEC supply remains optimistic New exploration and production technologies, aggressive cost reduction programs by the oil industry, and attractive fiscal terms to producers by governments are some of the factors responsible for such an optimistic outlook

With the reserve-to-production ratio of Gulf producers exceeding 75 years Persian Gulf OPEC has significant expansion capacity

Proved Reserves of Oil

	1977	1987	1997	At End of 1997	
		----billion bbls----		Share	R/P ratio
Non-OPEC					
Mexico	14 0	48 6	48 8	3 8	33 6
Russia			48 7	4 7	21 7
USA	35 5	35 4	30 2	2 9	9 8
China	20 0	18 4	24 0	2 3	20 5
Norway	6 0	14 8	11 2	1 0	8 6
UK	19 0	5 2	4 5	0 5	5 2
Total Non-OPEC	217 1	231 3	248 4	**24 0**	**16 1**
Venezuela	18 2	56 3	64 9	6 9	59 5
Iran	62 0	92 8	93 0	9 0	69 0
Iraq	34 5	100 0	112 0	10 8	100+
Kuwait	70 1	94 5	96 5	9 3	100+
Saudi Arabia	153 1	169 6	261 5	25 2	79 5
UAE	32 4	98 1	97 8	9 4	100+
Libya	25 0	21 0	29 5	2 8	55 6
Nigeria	18 7	16 0	15 5	1 6	20 2
OPEC	436 2	668 4	788 6	**76 0**	**75 2**
Total	653 3	899 7	1037	100	**40 9**

Not only Persian Gulf OPEC has vast reserves, its production economics are extremely attractive The cost to produce a barrel of oil in Persian Gulf OPEC ranges between $1 00 to $1 50 depending upon the field size The capital investment required to increase production by one barrel per day in that region ranges between $2,525 and $4,866 Because of these reasons even if the crude oil prices remain around $14 per barrel, total development and operating costs as a percentage of the total revenues range between 15 to 20%

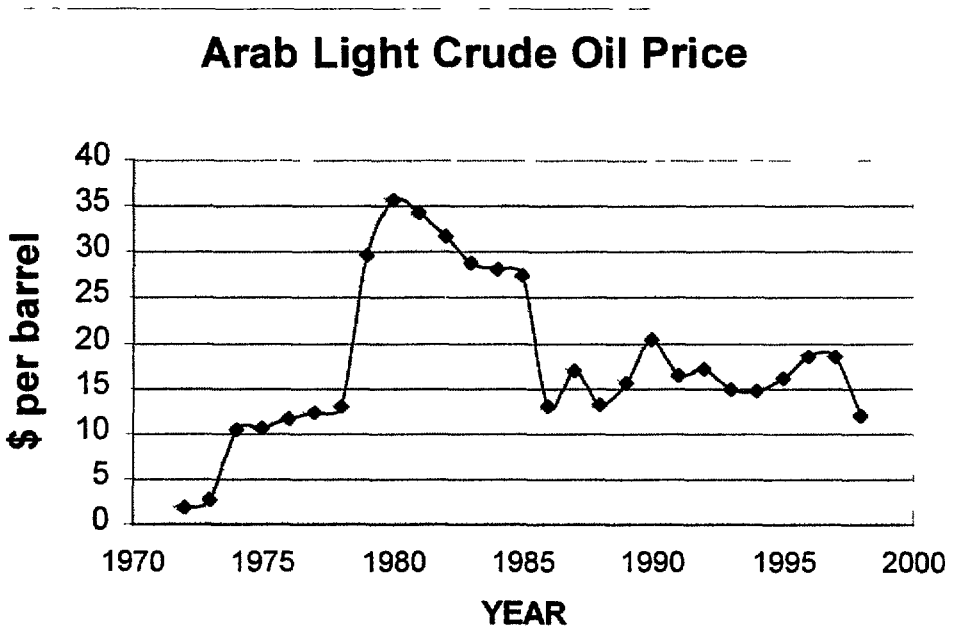
For OPEC producers outside the Persian Gulf, the cost to expand production capacity is considerably greater and it ranges from $7,610 per barrel (Indonesia) to $10,240 (Venezuela) Nevertheless, even this group of producers can expect margins in excess of 40% in the low price case

Though OPEC enjoys an attractive margin and has considerable cash flow from its oil operations, it is not certain that all of them will invest the surplus cash flow to increase

production capacity Because of the huge fiscal deficits they may be forced to divert that cash flow to balance the budget

Depending upon the scenario (i e reference or low or high price case) OPEC production could be as low as 35 3 million BD in the High Price Case (demand will be lower and non-OPEC supplies will be more) and as high as 48 8 million BD in the Low Price Case (demand will be higher and non-OPEC supplies will be less)

