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INSIDE THE FIRST ISSUE

EDITOR'S VIEW

by Necdet Karakurt

"It is clear that political incitation require long term and contingency planning. Hence, the world meets "The Energy Game" that comes out as the successful future planning."

"Syria's importance comes from being the last circle of pipeline chains from Egypt, Qatar and Iran: A democratic Syria would guarantee safety of the pipelines and so Turkey's being an "Energy Hub" deal."

Humanity largely depends on energy usage as technology advances. More energy definitely equals more power in today's world. However, the nature unjustly distributed energy resources around the earth that obligates some countries to acquire privileges in energy industry using capital and political influence. Europe and US succeeded politic advancement in areas with large oil reserves by colonization. Their influence in such areas spread through and sustained by autocracy ruled by hypocrites over a few decades. Autocratic hypocrites served well for the west until they became useless as the folks asked for revolution. The scenario is as simple as the west intervening to overthrow the dictators and ending the turbulence. In the past, there was always a new servant hypocrite coming to power once the old one was toppled, however, nowadays; the incumbents have to pass through a few critical international tests since there is a notable increase in the number of influencers.

It is clear that political incitation require long term and contingency planning. Developed countries are aware of the benefits of future planning and always prefer staying ahead comparing to those who are on the developing stage or yet to develop. Hence, the world meets "The Energy Game" that comes out as the successful future planning. Every country has a share from this game no matter how large of reserves they have. The biggest players in the game can be named as EU (as the consumer), US (consumer & seller), and Russia (seller). China might be added but their worldwide reputation and presence seems to be a follower more than a political influencer. OPEC can be considered as the producer but its political efficiency seems to be unnoticeable.

Europe along with its own natural resources has been a royal customer to Russia with large gas reserves. However, Russia's unpredictable political affairs (especially what it did in Ukraine) disturb EU's dependency on Russian gas. An alternative (perhaps alternatives) to Russian gas is inevitable for Europe and its copartner US. American intervention in Iraq started the long and painful journey in the Middle East. The Arab Spring rising from Tunisia would eventually hit Syria. Modern democratic governments to provide good deeds for EU and US would replace the autocratic ones in the region. Arab Spring theory worked well until rebellious acts took place in Syria. Being economically imbalanced and only having partial success in Iraq (in general, limited to Kurdish Region in Northern Iraq) restrained US from practicing a similar military engagement in Syria. To overthrow Assad, they furnished the opposition groups instead. However, Iran and Russia with some help from China interrupted the idea of dismantling Syria and kept the Assad's regime alive.

It may not be wise to classify Turkish politics as successful throughout the Arab Spring but Turkey has been actively involved in current politics and strategies in the Middle East. Turkey already had Azeri and Russian gas flowing along the current pipelines and there have been talks and agreements for building additional pipelines. At this point, Turkey could be a port that connected Middle East and Caucasian gas, and become a safe house for Europe's gas market. The thought of being an energy hub triggered aggressive politics during the Syrian opposition movement. Syria's importance comes from being the last circle of pipeline chains from Egypt, Qatar and Iran: Qatari gas through Saudi

Arabia and Jordan, Egyptian gas through Israel and Lebanon, and Iranian gas through Iraq all had to pass Syrian land. A democratic Syria would guarantee safety of the pipelines and so Turkey's being an "Energy Hub" deal. From the day one of Syrian oppositional movement, Turkey supported the opposition groups. On the other hand, Iran by having the control over Iraqi government (under Shiites dominance) helped Assad to stay in the office. At one point, opposition groups fought each other instead that reminds how seriously the west and Turkey should handle Iranian intelligence. Applying sanctions upon Iran happened to be semi-efficient. However, Russia chose to defend Assad against Coalition by proposing that it considered all the opposition groups as terrorist. Today, Assad is still the governor of Syria and Russia bombs Turkmen territories. EU, US and Turkey hit Daesh targets. However, chaos in Syria is still at high levels as millions of Syrians left the country and hundreds of thousands are dead.

The energy game is never as simple as one might think. Many innocent people suffer from the political decisions pressurized by illegitimate leadership. Some leaders create a chaos for their energy needs and some others try to calm the chaos. Setting international balance requires strong nerves but energy supplies and demands always tend to push the limits in areas with large oil reserves, causing irreparable mistakes. Now, that the tension increased rapidly in Turkey-Syria-Iraq borders, every country involved must measure and act wisely for each political step that they are ready to take. Let us not forget the fact that there are several desperate countries able to actuate their great military powers in the area. However, wiser decisions on the next and following steps is always the key to change the balance or to have the upper hand in any chaotic environment. Under current circumstances, it is better to analyze Iran's hand. What does Iran have? What are they planning and how are they going to do?

