DOABILITY OF TRANS-CASPIAN PIPELINE AND DELIVERABILITY OF TURKMEN GAS TO TURKEY & EU

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ABSTRACT

Due to increasing demand, gas supply is one of the most strategic energy security issues for huge importers. By taking that into consideration, Caspian region, where important gas supply potentials exist is related directly with the huge importers' energy security issues, which are mainly EU, China, India and Turkey.

As an important gas supplier country located in the Caspian Region, Turkmenistan and her future gas supplies are becoming more important for the importers. As a result, each importer is preparing long term plans and developing new projects to import the gas resources from Turkmenistan.

One of the most popular projects that are related to Turkmen gas resources is the Trans Caspian gas pipeline, which is planned to transport Turkmen gas through Caspian Sea to Azerbaijan, and then with other available pipelines to Turkey and Europe. Naturally, this pipeline is an important energy security issue for Turkey, Azerbaijan and EU. However, there are important political, technical and economic challenges to overcome.

In this study, after a short outlook into the gas politics in the Caspian Region (mainly Turkmenistan related issues); importance of Trans Caspian gas pipeline project will be described. Then, doability of this popular project will be evaluated from the technical, political, and economic perspectives. Additionally, Iran's claim to transport Turkmen gas through Iran to Turkey instead of Trans Caspian project will be compared economically.

"One of the most popular projects that are related to Turkmen gas resources is the Trans Caspian gas pipeline, which is planned to transport Turkmen gas through Caspian Sea to Azerbaijan, and then with other available pipelines to Turkey and Europe."

CASPIAN REGION GAS POLITICS & IMPORTANCE OF TURKMENISTAN

After oil and coal, natural gas is the most important energy resource in the world. Moreover, since being clean & easy to use and shale gas effect on prices, natural gas is expected to be the second world's leading consumed fuel in the future.

Caspian, including Russia, Turkmenistan, Kazakhstan, Uzbekistan, Azerbaijan and Iran, is the most important region according to her proved gas reserve potential in the world (46,7% of world share[1]). Moreover, due to the geographical properties (located in the middle of the important consumers; China, India, EU and Turkey), importance of Caspian region for the world gas politics is increasing.

Table 1 gives numerical information about the reserves, production and consumption values of Caspian and Caspian gas demanding countries.

It is observed from Table 1 that; there is an important volume of gas supply potential (such as 250 bcma) in Caspian region and an important demand volume (such as 400 bcma) in nearby areas.

Due to difficulties faced during transportation, storage and marketing procedures of natural gas, long term plans and forecasts are a lot more important than any other energy resources. That's why, for coherent gas politics, long term estimations are very important. Forecasts for the 2035 supply and demand potentials of these countries are given in the Table 2.

In this scenario to focus on Turkmenistan; she has the 3rd important gas reserves and 2nd (except Iran-no logical estimations due to sanctions) supply potential for the demand markets. Besides, India, China, Turkey and EU are the possible future buyers.

A brief insight into the Turkmenistan energy market;

		Azerbaijan	Turkmenistan	Uzbekistan	Kazakhstan	Iran	Russia	India	China	EU	TR
Proved Gas Reserves	tcm	0,9	**17,5**	1,1	1,3	33,6	32,9	**1,3**	**3,1**	**1,9**	**0,006**
Gas Production	bcma	15,6	**64,4**	56,9	19,7	160,5	592,3	**40,2**	**107,2**	**153**	**0,6**
Gas Consumption	bcma	8,5	**23,3**	47,9	9,5	156,1	416,2	**54,6**	**146,6**	**456**	**39**
Demand Volume	bcma	-7,1	**-41,1**	-9	-10,2	-4,4	-176,1	**14,4**	**39,4**	**303**	**38,4**
1 year Prod/Reserves		0,017	**0,004**	0,052	0,015	0,005	0,018	**0,031**	**0,035**	**0,081**	**0,100**
RESULT		SUPPLY	**SUPPLY**	SUPPLY	SUPPLY	SUPPLY	SUPPLY	**DEMAND**	**DEMAND**	**DEMAND**	**DEMAND**

Table 1: Energy statistics of the main energy players in Caspian Region (Current data).