WORLD OIL PRICE PROJECTION

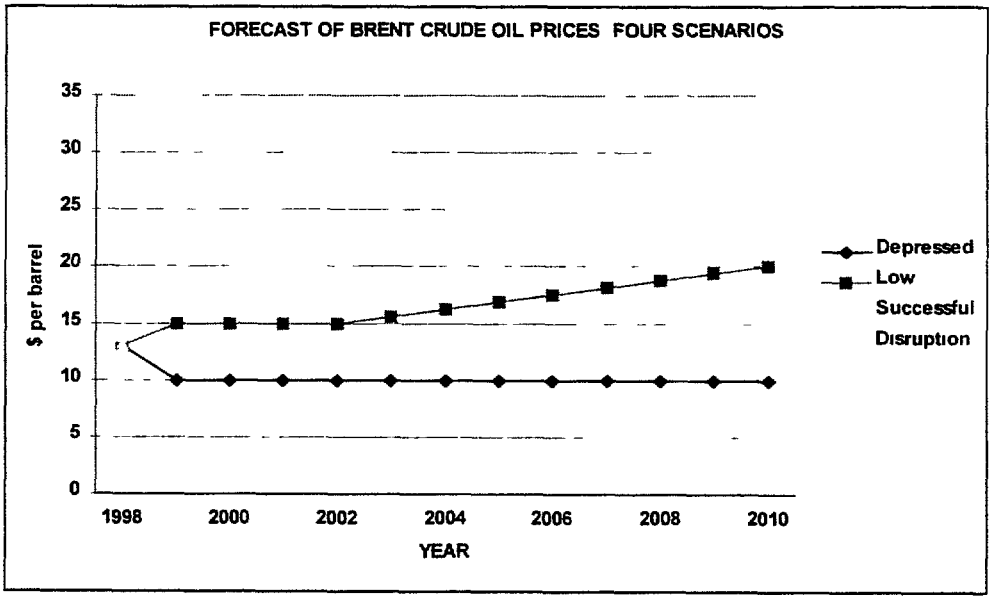


The above graph of the historic price of Arab Light crude oil shows that after the quantum jump in crude oil price in 1973 and then again in 1979, crude price has fluctuated within a narrow range of $13 00 and $18 00 per barrel It is interesting to review the performance of the crude oil price forecasters over the years to assess the ability of the economists to predict the long-term trend in crude oil price movement

Before 1973, even when the demand for OPEC crude used to increase every year and one could see the OPEC getting into the driver=s seat, most forecasts made during that time period used to predict that crude oil price may go up by 10 to 15 cents per barrel per year In other words crude oil prices will remain around $3 00 per barrel Once the crude price went up in 1974 to $11 00 per barrel, again the forecasts were predicting that they would remain in the range of $11 00 to

$12 00 per barrel For the next four years those forecasts actuallv turned out to be correct However when crude prices started to go up in 1979 long term crude price forecasts were revised almost every quarter and most were predicting a crude oil price of $ 50 to $60 per barrel by 1990 In today s dollars it would be more than $120 per barrel Even after the crude prices started to decline after 1983 the forecasts were for a real price increase The only difference was that the starting point was at a lower level depending upon the then prevailing crude oil price

However after the price drop in 1986 the oil economists started to acknowledge that oil also behaves like any other commodity and it has its own short and long term income and price elasticities The forecasts made during the first five to seven years after 1986 were predicting that crude oil price will be around $20 per barrel with an upside potential of about $5 to $10 per barrel and the down side risk of $2 to $4 per barrel However the recent forecasts predict long term crude oil prices with a very narrow range and expect them to be less than $20 per barrel What oil economists have learnt from their bitter experience of forecasting over the years is that it is just not possible to forecast crude oil prices with any kind of accuracy The following four crude oil scenarios are suggested for our planning studies



The following table gives a comparison of various crude oil price forecasts It should be pointed out that most of the forecasts with the exception of Petroleum Economists Ltd have similar predictions

Comparison of World Oil Price Projections, 2000-2010 ($ per barrel)

	2000	2005	2010
DOE s EIA			
Reference Case	19 11	20 20	20 81
High Price Case	21 86	24 51	26 97
Low Price Case	14 47	14 59	14 44
DRI	17 29	19 27	21 07
IEA			
Capacity Constraints Case	18 18	26 73	26 73
Energy Savings Case	18 18	18 18	18 18
PEL	15 31	13 97	13 14
PIRA	19 52	18 54	19 13

OIL/SUPPLY DEMAND FOR EUROPE

Based on the Western European consumption of 14 1 million BD and production of 6 8 million BD in 1997, the net import requirement was 7 3 million BD As shown below there was gross import of 8 9 million BD and gross export of 1 6 million BD

	Western European Oil Import/Export Million BD 1997
Import from	
U S A	0 2
Mexico	0 2
S & C America	0 2
FSU	1 8
Middle East	3 8
North Africa	2 0
West Africa	0 8
Others	0 3
Total	8 9
Less Export	1 6
NET IMPORT	7 3

According to EIA s crude oil production projection there is an increase in North Sea production of 0 8 million BD Hence the oil demand increase of 0 7 million BD of Western Europe can be easily met from the North Sea In addition there is bound to be competition from Algeria (which is increasing its production by 0 8 million BD) and also from West African producers This does not mean that Caspian oil, which will reach Mediterranean or Baltic will find a depressed market Even assuming that Russia will be able to increase its export to the European market by 1 0 million BD and Caspian producers to the Mediterranean by 2 0 million BD there is still need for Middle East crude to meet the petroleum requirements of Europe Since crude oil market is not a regional market unlike gas Caspian crude will command a price which is in equilibrium with either the Middle East crude (getting a quality premium) or West African crude (since West African crudes are sweet and light Caspian crude may not get any premium) or the North Sea crude as shown below