Perspicaciously connecting puzzle pieces together can directly answer many of the questions regarding the energy game, and how the game changes. The Energy Policy Turkey, in its first and unique issue, tries to place the correct pieces together and focus on certain aspects of the "Energy Game" that has been occurring in and around Turkey. A few of the articles articulate the famous subject Turkey to be an energy hub as the current pipelines (BTC, SCP, etc.), ongoing projects (TANAP, TAP, etc.) and possible future pipeline routes and projects (Turkish Stream, South Stream, Northern Iraq Pipeline, etc.) are examined deeply. You might take a glimpse of the article about possibilities of Turkmen gas transport and catch a clue on the new perspectives to the current strategies. Azerbaijan's export potential up to 2050 is enunciated in a unique study within the concept of Southern Gas Corridor. Another article explains if unconventional reserves can be a hope for Turkey's future energy needs or if Turkey can experience the shale gas revolution as well. More articles have been specific to the evaluation of Eastern Mediterranean resources and energy policies. Analysis of Iran and Iraq from the view of energy reserves and both countries' role in the game grasps great attention. The effects of the Arab Spring in the Middle East give a brief outlook of the major actors, their political advancement, and power shifts in the energy game. It also gives interesting ideas to what are happening differently in the Arabic Peninsula.

"The energy game is never as simple as one might think. Many innocent people suffer from the political decisions pressurized by illegitimate leadership."

"Setting international balance requires strong nerves but energy supplies and demands always tend to push the limits in areas with large oil reserves, causing irreparable mistakes."

DID ARAB UPHEAVAL CHANGE THE ENERGY GAME OR THE WEST STILL HAVE AN EDGE ON IT?

by Necdet Karakurt, Serhat Çubukçuoğlu and Oğuzhan Akyener

ABSTRACT

It all started in Tunisia on 18 December 2010 and reordered many countries in the Arabic Geography. Whereas some governments could not manage the upheaval and collapsed, some others had to face heavy civil disorder-protests and occurrences of necessary governmental reorganizations.

Many experts have studied and further analyzed the whole aspects of this Arab Spring by the sight of economics, military, sociology, religion and global politics. Obviously, there are definite changes in reorders of those affected countries and so their presence in the globe requires new policies. As a short note, today's world largely depends on energy politics because they seem to play a key role in determining global policies. From a point of view, it is unclear why nobody has yet reviewed results of the Arab Spring through the sight of energy policies. It is a good idea to note that if not all, most of these countries are definitely oil producers and their folks crave for democracy, which indeed has taken too many lives to owe. Was it worth taking the initiative and walking the democracy line with heavy loses and uncertain future due to lack of knowledge and control over militia groups? Maybe, those folks had no idea about the outcome but the West knew about how hard the transition would be. Major oil companies like to have the edge to act independently or run their international affairs as smooth as possible. They would prefer surpassing governments and their laws to extract and sell oil from known commercial reserves. Or perhaps, their preference would be causing some changes that are essential as far as who controls the laws or the oil markets in such countries.

Understanding the causes of the Arab Spring, the outcome of collapses, rebuilding and highlighting the effective changes in energy politics, balance and role of key oil players in Africa and Middle East will help determine how global politics have been reshaped over Arabic upheaval. To do that, all current import and export rates of the due countries, existing reserves, production and infrastructure of exports, international investors and companies in the region and important projects will be considered. In addition, pre-Arab Spring Era situations will be compared with the current values and changes in energy games will be identified.

"It all started in Tunisia on 18 December 2010 and reordered many countries in the Arabic Geography. Whereas some governments could not manage the upheaval and collapsed, some others had to face heavy civil disorder-protests and occurrences of necessary governmental reorganizations."

ARAB SPRING AND ENERGY GEOPOLITICS OF THE MIDDLE EAST

Middle East is the most tumultuous region in the world, plagued by sectarian and ethno-religious violence.[1] Situated in a geopolitical hotspot marked by political uncertainty, it is a stage of shifting power play of partnerships, where most countries of the Middle East suffer from democratic deficiencies and weak public confidence in illegitimate leaders. In a multipolar world with diverse national and transnational interests, the region seems to be more fragmented than ever with ensuing intense confrontation from Yemen to Syria. Even if this so-called Arab democratic movement culminates itself in responsive and representative political systems, the transition will be long and painful, as seen in the now four-year old tragic civil war in Syria.