		Azerbaijan	Turkmenistan	Uzbekistan	Kazakhstan	Iran	Russia	India	China	EU	TR
Gas Supply	bcma	40	140	80	60	No Est.	350				
Gas Demand	bcma							190	500	560	84

Table 2: 2035 Gas supply-demand potentials of main energy players in Caspian Region.

- An important gas exporter in the region (2nd).
- Having an oil exporting capacity more than 100 000 bbld.
- Having a gas exporting capacity more than 40 bcma.
- Lacking of sufficient foreign investment.
- Located too far from the important markets (China-India-EU-TR).
- Lacking of sufficient oil export pipeline infrastructure.
- Majority of gas is exported to Russia and some portion is exported to China and Iran.
- Important portion of gas reservoirs are high pressure / temperature reservoirs and have high percentages of H2S and CO2, which means not easy to develop due to economical & technical aspects.
- Main energy security targets are:
  1. To attract new foreign investors and develop more gas fields
  2. To continue to securely access to Russia, Iran and China gas markets
  3. To increase the capacity of transportation to access China gas markets
  4. To access Pakistan, India and European gas markets via planned pipelines
  5. To complete the construction of these relevant pipelines (TAPI & Trans Caspian)
  6. To reach gas export capacity of 230 bcma in 2035 (expected to be more than 140 bcma)
  7. To reach oil export capacity over 1 million bbld in 2035 (expected to be more than 250000 bbld (due to expected increase in condensate production; but new infrastructures for transportation will be needed)
  8. To complete East-West pipeline inside Turkmenistan and to have the ability to transport South East resources to the Caspian Sea markets (Then from Trans Caspian to EU)
  9. To resolve conflicting claims over the maritime and seabed boundaries of Caspian Sea with Iran & Azerbaijan

Note that items 4, 5, 8, and 9 are related directly with the Trans-Caspian pipeline project

GAS EXPORT INFRASTRUCTURE OF TURKMENISTAN

Table 3 summarizes existing and planned gas export infrastructure of Turkmenistan. As highlighted with yellow, Trans-Caspian gas

"Turkmenistan has the 3rd important gas reserves and 2nd (except Iran-no logical estimations due to sanctions) supply potential for the demand markets. Besides, India, China, Turkey and EU are the possible future buyers."

pipeline project is the planned infrastructure to transport Turkmen gas to TR and EU.

"Resolving conflicting claims over the maritime and seabed boundaries of Caspian Sea with Iran & Azerbaijan must be a priority for Turkmenistan."

TRANS-CASPIAN GAS PIPELINE PROJECT

INTRODUCTION

The idea to transport Turkmen gas to Europe continues to be popular since the start of the Turkmen independence. This idea has developed as the Trans-Caspian gas pipeline project. Many changes occurred in the structure and strategies of this pipeline. For instance, the plan used to include NABUCCO and SCPX pipeline, however political and commercial decision makers have changed the roots of the projects.

With the last updates, Trans-Caspian gas pipeline is planned to run under the Caspian Sea (See Map 1) from Türkmenbaşy to the Sangachal Terminal, then to connect to EU and Turkey via SCPFX and TANAPX and will carry 30 bcma gas annually.

MILESTONES OF THE PROJECT

Before the investment decisions of Trans-Caspian pipeline project, there are important milestones and risks to be considered. If these milestones cannot be overcome then this project will not be realized.