Let FOB Brent Crude oil price be P(Brent)
Let the transportation cost to move Brent to Mediterranean be T(Brent-M)
Let FOB Arab Light crude oil price be P(Arab)
Let transportation cost to move Arab light to Mediterranean be T(Arab-M)
Let the quality premium of Brent over Arab be Q(B-A)
Let FOB Caspian crude oil price be P(Casp)
Let transportation cost to move Caspian to Mediterranean be T(Casp-M)
Let the quality premium of Caspian over Arab be Q(C-A)

$$P(Arab) = P(Brent)+T(Brent-M)-T(Arab-M)-Q(B-A)$$
$$P(Casp) = P(Arab) +T(Arab-M) + Q(C-A) \text{ B } T(Casp-M)$$
$$P(Casp) = P(Brent) + T(Brent-M) \text{ B } T(Casp-M)- Q(B-A) + Q(C-A)$$

OIL SUPPLY/DEMAND FOR ASIA PACIFIC

As explained in the earlier section, increase in demand for Asia pacific region will result in increase demand for both the Middle East and potentially Caspian crude as shown below

	Asia Pacific Import/Export (in million BD)		
	1997	2010	Inc/(Dec)
Import from			
U S A	0 2	0 2	0
S & C America	0 1	0 1	0
W Europe	0 1	0 1	0
FSU	0 2	1 0	0 8
Middle East	10 9	18 4	7 5
North Africa	0 1	0 1	0
West Africa	0 6	0 8	0 2
Gross Import	12 2	20 7	8 5
Net Export	0 3	0 5	0 2
NET IMPORT	11 9	20 2	8 3

As shown above, the projected increase in Asia Pacific demand of 8 3 million BD can be met by increasing the export from the Middle East and also from FSU (in this case Caspian producers) Let us now try to analyze what netbacks Caspian crude oils can get back by selling in these markets It is necessary to reiterate that since crude oil can be easily moved around the world and the freight element as a percentage of crude oil price is not big, over the long-term there is no particular advantage of selling in one market over the other

Let the transportation cost of moving Arab light to Japan be T (Arab-J)
Let the transportation cost of moving Caspian Crude to Japan be T (Casp-J)

The netback that Caspian crude oil can get by selling in Japanese market is as follows

$$P(Casp) = P(Arab) + T(Arab\text{-}J) + Q(C\text{-}A) \text{ B } T(Casp\text{-}J)$$

If we compare the above netback with the one that can be obtained in Mediterranean the advantage of these two markets depend upon the following being positive or negative,

$$T(Arab\text{-}J)\text{-}T(Casp\text{-}J) \text{ B } (T(Arab\text{-}M) \text{ B } T(Casp\text{-}M))$$

In other words it is the transportation differential of Caspian crude and Arab Light oil in Mediterranean and Japanese market that will be the deciding factor It is true that in recent years that Persian Gulf crude producers have been able to enjoy a higher netback of about one dollar by selling in Asia Pacific market compared to selling in European market As shown above since the crude oil market is a world oil market and not a regional one, and the Persian Gulf producers will be the marginal suppliers, there will be no particular advantage of one market over the other but for the transportation advantages

If Caspian crude can be moved cheaper to the Asia Pacific market than to the Mediterranean then Caspian producers will enjoy a better netback by selling in that market than in the Mediterranean market Arguments have been made by some consultants that it is better to sell in the Asia Pacific market since that market is growing the fastest West European oil demand is likely to show very little buoyancy In addition, there is likely to be far more competition in that market since crude oil production is likely to increase in the North Sea North Africa Russia and West Africa All these producers will find it more advantageous to sell in European market than to take it other markets But the conclusion of this author based on the projection that Persian Gulf producers will continue to be the marginal producers, there is no particular advantage of being in one market over the other

WORLD GAS RESERVES AND DEMAND/SUPPLY (1995-2010)

As shown below, proved world gas reserves are more than adequate if we were to take a look at the reserves to production ratio of more than 64 However unlike oil in the case of gas just these statistics do not give the true picture of the adequacy of gas supply Gas markets are regional because of the difficulty and cost in transporting it

World Proved Reserves of Gas

	1997	1987	1987	At End of 1987	
	Trillion BCM			Share	R/P ratio
Russia	n/a	n/a	48 14	33 2	85 9
Iran	14 16	13 86	22 94	15 8	100+
Qatar	1 13	4 44	8 49	5 9	100+
UAE	0 61	5 76	5 80	4 0	100+
Saudi Arabia	2 48	4 14	5 40	3 7	100+
U S A	5 95	5 29	4 71	3 3	8 8
Venezuela	1 16	2 69	4 05	2 8	100+
Algeria	3 54	3 00	3 70	2 6	54 8
Nigeria	1 22	2 38	3 25	2 2	100+
Iraq	0 79	0 74	3 11	2 2	100+
TOP TEN	n/a	n/a	109 59	75 7	--
Turkmenistan	n/a	n/a	2 86	2 0	100+
Malaysia	0 48	1 48	2 26	1 6	57 4
Indonesia	0 68	2 07	2 05	1 4	29 7
Uzbekistan	n/a	n/a	1 88	1 3	38 7
Kazakhstan	n/a	n/a	1 84	1 3	100+
Total World	71 35	107 52	141 33	100	64 1
OECD	13 42	17 11	14 09	9 6	13 6

The top ten countries have 76% of the world proved reserves of natural gas In the case of oil the top ten countries account for 85% of the world proved reserves Thus natural gas reserves are more widespread geographically than oil reserves However many countries with huge gas reserves especially in the Middle East seem to be giving greater importance to the exploitation of their oil reserves for which they get better netbacks than that to the exporting of gas

World Gas Consumption 1995-2010 (in billion cubic meters)