Perhaps, not a fully appreciated game-changer behind assessment of the impacts of the Arab Spring is the rising importance of natural gas and the power struggle over control of energy sources around the Fertile Crescent. Clean-burning natural gas, despite its expense and varying demand, is a major import pillar in OECD Europe, which is more eager than ever to phase out coal and undertake greenhouse-gas emissions reduction commitments. While European natural gas consumption is

projected to grow by 0.3% till 2020,[2] Russia's annexation of Crimea and monopolization of energy supply routes through Ukraine to Europe has led energy consumers of the industrialized world finally to become serious about hydrocarbon alternatives. At the G7 Rome Ministerial Summit in May 2014, European leaders highlighted the need to address security challenges and ensure diversification of transit routes to sustain safe and uninterrupted access to energy.[3] Meanwhile, the Eurozone crisis since 2008 has been a severe impediment for Greece and Cyprus, both of which found large hopes in offshore energy exploration projects to become net exporters of oil & gas and recover from bankruptcy in the coming decades. The Arab Spring thus intersected with Europe's alarming economic slowdown, creating diverging push and pull dimensions to the inter-regional relationship.[4] On top of this tectonic shift in energy geopolitics, Turkey, with a projected use of 2.5 tcf[5] of natural gas per year by 2020, sought to diversify its sources of energy geographically and translate this into economic and foreign policy gains.[6]

The competition among littoral states of the eastern Mediterranean on one side and the Persian Gulf on the other to exploit and monetize on rich offshore energy resources is a by-product of the struggle to exert political influence for furtherance of national interests in the region.

Had the Arab Spring not taken place, Russia's plan to control the alternative route over Turkey to the West would have been successfully accepted by its major consumer market in Europe. On the other hand, Turkey's plan to distribute Qatari gas to Europe would increase Turkey's ability to suppress Russia's stronghold as the major supplier of Europe. However, US$10 billion-worth Iran-Iraq-Syria natural gas pipeline[7] from Iran's South Pars gas field to the Mediterranean would be a lifesaver for Europe to by-pass Turkey, Qatar, and Israel to become the prime supplier of the region to Europe. Such a move could outmaneuver Israel's initiative to export newly found gas from the "world's biggest deep-water reservoir in a decade",[8] and undermine Turkey's key position, and hinder any possibility of a political resolution in Cyprus due to unattractive returns on investment in gas finds. This would have been unacceptable for the Obama administration scrambling for foreign policy success, simply because reconciliation over Cyprus would allow U.S. oil companies to make safer investments into gas exploration, substantially reduce Europe's reliance on Russia for energy supplies – while giving Cyprus, Israel, and Egypt an edge over Iran, Iraq and Syria – and help to bring pro-American countries together in a region that had become increasingly anti-western with the rise of Islamic fundamentalism.[9] Moreover, standalone production and storage in an LNG liquefaction facility in Cyprus would have insufficient capacity to economize on gas volumes in its own Exclusive Economic Zone (EEZ), therefore desperately needing Israel's stake to reach a credible volume. If Turkey could be part of a brokered peace deal in Cyprus, this would decrease political risk and increase affordability of a Cypriot-Turkish pipeline project that may be linked with the "Southern Corridor" from Azerbaijan to Europe and by-pass Russia.

Meanwhile, global economic slowdown and the accompanying slump in oil prices dragged down growth in oil exporting countries of the Gulf. Even though the Gulf Cooperation Council (GCC) capital markets are viewed as relatively safe destinations for risk capital during periods of globally financial market volatility, post-Arab Spring political instability and a protracted downturn due to fiscal deficits have negatively impacted the region's overall outlook. Iran's come-back to the world stage by the prospect of lifting of international sanctions places it in a better position to weather oil-price shocks, while the drop in oil revenues may squeeze liquidity in the GCC, putting ever more pressure on the ruling monarchs to carry out crucial reforms to contain their closest foe's heightened political influence. This complex environment actually presents an opportunity for emergence of a sustainable and inclusive post-oil economy for Arab states in the long run.

Against this backdrop, and thanks to the changing landscape of the region, Turkey viewed the Arab Spring as an opportunity

"Had the Arab Spring not taken place, Russia's plan to control the alternative route over Turkey to the West would have been successfully accepted by its major consumer market in Europe."

"Turkey viewed the Arab Spring as an opportunity and put itself on the map as an important player in energy geopolitics, acting as a transit route between the Central Asia, Middle East, and Europe."

and put itself on the map as an important player in energy geopolitics, acting as a transit route between the Central Asia, Middle East, and Europe. Turkey's soft power resting on its cultural, historical, and commercial links with the neighborhood set the foundation stone of this re-alignment. Most recently, the transport of crude oil to Israel through Turkey's Mediterranean port of Ceyhan via pipelines from the semi-autonomous Kurdish Regional Government in Iraq, the holder of world's fifth largest deposits,[10] underscored Turkey's tactical maneuverability and keen interest to consolidate its influence as an economic hub in the eastern Mediterranean. In a region polarized by prolonged conflict, autocratic tendencies, and illegitimate sub-state actors, Turkey still represents the best model for institutionalized democratic governance and diversified economic development in a Muslim-majority society.