POLITICAL

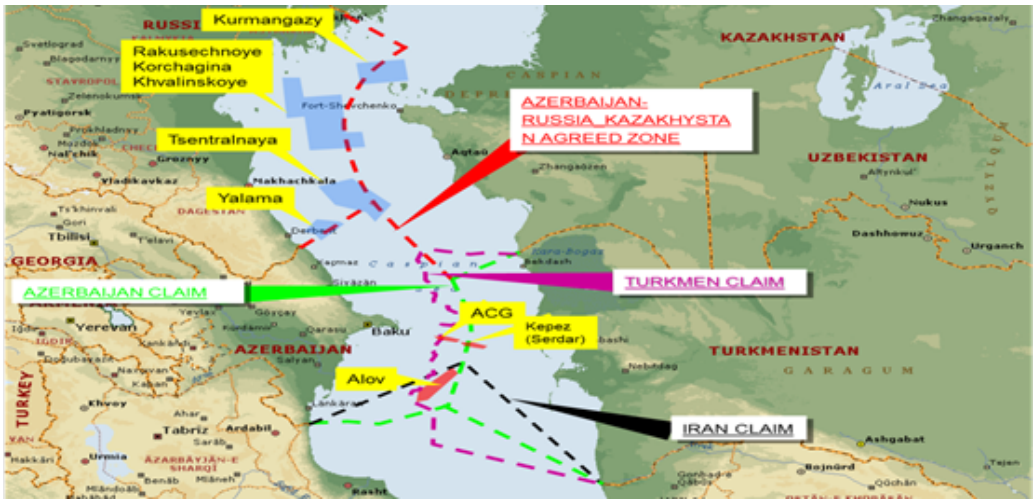
The delimitation of the economic zone between Caspian countries negatively affects the investment possibilities in the region. As seen from Map 1, Turkmenistan has disagreements with both Azerbaijan and Iran but Trans-Caspian pipeline project is affected directly by the conflicts between Azerbaijan and Turkmenistan. This is the first issue that has to be overcome.

This issue is also related with the sharing of

		GAS EXPORT PIPELINES				
		Name of Pipeline	From (Supply Country)	Through (Countries)	To (Markets)	Capacity (bcma)
TURKMENISTAN	EXISTING	CAC	TURKMENISTAN	TURK-UZB-KAZ	RUSSIA	100
		KORPEZHE KK	TURKMENISTAN	TURK	IRAN	13
		DAULETABAT-KANGIRAN	TURKMENISTAN	TURK	IRAN	6
		CENTRAL ASIA-CHINA	TURKMENISTAN	TURK-UZB-KAZ	CHINA	40
		BUKHARA-URALS	TURKMENISTAN	TURK-UZB-KAZ	RUSSIA	20
	FUTURE	EAST-WEST	TURKMENISTAN	TURK	CASPIAN	30
		TAPI	TURKMENISTAN	TURK-AFG-PAK	INDIA	34
		TRANSCASPIAN	TURKMENISTAN	AZ	TURKEY-EU	30
		CENTRAL ASIA-CHINA X	UZBEKISTAN	UZB	CHINA	+18

Table 3: Gas export pipelines of Turkmenistan.

Map 1: Proposed Trans-Caspian Pipeline.[2]



Map 2: Caspian Sea border problems.

some important oil and gas fields around the borders such as ACG & Kepez, therefore the solution will not be easy (also EU&US supports to have a solution).

COMMERCIAL

Commercial milestones may be the most difficult steps to overcome. Hence, the commerciality of a pipeline is related directly with the commerciality of gas production projects. Not increasing or decreasing gas prices (due to the changes in agreement types and shale gas affects); huge tariffs are the main elements for gas development projects to be commercial.

Trans Caspian gas pipeline is planned to transport Turkmen gas to EU & TR markets. Trans-Caspian Pipeline to be reasonable a pipeline, production costs of the fields, tariffs of related pipelines and EU & TR gas market prices become important. If a more economical way is found for transportation of Turkmen gas (such as India-China or Russia) then there will be no need for Trans-Caspian pipeline project.

MARKET RELATED

Hence, gas and pipeline projects require long term plans and projections before the development of investment decisions for the evaluation of Trans-Caspian pipeline's preferred markets (TR & EU), the earliest 2035 projections have to be studied.

Map 3 shows the extra gas supply & demand potentials of the related countries in 2035. According to the estimations, there seems to be enough market potential in EU & TR for 30 bcma (max. capacity of Trans-Caspian) Turkmen gas. However, market potential can change due to other supply possibilities such as Russia, Iran, Iraq and Western Mediterranean. The most deterministic factor in the market share will be the gas prices. Naturally, Azeri gas is one step forward than the Turkmen gas in the struggle due to less tariff costs. Moreover, if the political situations and sanctions in Iran changes, then due to average gas production unit costs and gas quality parameters; Iran and Iraq will be one step forward than the Turkmen gas in TR & EU markets. As a result, market is another risky milestone for the doability of the Trans Caspian pipeline project.

FINANCIAL

The owner of the project will probably be Turkmenistan and EU and WE support the project. This shows that both Turkmenistan can finance such an investment with her own resources and easily find credit from western funds. As a result, financial milestones do not contain any risks for the project.