	1995	2010	Avg Annual Change (%)
Developed countries	611 3	815 0	1 6
U S A	359 4	665 1	3 8
Western Europe	62 3	79 2	1 5
Japan	1166 0	1757 4	2 5
Total Developed			
FSU	583 0	837 7	2 2
EE	76 4	158 5	4 0
FSU/EE	662 2	996 2	2 4
Developing			
china	17 0	84 9	7 5
India	17 0	93 4	9 4
Other Asia	99 1	342 4	6 8
Middle East	133 0	192 4	2 6
Africa	48 1	67 9	2 8
C & S America	73 6	203 8	6 7
Total Developing	387 7	987 7	5 6
Total World	**2215 9**	**3738 4**	**3 2**

As mentioned earlier, natural gas is expected to be the fastest-growing primary energy source in the world at a rate of 3 2 % per year over the forecast horizon Much of the growth is expected to fuel electricity generation worldwide Resource availability, cost, and environmental considerations will also contribute to growing use of gas in industrial, commercial, and residential sector applications

The following table gives a supply/demand picture of gas based on 1997 BP statistics review

World Gas Demand/Supply 1997 (in billion cubic meters)

	Consumption	Production	Trade	Inventory
U SA	632 5	545 3	81 8	5 4
Canada	74 9	156 8	-82 2	0 3
Total North America	740 2	735 2	0 3	4 7
Germany	79 0	17 3	69 0	-7 3
Italy Netherlands	53 9	19 5	39 2	-4 8
Norway	39 1	67 1	-34 2	6 2
UK	0 4	46 7	-42 3	-4 0
Total Europe	85 8	87 0	-0 4	-0 8
	417 2	275 5	165 3	-23 6
FSU	492 7	623 4	-116 8	-13 9
Total Middle East	158 7	166 7	-11 0	3 0
Total Africa	51 0	94 1	-49 6	6 5
Indonesia	32 8	69 0	-35 7	-0 5
Japan	65 1	0	64 3	0 8
Malaysia	17 8	39 4	21 6	-0 2
Total Asia Pacific	250 5	240 4	10 3	-0 2
Total World	**2196 7**	**2223 0**	**0**	**-26 3**

In the case of oil, 40 1 million barrels per day, which amounts to 56% of the total world consumption, are internationally traded to balance the requirements of different countries However in the case of natural gas, annual international trade is only 20% of the total world gas consumption comprising 321 7 billion cubic meters (bcm) by pipeline and 111 3 bcm in the form of LNG To support the forecast world consumption of 3738 bcm of gas in 2010 the international trade in gas -both pipeline and LNG -has to go up significantly

The Kyoto Protocol is definitely a positive factor supporting increased consumption of gas However if the crude oil prices remain soft or the perception on the part of the investors is one of soft crude oil prices, then not enough capital will be invested in international pipeline projects or even more expensive LNG projects

PERCEPTION OF IEA'S GAS SECURITY

In 1995, International Energy Agency (IEA) completed a study titled "THE IEA NATURAL GAS SECURITY STUDY " The purpose of the study was twofold to discuss and clarify the concept of security of supply in relation to natural gas and to provide factual information on

various aspects of gas security and on the present and future security situation of individual IEA countries

The study defines energy security as being in a state to supply natural gas against two broad categories of risk They are long term risk that new supplies cannot be brought onstream to meet growing demand for either economic or political reasons and risk of disruption to existing supplies such as political disruptions accidents or extreme weather conditions Oil security issues are different from the gas security issues This is because of the rigid nature of transportation in the case of gas (though it is not true for LNG) the relative difficulty of storage and the regional nature of gas markets

The study has concluded that under a scenario of rising oil prices (for example in one of IEA=s studies the oil price is forecast to rise to $28 per barrel by 2005), to which gas prices in many regions remain coupled, there would seem to be no problem in economic or commercial terms in bringing new supplies to markets given current cost estimates However under a scenario of constant oil prices the conclusion is less clear For example at an oil price of $18 per barrel an analysis prepared for IEA of the costs of possible new supplies for Europe shows that only a small proportion of the forecast demand growth to 2010 could be met under current cost and pricing conditions

Analysis of political disruptions in OECD Europe reveals that most countries could continue to supply their core customers for many months, and in some cases indefinitely in the event of a total disruption in deliveries from their single largest non-OECD suppliers European gas companies have in place supply flexibility in the form of spare import capacity from other suppliers, reserve production capacity and seasonal storage Demand for gas can also be reduced by cutting supplies to those who can easily switch to alternative fuels like fuel oil

THE OUTLOOK FOR GAS EXPORT MARKETS IN OECD EUROPE

Gas Balance for OECD Europe (in billion cubic m)

	1992	2000	2010
Demand	**306 6**	**412 4**	**502 8**
Production for Own Use	142 6	157 4	175 5
Contracted Imports From			
Norway	29 6	60 7	69 2
Denmark	2 3	3 8	3 8
France	0 4	0 6	
Germany	1 3	2 3	2 0
Italy			
Netherlands	39 2	19 3	13 2
UK		0 6	0 6