MIDDLE EAST COUNTRIES: TODAY (POST - ARAB SPRING ERA)

To successfully evaluate the effects of the Arab spring on the due countries, energy politics, import and export rates, existing reserves, production volumes, related infrastructures, international investors and active companies in the region and important projects should be taken under consideration.

The oil & gas production - reserves - export potential volumes of the Middle East countries are summarized in Table 1. Important information presented on the table could be listed as follows:

- Only potential exporter and importer countries are focused.
- Iran, Iraq, Kuwait, Qatar, Saudi Arabia, United Arab Emirates are the most important exporters in the region, that will be given more attention to.
- Israel and Syria might be accepted as the potential future exporters after 2030.
- The analysis of Arab Spring's effects from the view of being an exporter or an importer confirms the following results;
  - Analysis shows no direct relation between the effect incidence of Arab Spring and being an exporter or an importer.
  - The information in the Arab Spring Effect column implies;
    - HIGH means: "There is a civil war.".
    - MIDDLE means: "There are governmental changes or ruinous protests or attacks.".
    - LOW means: "There are some mild protests.".

As far as the production, reserves and export potentials of the due countries are considered, Iran, Iraq, Kuwait, Qatar, Saudi Arabia, and United Arab Emirates can be elected as

Country	Situation	Arap Spring Effect	Oil Production (mbbld)	Oil Export Potential (mbbld)	Oil Reserves (mmmbbl)	Gas Production (bcma)	Gas Export Potential (bcma)	Gas Reserves (tcm)
Iran	EXPORTER	LOW	3200	1300	158	167	10	34
Iraq	EXPORTER	MIDDLE	3000	2400	140	0,6	0	3,2
Israel	POS. FUTURE EXPORTER	NO EFFECT	0,5	0	0,011	6,4	0	0,3
Bahrain	IMPORTER	MIDDLE	58	0	0,13	13,6	0	0,1
Jordan	IMPORTER	LOW	0	0	0,001	0,3	0	0,006
Kuwait	EXPORTER	MIDDLE	2800	1400	104	16	0	1,8
Lebanon	IMPORTER	MIDDLE	0	0	0	0	0	0
Syria	POS. FUTURE EXPORTER	HIGH	70	0	2,5	6	0	0,25
Palestine	IMPORTER	NO EFFECT	0	0	0	0	0	0
Oman	EXPORTER	LOW	950	830	5,5	30	10	0,9
Qatar	EXPORTER	NO EFFECT	2050	1400	25,25	156	120	25
Saudi Arabia	EXPORTER	LOW	11600	6900	269	103	0	8,3
United Arab Emirates	EXPORTER	NO EFFECT	2800	2500	98	53	8	6,1
Yemen	EXPORTER	MIDDLE	130	43	3	7,7	6,7	0,5
Turkey	IMPORTER	NO EFFECT	50	0	0,3	0,5	0	0,007

Table 1: The chart displays oil & gas production - reserve & export potentials of Middle East countries (Production & Reserve values are adapted from CIA FACTBOOK).

the major exporters for the world markets. Syria might be added due to being a popular exporter before the Arab Spring Era. Hence a new list of countries can be shaped to focus and taken into consideration. After selecting the main countries in the Middle East in accordance with the importance of energy export (mostly oil), destinations and the percentages of the export volumes for those destinations will have to be analyzed.

To determine the most important destinations, the largest oil and gas importers, their effects on the international politics and the largest economies in the world are to be examined carefully. The result of this examination states that US, EU, China, Russia and Japan could be highlighted as the first five most important energy players in the world. Table 2 displays the relation between exports of main countries in the Middle East and import destinations to those defined above.

		DESTINATIONS				
		US	EU	CHINA	RUSSIA	JAPAN
EXPORTERS	IRAN	0%	10%	40%	0%	7%
	IRAQ	14%	18%	22%	0%	2%
	KUWAIT	16%	4%	30%	0%	10%
	QATAR	2%	22%	3%	0%	20%
	SAUDI ARABIA	10%	10%	15%	0%	10%
	UAE	1%	2%	10%	0%	32%
	SYRIA	0%	0%	0%	0%	0%

Table 2: Middle East exports chart to due destinations.

Certain facts can be extracted from Table 2:

- All percentages in the table refer to the ratio of export volume to due destination over the exporter countries' total export volume.
- Even though being an important oil exporter country, and also there may be some small volumes of trade with the Middle East countries, Russia is accepted not importing any oil from the exporters above.
- Due to current sanctions and ongoing civil war inside, Syria is accepted not exporting any oil.
- The table indicates that nearly all these exporters are selling half of their total supply volumes to these giant players in oil market.