Note: Azerbaijan may possibly be a partner of this project but this is a weak probability due to SOCAR's investment projections around the region.

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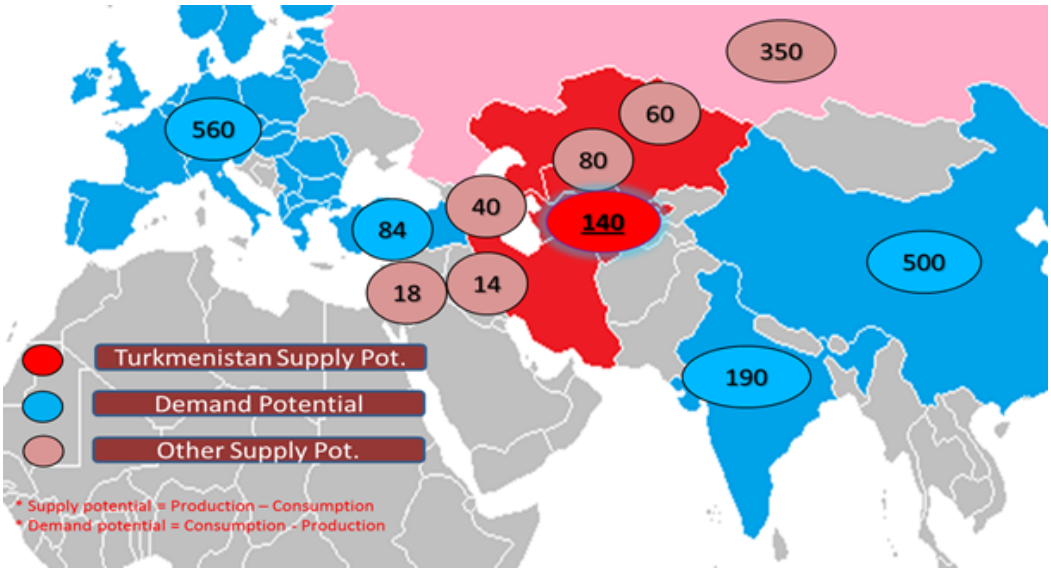
"The most deterministic factor in the market share will be the gas prices. Naturally, Azeri gas is one step forward than the Turkmen gas in the struggle due to less tariff costs."

"Financial and technical milestones of the project do not place any obstacles for the doability of the Trans Caspian gas pipeline project."



Map 3: EU-TR-Caspian-Middle East 2035 gas supply and demand potentials.

TECHNICAL

Technical milestones are not too crucial to overcome. Caspian Sea and the planned Trans-Caspian pipeline route's water depth is not so much (i.e. maximum 300 meter in the deepest point). Although more studies have to be done to handle the topographic and geological risks of Caspian subsurface (mud volcanos) generally, geographical structures and climate effects are not so difficult to overcome. As a result, there are no important technical and technological milestones to overcome.

After the Azerbaijan/Shangachal Terminal point, the transportation of Turkmen gas will be another question and again, will be evaluated technically and commercially. Hence, SCPX, which is going to transport SD2 gas to TR, and TANAP (through Turkey to EU) capacities and extension possibilities have to be studied technically and commercially.

EVALUATION OF THESE MILESTONES

As described in the previous chapter, financial and technical milestones of the project do not place any obstacles for the doability of the Trans Caspian gas pipeline project.

To evaluate the political, commercial and the market issues, initially some technical aspects of the pipeline and the other possible roots that will be used to reach TR & EU markets have to be studied.

TECHNICAL PROPERTIES OF TRANS-CASPIAN (ESTIMATION)

- Start Point: Turkmenbasy / Turkmenistan
- End Point: Shangachal Terminal / Baku / Azerbaijan
- Total Length: 338 km
- Max. Water Depth: 300 m
- Operating Capacity: 30 bcma
- Inlet Pressure: 10 bar
- Outlet Pressure: 90 bar
- Pipe Diameter: 60"
- Thermal Isolation Material Quality: Middle Quality
- Estimated CAPEX (MOD): 7 billion USD
- Estimated Tariff (MOD) (10% IRR based): 75 USD/1000 m^3

POSSIBLE ROUTES FOR TURKMEN GAS AFTER SHANGACHAL TERMINAL

FROM AZ TO TR

Hence, Azerbaijan is not a market for Turkmen gas and all gas will have to be transported to TR and then to some portion of EU.