Gas Balance for OECD Europe (in billion cubic m)			
	1992	**2000**	**2010**
Russia	63 0	73 0	15 4
Algeria	35 4	58 9	48 3
Nigeria		0 5	5 3
Libya	2 2	1 7	0 0
Secured Supply	**316 0**	**379 0**	**333 5**
Supply yet to be secured	-9 4	33 4	169 3
Assumed Contract extensions			
Norway		6 9	15 7
France			0 6
Germany			0 3
Netherlands		17 3	18 2
Russia		1 8	60 6
Libya			1 7
Algeria			10 3
Subtotal Extensions		**25 9**	**107 3**
Production for own use			1 1
Norway		0 5	2 7
UK Interconnector		3 8	14 0
Algeria		1 1	9 5
Russia		9 8	20 1
Qatar		2 9	2 9
Denmark		0 1	1 1
Turkmenistan			11 0
Subtotal Possible new supply		18 3	62 5
Total New Supplies		**44 2**	**169 8**

Source The IEA Natural Gas Security Study

The above table represents one example of how gas demand in OECD Europe could be covered during the period up to 2010 Following observations can be made concerning the above table

- Production for own use in OECD European countries is expected to increase marginally over the forecast period, but less than demand, thus increasing the need for imports
- Contract imports volumes from some of the major suppliers, in particular Russia, will level off and decline before the end of the forecast periods Contract extensions are therefore necessary for these countries With the exception of the Netherlands, all have enough reserves to support higher export

- The unsecured supply in 2010 amounts to around 169 bcm According to the IEA report there will be no trouble in meeting these requirements Even after an additional export of 20 bcm from Algeria total export from that country is below the stated goal of 75 bcm by Sonatrach

- Total Russian export of 96 bcm projected for 2010 needs some investment in transportation infrastructure However this expansion of the additional pipeline capacity is relatively cheap

- The continent of Europe should be regarded as one gas market with countries in Central and Eastern Europe potentially competing for volumes from some of the same sources that will supply OECD Europe countries Historically these countries have taken all these supplies from Russia based on short-term contracts Both for economic (supplies from the North Sea are more expensive compared to Russian) and geographic reasons it is more likely that Russia will remain the main supplier to these countries despite the interest of diversifying their supplies for strategic reasons

- As shown below OECD Europe will increasingly rely on outside supplies to meet its requirement according to the IEA report

OECD Europe's Dependence on Various Suppliers (percent)

	1992	2000	2010
Indigenous production not for exports	45 1	37 2	35 1
Russia	19 9	20 0	19 1
Algeria	11 2	14 2	13 5
Norway	9 3	16 1	17 4
Netherlands	12 4	8 7	6 2
Turkmenistan	--	--	2 2
Others	2 1	3 8	6 5

- The following table shows the demand for OECD Europe by countries and also the need for additional import for 2010

Future Supply Requirements for OECD Europe by Countries for 2010 (in BCM)

	Demand	Production & Contracted Supplies	Additional Requirements	Contract Renewals	Need for New Supplies
Austria	10 5	4 8	5 7	2 9	2 8
Belgium &	18 7	11 6	7 1	4 6	2 5
Luxembourg	0 0	0 0	0 0	0 0	0 0
Denmark	4 4	4 4	0 0	0 0	0 0

	Demand	Production & Contracted Supplies	Additional Requirements	Contract Renewals	Need for New Supplies
Finland	5 5	4 1	1 4	1 4	0 0
France	50 2	32 9	17 3	14 5	2 8
Germany	101 0	45 0	56 0	49 9	6 1
Greece	4 1	3 0	1 0	0 0	1 0
Ireland	2 5	0 0	2 5	0 0	2 5
Italy	88 4	51 7	36 7	21 7	15 0
Netherlands	47 0	47 4	-0 4	0 0	-0 4
Norway	1 3	1 4	-0 1	0 0	-0 1
Portugal	3 8	2 7	1 1	0 0	1 1
Spain	18 7	9 7	9 0	6 2	2 8
Sweden	2 3	1 1	1 1	0 0	1 1
Switzerland	4 1	2 2	1 9	1 9	0 0
Turkey	31 9	8 4	23 5	0 0	23 5
UK	108 6	103 4	5 2	4 2	1 0
Total	**502 8**	**333 6**	**169 2**	**107 3**	**61 8**

The above table shows that the sellers of new gas have relatively a huge potential to sell gas in Germany, Italy and France

CENTRAL AND EASTERN EUROPEAN EXPORT MARKETS

As shown below, total demand in Central and Eastern Europe has been 64 7 bcm and total import has been 34 3 bcm

	1995 (bcm)
Demand	
Bulgaria	5 0
Czech	6 6
Hungary	10 2
Poland	9 9
Romania	24 0
Slovakia	4 8
Others	4 2
TOTAL	**64 7**
Production	30 4
IMPORT	**34 3**

Source BP Statistical Review of World Energy 1997

If we accept the growth rate of EIA study of 5 3% per vear then the total demand of Central and Eastern Europe in 2010 will be 148 bcm The production in this region is projected at best to remain at the same level as in 1995 **On this basis, the import requirement from this region will be 117 6 BCM** According to a study by Cedigaz import requirement for this region is forecast to be in the range of 70-90bcm The significant reason for lower import requirements is due to a much lower demand by Cedigaz

Only a small share of projected demand in 2010 is already contracted for Thus a large portion of the demand is up for grabs Russia, the previous supplier would like to hold onto the old markets Recently Poland has signed up a long-term take-or-pay contract with Gazprom for the delivery of 250 bcm over a 25-year period Poland is also planning to buy gas from Gasunie and Norway Hungary=s oil company MOL has signed up a contract with Gazprom to buy 225 bcm over a 20-year period Czech and Slovak republics, which serve as transit countries for Russian gas to Europe usually, pay less for their imports from Russia Still Czech has contracted with Norway for the delivery of 53 bcm over 20 years despite it being expensive Czech will continue to depend upon Russia as their main supplier Slovak has not showed any desire so far to diversify their supply sources