In addition to the export rates, understanding the relations of these exporters with the 5 major players in energy game, huge international ongoing upstream projects (exploration and / or production) and the number of investors working in these exporters' oil markets are important. Looking at the number of companies from the major oil players of the world that actively operate in the Middle East might yield better analysis results to identify the effects of major oil players in those countries. The number of operating companies is given on Table 3. Table shows the number of US - EU - China - Russia - Japan originated operating companies working in due countries' upstream market. Note that companies who suspended their activities in the due country are excluded. However, "force majeure" declared companies are included. Moreover, Canadian companies are accepted as US companies.

As given on the Table 3;

- EU is the most active player in oil game in the Middle East with 27 companies.
- US come as the second by count of 13 companies.
- Russia and China both have 7 companies in total.
- Japan seems to be the worst in the game

		MAJOR PLAYERS				
		US	EU	CHINA	RUSSIA	JAPAN
EXPORTERS	IRAN	-	-	1	1	-
	IRAQ	7	12	2	4	-
	KUWAIT	-	-	-	-	-
	QATAR	2	5	1	-	1
	SAUDI ARABIA	1	1	1	1	-
	UAE	2	8	1	-	1
	SYRIA	1	1	1	1	-

Table 3: A chart displaying the number of upstream companies in due countries.

by only 2 companies but Japan's involvement in the consortiums is inevitable.

Other balances such as investor tendencies, the shifts and other important key notes related to the energy markets of the Middle East (Post-Arab Spring Era) will be mentioned in the next sections.

MIDDLE EAST COUNTRIES: BEFORE 2011 (PRE - ARAB SPRING ERA)

Making a logical comparison for energy market indicators of due exporters requires analyzing the whole data of the current and pre-Arab Spring Era regarding the knowledge and information from the Middle East. That's why; production - reserves - export potentials of the major exporters in the Middle East (See Table 4) and the changes in the number of US - EU - China - Russia - Japan originated operational companies in the due countries' upstream market (See Table 5) are prepared.

Analyzing Table 1 and utilizing the information given on Table 3, 4 and 5, comparison charts are formed and illustrated on Table 6 and 7. Major shift in the export potentials seems to hit Iran, Iraq, Kuwait and Saudi Arabia. On the other hand, changes in company activities are mainly in Iran, Iraq and UAE, which note that Arab Spring resulted in an inevitable power shift between the key players.

After laying out some important facts regarding what has happened in the due countries' energy markets, certain comments and analysis will be presented in the next sections.

WHAT IS DIFFERENT IN THE MIDDLE EAST: COUNTRY ANALYSIS

Changes in each country in the Middle East are carefully analyzed to certain extents. Some of the extents can be mentioned as influence of foreign investors, production differences, political balance, etc. The information provided below is extracted from IHS database. It is divided into sub categories for each country and the general summary is given at the

	Oil Production (mbbld)	Oil Export Potential (mbbld)	Oil Reserves (mmmbbl)	Gas Production (bcma)	Gas Export Potential (bcma)	Gas Reserves (tcm)
IRAN	4300	2550	137	139	8	30
IRAQ	2400	1900	115	1,2	0	3,2
KUWAIT	2450	2100	104	11,5	0	1,8
QATAR	1400	1200	25,5	117	95	25,4
SAUDI ARABIA	10500	7600	263	84	0	7,8
UAE	2800	2400	98	49	0	6,5
SYRIA	401	260	2,5	6	0	0,25

Table 4: A chart that displays Production - Reserves - Export Potentials of the Middle East exporters (Production & Reserve values are adapted from CIA FACTBOOK).

		MAJOR PLAYERS				
		US	EU	CHINA	RUSSIA	JAPAN
EXPORTERS	IRAN	1	4	5	2	1
	IRAQ	1	3	2	2	1
	KUWAIT	0	0	0	0	0
	QATAR	3	4	2	0	1
	SAUDI ARABIA	1	2	1	1	0
	UAE	6	5	2	0	0
	SYRIA	2	4	1	0	0

Table 5: A chart showing the number of upstream companies in due countries.

	Difference Between 2015 and 2010 Values	
	Oil Export Potential (mbbld)	Gas Export Potential (bcma)
IRAN	-1250	2
IRAQ	500	0
KUWAIT	-700	0
QATAR	200	25
SAUDI ARABIA	-700	0
UAE	100	8
SYRIA	-260	0

Table 6: The chart compares Oil & Gas Export Potentials of Middle East countries.

	PLAYERS				
	US	EU	CHINA	RUSSIA	JAPAN
IRAN	-1	-4	-4	-1	-1
IRAQ	6	9	0	2	-1
KUWAIT	0	0	0	0	0
QATAR	1	-1	1	0	0
SAUDI ARABIA	0	-1	0	0	0
UAE	-4	3	-1	0	-1
SYRIA	-1	-3	0	1	0

Table 7: A chart displaying the changes in the number of upstream companies that operates in the Middle East.

end of this section.