30 bcma gas will directly be transported to Turkish border.

The only gas transportation facility from Azerbaijan to Turkey is SCP and new extended looped version SCPX pipeline. Total capacity of SCP & SCPX is around 26 bcma and with some extension works capacity can be increased. However, for 30 bcma gas transportation, a new standalone pipeline will be a better solution. Moreover, Azerbaijan estimated to have extra gas supply potential for SCPX after 2025. So, for any SCPFX option, Azerbaijan is going to use that capacity.

From Shangachal Terminal to Turkish border a new standalone gas pipeline construction is planned. With technical properties;

- Start Point: Shangachal Terminal
- End Point: Turkish Border
- Total Length: 690 km
- Operating Capacity: 30 bcma
- Inlet Pressure: 90 bar
- Outlet Pressure: 10 bar
- Pipe Diameter: 58”
- Thermal Isolation Material Quality: Middle Quality
- Estimated CAPEX (MOD): 8 billion USD
- Estimated Tariff (MOD) (10% IRR based): 85 USD/1000 m^3

FROM TR TO EU

In the Turkish border there are 2 options;

- First: Due to commercial and political issues 40% of 30 bcma gas is sold in Turkey and 60% is transported to EU.
- Second: All gas sold in TR market or transported and sold in EU market.

TR to EU Option1:

12 bcma is transported & distributed inside TR market via BOTAŞ’s own facilities and other 18 bcma is transported to EU via looped TANAPFX.

(However, today BOTAŞ do not have enough capacity to accept 12 bcma gas in the eastern border of Turkey, so BOTAŞ also has to make an investment for such an option. Moreover, TANAP is going to be constructed with an operating capacity of 23 bcma. Then in 2026 this capacity is planned to be extended (TANAPX) up to 31 bcma. This extra volume will be devoted for extra Azerbaijan gas supply potential. So, this option will not be the most probable choice.)

- Start Point: Western Turkish Border
- End Point: Eastern Turkish Border
- Total Length: 1000 km
- Operating Capacity: 18 bcma
- Inlet Pressure: 90 bar
- Outlet Pressure: 10 bar
- Loop Pipe Diameter: 54”
- Thermal Isolation Material Quality: Middle Quality
- Estimated CAPEX (MOD): 10 billion USD
- Estimated Tariff (MOD) (10% IRR based): 110 USD/1000 m^3

TR to EU Option2:

Similar to TANAP a new 30 bcma capacity standalone gas pipeline is constructed and TR’s portion is transported to the western Turkey and EU’s portion is transported to western Turkish border. This seems the most probable scenario.

- Start Point: Western Turkish Border
- End Point: Eastern Turkish Border
- Total Length: 2000 km
- Operating Capacity: 30 bcma
- Inlet Pressure: 90 bar
- Outlet Pressure: 10 bar
- Pipe Diameter: 48”
- Thermal Isolation Material Quality: Middle Quality
- Estimated CAPEX (MOD): 12 billion USD
- Estimated Tariff (MOD) (10% IRR based): 130 USD/1000 m^3

"Azerbaijan is not a market for Turkmen gas and all gas will have to be transported to TR and then to some portion of EU. 30 bcma gas will directly be transported to Turkish border. A new standalone gas pipeline construction from Shangachal Terminal to Turkish border is planned."

"Similar to TANAP a new 30 bcma capacity standalone gas pipeline is constructed and TR's portion is transported to the western Turkey and EU's portion is transported to western Turkish border."

TR to EU Option3: All gas is sold to Turkey

For this option, all gas being sold to BOTAS in the Turkish border is planned and all inside Turkey transportation investments will belong to Turkey. However, situation of Turkish market, demand potential and BOTAŞ's infrastructure are other unknowns that make this choice non-probable.