Bulgaria, which also serves as a transit country for Russian gas has shown a desire to be independent of Gazprom to secure its gas supply Since many of these countries (Romania included) do not have enough hard currency to spare despite their desire to be independent of Russia do not have much option and may not prove to be an attractive market for Turkmen gas

EXPORT POTENTIAL TO UKRAINE

Ukraine like any other FSU country is energy inefficient In 1990 Ukraine consumed 115 bcm of gas (36% of primary energy supply) By 1995, gas consumption which was mostly from Russia and Turkmenistan had declined to an estimated 73 bcm (increasing to 41% of primary energy supply) as a result of price increases imposed by its suppliers According to an IEA study, under moderately optimistic assumptions and reform policies and economic growth, Ukranian gas use could recover to about 110 bcm by 2010 Depending upon which gas production assumption is used Baccording to Ukrainian authorities it is likely to be 35 5 bcm and independent analysts project it to be around 20 bcm-import requirement may range between 74 5 bcm and 90 bcm

Ukraine has strongly criticized the Russian decision to build a new export pipeline across Belarus and Poland to Germany arguing that Ukraine stands ready to transit much more than it currently does If it does succeed in convincing Gazprom to route a high share of incremental gas exports to Europe through Ukraine, and Gazprom convinces Kiev to continue taking payment for transit services in gas rather than in cash, incremental gas needs could be covered more or less for the foreseeable future by Russia

In 1997 it began importing 6-10 bcm per year of Uzbek gas in part to replace volumes cut by Turkmenistan It has also held exploratory talks with Iran Since 1995 the Ukrainian authorities have been experimenting with import liberalization by allowing half a dozen private or corporatized trading companies to handle the bulk of imports

EXPORT POTENTIAL TO TURKEY

The potential size of the Turkish gas market makes it a prime target for all producers supplying or hoping to supply gas to Europe In 1997 total gas consumption amounted to 11 bcm corresponding to 9 9 % of total primary energy supply (TPES) Currently the power sector accounts for more than 50% of gas use in Turkey Gas consumption by industry and residential sectors remains restricted by the current size of the transmission and distribution grids

The Turkish Ministry of Energy and Natural Resources projects a demand of 31 bcm of gas (representing 18% of TPES) in 2010 On the other hand Botas the national pipeline company is making arrangements to import 60 bcm per year by 2010 Turkey is already importing LNG from Algeria since 1994 At the beginning of 1998, Botas was negotiating with ten different potential suppliers as shown below

1 Russia Contract signed in 1998 for 6 bcm Current negotiations to increase the supply to 16 bcm Either via Bulgaria or Georgia or by a laying a pipeline through the Black Sea
2 Algeria Contract for delivery of 2 bcm equivalent of LNG which started to deliver in 1994
3 Iran Signed a contract in 1996 to supply 10 bcm per year by 2000
4 Iraq A proposed 1380-km pipeline with a capacity to deliver 10 bcm per year from the northeastern Iraq to Anatolia
5 Nigeria Botas has signed a contract for LNG deliver of 1 2 bcm per year
6 Egypt Memorandum of understanding for LNG delivery of 4 bcm
7 Qatar Memorandum of understanding for LNG delivery of 1 bcm
8 Abu Dhabi MOU for unspecified amount of LNG
9 Oman MOU for unspecified amount of LNG
10 Turkmenistan MOU for deliveries of up to 20 bcm

With so many potential suppliers eager to supply gas, Turkey is in an excellent position to get good terms from its suppliers There is currently a widespread feeling that Botas= demand forecasts could be over-optimistic and that the company has over-contracted The World Bank expects Turkish gas demand to be significantly below the one forecast by Botas and even by a wide margin below the lower projection of the Turkish Government

EXPORT POTENTIAL TO PAKISTAN AND INDIA

In 1997 Pakistan consumed 15 8 bcm of gas and is projected to increase to as much as 48 bcm per year according the latest IEA report on Caspian Oil And Gas Currently Pakistan is self sufficient in gas Its gas production is projected to level off at 27-29 bcm very soon The country=s Sui gas field (opened in 1955) and Mari field (opened in 1966) are at fairly advanced stages of depletion Many other fields that were put into operation recently are comparatively small On the other hand if exploration can be intensified in Pakistan there are good possibilities to find more gas Also if gas price reforms are put into effect demand may turn out to be less than projected Thus the deficit in Pakistan=s gas supply of 20 bcm may be less than projected Besides Turkmenistan other gas producing countries in the vicinity namely Iran and Qatar are interested in Pakistani market It is doubtful that Pakistan can support more than two projects

The Indian gas market is the larger prize in producing countries= and companies= race to gain footholds in South Asia India consumed 24 4 bcm of gas in 1997 according to BP statistics Since gas accounts for 9% of TPES presently, the potential for substitution is considerably great Though many analysts are forecasting India=s gas needs to increase to 75bcm by 2010, it can consume far more than that if gas is available at competitive costs According to the EIA projection India=s gas demand in 2010 may be 93 bcm India=s gas production in 2010 is forecast to be around 38 bcm, calling for imports of more than 37 bcm by 2010 However the real potential of India=s gas market may be more than 50 to 60 bcm by 2010