OMAN

Changes via Arab upheaval show some progress from democracy perspective of Oman as new 'Petroleum and Minerals Law' issued by Oman government is taken place in 2011. The new law engages the Ministry of Oil and Gas in being the authority as far as oil and gas activities are concerned. New features in the law covers environmental protection, natural gas treatment facilities and allows for export of natural gas.

Companies operating in Oman include American based Occidental Petroleum Corp. (OXY) and Petro Tel Inc. of), European based DNO ASA, RAK Petroleum Public Company Limited a subsidiary of DNO ASA, Frontier Resources International Plc., Circle Oil Plc. and Tethys Oil AB, and Middle East based CC Energy Development SAI Ltd. and several Oman companies. Oman appears to

"Oman: New oil and gas discoveries show a positive outlook for Oman. Additionally, light tight oil unconventional practices are about to add up to production."

"Iraq plans to build oil export pipeline to Aqaba port of Jordan. Agreements with Iran over Iranian gas exports appear to be Iran's increasing influence in Iraq."

be unattractive for large scale companies but Shell and Total prefer to be shareholders in some of the exploration and development contracts.

Petroleum Development Oman Llc. (PDO) plans to build world's largest solar plant to produce steam for use in its unconventional practices. Other remarkable activities are those 'Oil Park Project' awarded to British based Amec Foster Wheeler and development of new power plants contracted to Hyundai Engineering Company Limited of Korea.

New oil and gas discoveries show a positive outlook for Oman. Additionally, light tight oil unconventional practices are about to add up to production. Iran succeeds constructing a pipeline to export gas through Oman to Far East.

IRAQ

Democracy is at its baby steps in Iraq due to conflicts between Iraqi Government and diverse sects within the country. Namely Kurdish Regional Government claims some shares from the oil revenue, which Iraqi Government subsequently started to approve. An agreement is signed with Kuwait for the exploitation of cross-border fields. Iraqi government establishes new state oil companies to increase its exploration and production activities around the country.

"Yemen: Security threats caused many companies to halt their activities throughout the country and some of the operational companies happened to withdraw from their licensed contracts."

Insurgency threats interrupt a fast steady pace of work in the region. However, Kurdish Region of Iraq is able to release tension for exploration practices. That is why almost all companies prefer performing in the Kurdish Region. Keeping in mind that Iraq is accepted to having one of world's largest oil reserves, it attracts companies of all scales. ExxonMobil, BP, Chevron, Total SA, DNO ASA, ENI, Kuwait Energy Co., Repsol SA, Talisman Energy Inc., Lukoil, Genel Energy Plc., Crescent Petroleum Co. Inc., Chinese national oil companies and several other are actively operational in the region.

Iraq plans to build oil export pipeline to Aqaba port of Jordan. Agreements with Iran over Iranian gas exports appear to be Iran's increasing influence in Iraq. Upheaval effect shows a positive outlook on the reserves but the insurgency threats make it hard to bear with.

YEMEN

Public unrest in 2011 ended up in cabinet change that resulted in Yemen's ambassador to France as new Oil Minister. Current oil production in Yemen is subject to decline steeply because of insurgent attacks to pipelines. Security threats caused many companies to halt their activities throughout the country and some of the operational companies happened to withdraw from their licensed contracts. Major actors in Yemen are a bundle of American, European, Middle Eastern, Pakistani and Chinese companies.

QATAR

One of the main issues that Qatar has to resolve is the sharp increase in population since the growth is about 300% in the last 10 years. Restructuring of Qatar Petroleum has taken place. Large scale companies such as ExxonMobil, Total SA and Shell mostly operates in Qatar through downstream projects. Qatargas LNG Process Trains, Pearl Gas to Liquids Project, Al Karaana Petrochemicals Complex, new condensate refineries in Laffan are examples of high budget downstream projects. There is no insurgency in Qatar and oil production follows a declining trend.

SAUDI ARABIA

King Salman appoints Minister of Petroleum and Mineral Resources as new Chairman of Saudi Aramco. Main actor in Saudi Arabia is its own petroleum company, Saudi Aramco, which is also discovering and evaluating country's unconventional potential. However, China Petroleum & Chemical Corp. (SINOPEC) and Lukoil of Russia continue their exploration activities in the country. On the other hand Total SA in a joint venture with Saudi Aramco governs export refinery complex. Kellogg Brown & Root (KBR) agreed building billions of dollars' worth refinery complex.

UNITED ARAB EMIRATES (UAE)

International Renewable Energy Agency (IRENA) headquartered in Abu Dhabi in 2009. UAE Government placed US$136 million to fund the organization in 2015. In December 2013, Iran and UAE reached an agreement on Tunb and Abu Musa Islands negotiations. National Iranian Oil Company stops delivery of gas sales and purchase agreement with Crescent Petroleum Co. Inc. based in UAE. Drilling activities are increased in the country resulting in constructing new rigs. UAE based companies are main actors in the country where as Japanese, European and American companies also practice explorational activities. Dodsal Group of India succeeds million dollars' worth pipeline replacement construction deal. Oil refinery and LNG import facility in Fujairah are up for construction by International Petroleum Investment Corp. (IPIC) based in UAE. Oil and gas reserves in UAE appear to increase steadily.