TR to EU Option4: All gas is sold to EU

Similar to TANAP a new 30 bcma capacity standalone gas pipeline will be constructed all gas is transported to EU. Technically this option is similar with the second option, only the average tariff is estimated as 5 USD less (due to transportation of all volume up to the western point of Turkey)

- Start Point: Western Turkish Border
- End Point: Eastern Turkish Border
- Total Length: 2000 km
- Operating Capacity: 30 bcma
- Inlet Pressure: 90 bar
- Outlet Pressure: 10 bar
- Pipe Diameter: 48"
- Thermal Isolation Material Quality: Middle Quality
- Estimated CAPEX (MOD): 12 billion USD
- Estimated Tariff (MOD) (10% IRR based): 125 USD/1000 m^3

EVALUATION

POLITICAL EVALUATION

While transportation of Turkmen gas to EU contains market and commercial risks and this volume of gas is not a vital issue for EU energy security strategies, political border conflict between Azerbaijan and Turkmenistan cannot be solved only for Trans-Caspian pipeline project.

Azerbaijan's aim to be a gas transit country is understandable. However, hence the solution of the border conflict affects the share of the offshore oil & gas fields such as ACG and Kepez, this aim (being a gas transit country) will not be so much exciting for Azerbaijan.

Moreover, Turkmenistan may have other more commercial options to sell her own gas (as India & China).

Russia and Iran's effect to the solution of the border problem in the Caspian Sea is also important. They may not let such a solution, which will be in favor of EU.

MARKET EVALUATION

Due to higher estimated tariffs and unit production costs, Turkmen gas cannot compete with other gas suppliers in Turkish and EU gas markets. All Azeri, Russia, Iraq and Iran gas supplies will be cheaper for those markets. Moreover, the supply potentials of these countries are estimated to meet the demand in such markets.

COMMERCIAL EVALUATION

To start the commercial evaluation, an average gas production cost for western Turkmenistan region has to be estimated. Hence, important portion of gas reservoirs in the western Turkmenistan are high pressure and temperature reservoirs and have high percentages of H2S and CO2; the unit costs to develop and produce the fields will be high. That is why an average of 150 USD / 1000 m^3 will be taken as the unit cost.

Condensate & gas ratios and condensate sales will not be included into the estimations. Hence usually in condensate rich gas reservoirs, condensate sales are more profitable than gas sales. Sometimes it may be better to inject gas to produce more condensate, so this issue is not included in the scenarios.

For average commercial evaluations, all values are as MOD.

For average market prices; for EU: 400 USD /1000 m^3 and for TR 450 USD / 1000 m^3 is estimated.

The calculated netback prices (without tax) for only gas sales are given in Table 4. As seen from the Table 4, the only commercial option is Option 3, which will not be possible due

to Turkish market demand profiles. The most probable scenario is option2, whose net back value is -55 USD/1000 m^3 gas sales. This means it is better to either inject gas for more condensate production or find another market or not to make any investment.

A MORE OPTIMISTIC SCENARIO

If the average gas prices for EU is taken as 420 USD / 1000m^3 and the unit gas production cost for western Turkmenistan is taken as 120 USD / 1000m^3, without changing the tariffs (hence the total investment costs of each pipeline are already optimistic values); then the new commercial summary is given in Table 5. According to the results given in the table, netback values are better than the previous scenario however, for an investor it seems better to take part in a pipeline project instead of an E&P project. Moreover, for the most probable option (Option 2), again netback is minus. This means no positive decision for the investment on Trans-Caspian.

RESULTS OF THE EVALUATION

As a result, the doability of Trans Caspian pipeline is not possible although the gas prices and EU demand will increase unexpected levels.

TRANS-CASPIAN VS. TRANS-IRAN PIPELINE

As seen in the chapter above, doability of Trans Caspian gas pipeline project is not possible due to commercial, political and market related obstacles in the current projections. However, some Iranian specialists claim that transportation of Turkmen gas through Iran to Turkey instead of Trans Caspian project will have better economics. In this chapter, this claim will be briefly evaluated.

TECHNICAL PROPERTIES OF TRANS-IRAN PIPELINE (ESTIMATION)

- Start Point: Turkmenbasy / Turkmenistan
- End Point: Agrı / Turkey
- Total Length: 1442 km
- Operating Capacity: 30 bcma
- Inlet Pressure: 10 bar
- Outlet Pressure: 90 bar
- Pipe Diameter: 56”
- Thermal Isolation Material Quality: Middle Quality
- Estimated CAPEX (MOD): 16 billion USD
- Estimated Tariff (MOD) (10% IRR based): 180 USD/1000 m^3

"Important portion of gas reservoirs in the western Turkmenistan are high pressure and temperature reservoirs and have high percentages of H2S and CO2; the unit costs to develop and produce the fields will be high."