India is currently looking hard for new supply of gas Gas could be imported via pipelines from Turkmenistan, Iran Qatar Oman or Bangladesh, and /or as LNG from Middle East Far East or other sources Unless LNG costs can be further brought down, it would be a big luxury for a developing country like India to afford it Oman has already given on the possibility of supplying gas to India through pipeline The same is likely to happen with Qatar Potential export from Bangladesh is limited Thus the real potential alternative sources for India are Turkmenistan and Iran But to receive gas from these two countries, overland pipeline has to pass through Paksitan Unless some break-through can be achieved, India is unlikely to find it feasible to depend upon gas supply via Pakistan for security reasons In the case of Turkmenistan, there is the additional problem of pipeline having to pass through Afghanistan

In terms of cost of supplying gas to India, a World Bank study has found Middle East sources (Iran) cheaper than Turkmenistan But given the present US embargo against Iran by the US, it would be difficult to raise international finance for any Iranian project to supply gas to India

EXPORT POTENTIAL TO CHINA AND JAPAN

Currently Chinese gas market is small (19 3 bcm in 1997) It is forecast to increase to 85 bcm based on the EIA study According to the IEA study Chinese gas demand in 2010 is likely to be only 34-52 bcm As in the case of India, the potential Chinese market is likely to be much larger than either the one projected by EIA or IEA if gas is available at competitive cost since the gas share of TPES is less than 4% Moreover, pollution problems related to coal burning by power plants, industry and households in urban areas are already extreme and likely to get worse

China is considering gas imports from Russia and Central Asia via pipelines and in the form of LNG from Middle East, Malaysia, Indonesia and other South Eastern sources According to the IEA study, the most competitive option may be to move gas by pipeline from eastern Siberia to eastern China Based on the preliminary estimates this would cost around $57 per thousand cubic meters (mcm) As far as other sources are concerned, LNG from Middle East is the most the expensive one followed by Central Asians sources (transportation cost of $106 per mcm via a 6000-km pipeline) and then closely followed by LNG from South East Asia

In 1997 Japan used 65 1 bcm of gas and is forecast to consume 79 bcm in 2010 Japan depends upon LNG to meet its gas requirements In the case of Japan also, Central Asian sources may not be competitive with LNG or importing gas via pipeline from Russia

EXPORT POTENTIAL TO IRAN, RUSSIA AND OTHERS

Iran used 42 9 bcm of gas in 1997 and demand for gas is booming The Iranian oil industry needs increasing amounts of gas for re-injection into its aging oil fields in order to maintain pressure and output rates Iran has also plans to increase gas consumption in its power and residential sector Since it costs more to supply northern Iran from its own gas fields, Iran has found it advantageous to import gas from Turkmenistan However when Iran=s gas transmission and distribution system is expanded, it may find it more economical to supply even its northern market from its own fields, thus reducing its import requirements

Even after the break up of the Soviet Union at the end of 1991, Turkmenistan used to supply gas to Georgia, Ukraine, Kazakhstan and Armenia However when these countries could not pay for their gas supplies, Turkmenistan stopped supplying gas to them Till an alternate gas pipeline is laid out to supply gas to the Transcaucasus either under the Caspian or via Iran, there is not much potential to export gas to Georgia or Armenia from Central Asia Besides, Iran through IGAT 1 & 2, Gazprom through the existing pipelines and Azerbaijan when it expands its gas industry (at least to supply Georgia) are likely to be more competitive than sources from Central Asia In addition, the total gas export potential to Transcaucasus is unlikely to be more than 10 bcm per year by 2010

It is interesting that the IEA report discusses the possibility of Russia importing as much as 40 to 60 bcm per year of gas by 2010 to supply its southern states from Central Asia For this scenario to unfold the IEA study makes the following observations Gazprom is planning to increase its gas export to Europe from 112 5 bcm in 1995 to 200 bcm in 2010 To meet the domestic requirement and also the increased export volumes Gazprom has to develop its very expensive Yamal fields Instead of doing this Gazprom can optimize its earnings by importing gas from Central Asia to meet the gas requirements of Southern Russia and to export a higher share of its west Siberian gas production Given the vast gas reserves and the need to earn hard currency it is unlikely that this scenario will take place However if there is new political development this scenario cannot be totally ruled out

GAS SUPPLY COSTS AND POTENTIAL NETBACKS

Total natural gas supply cost should reflect the following four elements exploration and development, operation or production, transport to the market, and local distribution It is difficult to establish or assess exploration or production cost in comparison to transportation cost Simple rules of thumb can be used to estimate pipeline and LNG costs as shown below

Pipeline costs (per 1000 cubic meters)

	Onshore Pipeline				Offshore Pipeline			
Capacity (bcm/year)	**5**	**10**	**15**	**20**	**5**	**10**	**15**	**20**
1000km	28	16	12	12	36	24	20	20
3000km	75	47	40	36	107	75	59	51
5000km	130	83	67	59	178	123	99	87
7000km	178	119	99	87	245	174	134	123

Total costs for LNG Plants

	6 bcm/year	12 bcm/year	18 bcm/year
Liquefaction	42-56	32-42	28-39
Regasification	14	14	14
Transportation			
1000km	7	7	7
8000	56	56	56
Total costs			
1000km	63-77	53-63	49-60
8000km	112-126	102-112	98-109