"UAE: Oil and gas reserves in UAE appear to increase steadily."

JORDAN

Jordan has a new Minister of Energy and Mineral Resources as of 2015. The country is found to be unattractive for oil and gas industry since its reserves are small. Main actors are European companies and major events might be pipelines to export gas from Iraq, Gaza in Palestinian territories and Egypt. Oil shale practices are favored in Jordan to increase its hydrocarbon potential.

BAHRAIN

The country has an investment plan in the oil and gas sector for a time range of 20 years, most of which will be spent on exploration and production. Japanese and American companies are operational in the country. Bahrain is evaluating its unconventional reserves and its production is rising significantly. Bahrain Petroleum Co. (BAPCO) is to renew old pipelines and construct new refineries.

KUWAIT

Kuwait is one of the largest oil producers in the Middle East. Kuwait Oil Co. Ltd. oversees all the explorational activity in the country. Contracts to extract heavy oil are given to American and European companies. The same situation is true for engineering, procurement, construction and commissioning provision.

LEBANON

Lebanese government appears to be dysfunctional. New ministry of Energy signs an agreement with Norway to assist Lebanon in oil and gas sector. Oil and gas reserves are questionable and Lebanon commences negotiations with Cyprus to delimit an exclusive economic zone. US will provide assistance to do so and Lebanon will be able to open its offshore bid round.

SYRIA

The future of Syria is still cloudy as the government and opposition forces are fighting each other. The American and European ban over Syria is ongoing. Production rates dropped significantly due to war in the country. Russia's Soyuzneftegaz starts explorational activities in offshore Syria. This might be Russia's way of holding power in the Mediterranean.

"The future of Syria is still cloudy as the government and opposition forces are fighting each other."

ISRAEL

Major operational companies are Israeli companies but American based Noble Energy stands out as a foreign investor in the country. Israel's oil and gas reserves have a sharp increase after the offshore discoveries in 2010, when Arab Spring started. Perhaps, it is all related; Israel has realized discoveries of huge oil and gas reserves that might have ended the power of Oil Rich Arab Era but of course, it did NOT!

"Israel's oil and gas reserves have a sharp increase after the offshore discoveries in 2010, when Arab Spring started."

IRAN

Sanctions against Iran because of its nuclear program had been effective since 2012 but they are lifted gradually. The sanctions had a notable impact on Iran's oil and gas reserves since the ban on oil and gas exports dropped the production rate and hence lowered the oil revenue. National Iranian Oil Co. (NIOC) is the major player along with a couple of Chinese companies since the other operating

companies had to leave due to sanctions. Iran is trying to build a pipeline web to export its natural gas by building routes to Pakistan, Iraq and Oman. An important note is that EU and US push Iran to allow foreign oil companies to enter the country right after lifting the sanctions that will give an opportunity for American and European companies to invest in downstream and upstream projects.

"The acts of cold war in Syria, which is the most affected country from the Arabic Upheaval, have resulted in an unrest that is triggered by terrorism and insurgency."

The impact of the Arab Spring over Middle Eastern countries (See Table 1) can be related to the country analysis data as a result of what has changed in the energy game. Several countries listed on Table 1 i.e. Israel, Palestine, Qatar, UAE and Turkey are not affected from the upheaval. One reason may be they either have no potential hydrocarbon reserves such as Turkey and Palestine or provide safe investment opportunities to foreign investors as Israel, UAE and Qatar do. Turkey has been investing its offshore assets in Black Sea and Mediterranean Sea but it has no luck so far. However, Turkey knows the fact that it is located between the oil producer and the consumer countries. This fact drives Turkey to accomplish being the energy corridor between them. The war in Syria has set back the plans to be an energy corridor. Palestine has not really attracted any investors because of the security problems and no possible hydrocarbon reserves. The rest of the unaffected countries (Israel, UAE and Qatar) have political stability that attracts foreign investors. Qatar's reserves have already been assessed that there is unlikely a debate for conflict on possible future reserves. Instead, the debate is for billion dollars' worth huge downstream projects. UAE is another perfect environment for EU and US companies to overtake high stakes on big upstream and downstream projects. Israel seems to be staying out of the conflicts in the region but perhaps, this is because it hides behind US, which acts as the main political dominator. Israel's great offshore discoveries brought out the idea that Israel could supply gas and be a port to Arab gas to Europe or to Turkey. This would ease security concerns of energy routes and provide an alternative for Russian gas under the stronghold of Israel over Arab gas. However, discoveries were insufficient for Israel to be the prime supplier but the idea was presumed by US and EU and that is how Syria has got agitated.