	TRANSCASPIAN	AZ-TR PIPELINE	OPTIONS			
			OPTION1	OPTION2	OPTION3	OPTION4
	75	85	110	130	0	125
REVENUE			420	420	450	400
NETBACK			0	-55	60	-5
* All values are USD/1000m3 MOD prices						

Table 4: Evaluation of commerciality - netback prices of the scenarios.

	TRANSCASPIAN	AZ-TR PIPELINE	OPTIONS			
			OPTION 1	OPTION 2	OPTION 3	OPTION 4
	75	85	110	130	0	125
REVENUE			432	432	450	420
NETBACK			42	-13	90	45

* All values are USD/1000 m^3 MOD prices

Table 5: Evaluation of commerciality - netback prices of the scenarios (More optimistic scenario).

"Some Iranian specialists claim that transportation of Turkmen gas through Iran to Turkey instead of Trans Caspian project will have better economics."

Map 4: Trans Caspian and Trans Iran Pipelines from Turkmenistan.

COMMERCIAL COMPARISON

Hence, the gas production price unit in Turkmenistan and scenarios after the eastern border of Turkey are the same, total tariff values and total investments will be enough for comparison.

As the calculation shown in Table 6, Iranian transit of Turkmen gas will not be an economic choice.

	TRANS-IRAN PIPELINE	TRANS-CASPIAN + AZ-TR PIPELINE
Tariff @ TR Eastern Border (USD/1000m³)	180	75+85 =160
Total CAPEX @ TR Eastern Border (bUSD)	16	7+8= 15

Table 6: Evaluation of commerciality - netback prices of the scenarios.

"Gas politics and Caspian gas resources are very important energy security issues for huge consumers around the region. Turkmenistan by having the 3rd reserves potential and 2nd supply potential is the shining star of the region."

POLITICAL-MARKET-TECHNICAL-FINACIAL COMPARISONS

On the other side, all political, financial and market related issues will be more risky and problematic than the Trans-Caspian scenario due to sanctions on Iran. Only the technical milestones may be easier than the rest.

SUMMARY

As described in the related chapters, gas politics and Caspian gas resources are very important energy security issues for huge consumers around the region. Turkmenistan by having the 3rd reserves potential and 2nd supply potential is the shining star of the region. That is why all huge consumers are planning and developing projects to meet some part of their gas demand from Turkmen resources. Such as extension of CAC Pipeline Project of China, TAPI Pipeline Project of India and Trans-Caspian Project of EU.

For such huge pipeline project investments, long term projections, commerciality, politics, market views, and etc. are very important items to consider.

There may be gas resources; however, if those resources cannot be transported to the market via a safe, sustainable and commercial way, those resources do not mean anything up to the changes in the current conditions.

That's why in this paper, with the risks and milestones, doability of the popular Trans-Caspian pipeline project is evaluated and as well as an alternative route to transport Turkmen gas to TR and EU through Iran is also compared.

As a result, for the current situation, Trans

Caspian pipeline project does not seem to be a logical choice for investment.

ABREVATIONS

TR: Turkey
EU: European Union
CAC: Central Asia China
TAPI: Turkmenistan Afghanistan Pakistan India
CAPEX: Capital Expenditures
IRR: Internal Rate of Return
ACG: Azeri Chirag Guneshli Oil Field
MOD: Money of the Day
TANAP: Trans Anatolia Pipeline
TANAPX: Trans Anatolia Pipeline Extension
TANAPFX: Trans Anatolia Pipeline Forward Extension
SCP: South Caucasus Pipeline
SCPX: South Caucasus Pipeline Extension
SCPFX: South Caucasus Pipeline Forward Extension

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[1] BP Statistical Review, "World Energy", 2013.

[2] Wikipedia.

"There may be gas resources; however, if those resources cannot be transported to the market via a safe, sustainable and commercial way, those resources do not mean anything up to the changes in the current conditions."