Asian gas market is dominated by LNG Japan has been the dominant buyer Though Indonesia has been the dominant seller other countries like Malaysia Algeria have been slowly increasing their market share Originally LNG prices were cost based At a relatively early era of the LNG business, however, it became necessary to price LNG in relation to oil From the very beginning LNG has been commanding a premium with respect to crude oil on heat equivalent basis One can justify paying a premium to secure LNG supplies to improve energy security or for environmental protection However during the times of surplus energy or in the absence of the need to protect the environment (especially for developing countries) countries may not be willing to pay a premium for LNG

In the case of Europe, where relatively few and big companies are dominating, gas market is characterized by long term take or pay contracts At present at wholesale level European gas prices are higher than the North American level but lower than the Asian level which is dominated by LNG Although the gas price in Europe is still linked to the oil price this could change over the years, especially under the low oil price scenario This has been already seen in the UK market where the liberalization of the gas market has led to changes in contract structures Escalator clauses are tied to coal, electricity, general inflation or other price indices

Following examples based on the IEA Natural Gas Security Study show how to compute potential gas netbacks for different markets and the table at the end of section gives the total cost of supplying different markets for different gas exporting countries

1 **Gas netback to compete in European power market**

Most of the time, coal is the main competitor of gas in the power generation sector The calculations of the gas netback are based on the following assumptions,

A combined cycle gas plant with an efficiency of 55% is compared with a coal-fired power station with FGD equipment having an efficiency of 43%

The competitive equilibrium between the two plants is expressed by the following equation

$P(G) = 1\ 28\ P(C) + 2\ 20$ where P (G) is the price of gas and P (C) is the price of coal, 1 28 is the coefficient resulting from the yields of the two plants, and 2 20 is the coefficient resulting between unit investment costs for the tow types of plants

Average transportation cost to transport 650 km within the Europe is estimated to cost $ 0 36 per million btu

Cost of Coal	= $40 00 per ton
Cost of transporting And preparing coal	= $12 00 per ton
Total cost	= $52 00 per ton
	= $ 2 08 per million btu

$P(G) = 1\ 28\ P(C) + 2\ 20 = 2\ 66 + 2\ 20 = 4\ 86$

Gas cost at the burner tip on a heat equivalent basis = $ 171 56 per mcm
Pipeline(for 650 km) cost of transporting gas = $ 12 70 per mcm
Gas Netback at the country border = **$ 158 86 per mcm**

To be expected the gas netback could vary from plant to plant depending upon the values of the coefficients in the above equation between the gas and coal price

2 Gas netback to compete in the residential market

The cost of gas at the burner tip should be equal to the cost of burning gas oil Transmission cost(cost of transporting gas through 600 km pipeline) is assumed to be $ 0 71 million btu

Average distribution cost is assumed to be $ 2 16 million btu

Gas is assumed to enjoy a 15% premium over gasoil

It is assumed that gasoil cost is 1 25 times that of crude oil

Crude oil price	= $ 18 00 per barrel
Gasoil price	= $ 22 50 per barrel
	= $ 3 73 per million btu
Cost of transporting gasoil	= $ 0 08 per million btu
Add Premium for gas	= $ 0 57 per million btu
Less distribution cost	= $ 2 16 per million btu
City gate netback for gas	= $ 2 22 per million btu
Less cost of transmission	= $ 0 71 per million btu
Country border gas netback	= $ 1 51 per million btu
	= **$ 53 30 per thousand cubic meters**

3 Gas netback to compete in the industrial sector

In this case there will be no distribution cost The main competing fuel is low sulfur fuel oil, which is estimated to cost 75% of crude oil price Premium for gas over fuel oil is assumed to be 5%

Crude oil price	= $ 18 00 per barrel
Low sulfur fuel oil price	= $ 13 50 per barrel
	= $ 2 11 per million btu
transportation cost of fuel oil	= $ 0 11 per million btu
Add premium for gas	= $ 0 11 per million btu
Less transporting gas	= $ 0 53 per million btu
Country border gas netback	= $ 1 80 per million btu
	= **$ 63 5 per thousand cubic meters**

Based on the above calculations by selling gas in to power sector market where it competes against coal, the gas producing country can secure the maximum netbacks for gas In fact if crude oil price were to remain at $18 00 per barrel not many will be able to sell gas either to replace gasoil in the residential sector or fuel oil in the power sector to get a netback at the wellhead which will give attractive returns to exploration and production investment

Gas Supply Cost at the European Border ($ per mcm)

Supply Country	Transportation Route	Production Cost	Transportation Cost	Transit Fees	Total Costs
Russia	Ukraine	21	92	12	125
Turkmenistan	Iran, Turkey	11	109	28	148
	Caspian Sea	11	109	25	145
	Russia Ukraine	11	113	28	152
Iran	Turkey	11	109	19	139
	LNG	11	102	9	122
Iraq	Turkey	18	88	19	125
Qatar	LNG	11	102	9	122
UAE	LNG	18	106	9	132
Oman	LNG	18	109	9	136
Nigeria	LNG	21	106	0	127
Algeria	Tunisia	18	39	5	62
	LNG	18	81	0	99
Libya	Sub sea pipe	18	42	0	60
	LNG	18	81	0	99
Norway	Subsea pipe	48	53	0	101

Based on the netbacks given in the above table, not many (exceptions being Libya and Algeria) will be able to compete against gasoil and fuel oil in European market Even when they can compete against coal, the netback they get for their gas cannot be said to be all that attractive

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