The countries with low to middle effects are mentioned as having some governmental changes, protests and attacks. Among these countries (Iran, Iraq, Bahrain, Jordan, Kuwait, Lebanon, Oman, Saudi Arabia and Yemen), Lebanon, Bahrain and Jordan are treated as Palestine since they are believed to have limited reserves. Jordan might be an example country for being unpopular due to having no hydrocarbon reserves. The effect of Arab Spring in this country might be low but unnoticed. Bahrain is under American and Japanese influence. The new investment plan in the oil and gas sector provides cash flow to foreign investors. Its oil reserves are based on its unconventional reserves. Lebanon, on the other hand, seeks assistance from EU and US to evaluate its offshore reserves and delimitation of economic zone with Cyprus.

As stated on Table 1, Oman has low impact from the Arab Spring and the country review approves this finding because changes in Oman's oil market are succeeded by the new Petroleum and Minerals Law. The outcome of new petroleum law is giving flexibility to foreign investors to sign contracts for big projects such as power plants, gas treatment facilities and unconventional practices. It is quite possible to imply high European and US involvement in Oman and Yemen except that threats to pipelines in Yemen imply hardship on the investors. Saudi Arabia resembles Qatar as the fight for oil is characterized over downstream projects such as refinery complexes since Saudi Aramco is the major player in its own country but let's keep in mind that US influence over Saudi Aramco is inevitable. Kuwait can be accepted as the backyard of US and EU. Kuwait Oil Co. Ltd. oversees all the exploration activities but the unconventional and downstream projects are rewarded to EU and US companies.

Iraq has its share from the upheaval since Iraqi government seems unable to have control over the Iraqis but again attacks continues to threat stability since US occupation. Governmental changes still require more work to stabilize the country. Europe and US' absolute

influence is based in Kurdish Region as there seems to be very large oil and gas reserves. On the other hand, the diversity of sectarian outlook in the region is open to interference by Iran. The acts of cold war in Syria, which is the most affected country from the Arabic Upheaval, have resulted in an unrest that is triggered by terrorism and insurgency. Syria's future holds instability since Russia's military intervention changed the game. Exploitation of its possible offshore reserves will have to wait until the country stands on its own foot. Iran's involvement in the Arab Spring is quite notable in Syria. After US occupation in Iraq and / or rebuilding of Iraq, Iran has spread through the country due to its great influence over a large number of Iraqi Shiites. US and EU forced Iran over its nuclear program by applying sanctions but Iran and Russia has gotten closer and both countries acted as allies over the war in Syria or let's say the war in energy game.

RESULTS

The unrest in the Middle East still continues especially in Syria and Iraq, where there are severe disputes regarding who has the control over areas, where radical groups pose threats. The region is susceptible to political influence because many countries in the region are governed by Sultans and religious orientation is quite diversified since each tribe has its own way of believing in God, living, and acting by their sectarian traditions. This means if a Sultan's ruling weakens, dramatic power shifts and changes in the way of handling the laws and living conditions are expected. Since many of the tribunal masterminds are easily manipulated by money and power, foreign political involvement can easily deteriorate region's fragile structure. Hence, control over tremendous oil reserves, related infrastructures, and agreement deals are subject to be broken by the current authority or insurgency attacks. This is exactly what is happening in Syria, Iraq and Yemen these days. Radical Islamic groups occupy large areas in Syria and Iraq, and cause chaotic environment to deal with. Yemen is suffering from attacks to its pipelines as these attacks drop the production rate and so weaken Yemen's stability. Ending insurgency and oppositions should be a must to stabilize the region.

Governmental institution has come to a halt in Syria since Syrian Government is unable to settle an agreement with the opposition leaders and stimulate the war within its borders causing a great loss of soil to Syria. Coalition forces formed by US and Europe have been applying sanctions against Syria and they are trying to dismantle a terrorist group (Daesh) that threats both Iraq and Syria. Russia, Iran and China, on the other hand, are acting as supporting Syrian Government against the coalition and the rebel groups. Russia's aim towards having a share in energy game through Mediterranean seems to be paying out for good but the Middle East continues to suffer from this act. In fact, the area is longing for a prolonged rest.

The numbers on Table7 states the number of foreign companies practicing business in the region decreased since the start of Arab movement. Iran might be omitted because changes in the numbers are due to the sanctions against Iran's nuclear program. Perhaps the most important change is the fact that American and European involvement in the Middle East is shifting towards downstream projects in calmer states since the reserves in those countries are bound to decline and to mention, American and European companies already hold shares in the largest producing fields. Small and mid-size companies are still actively running their businesses in the south part of Middle East. However, Kurdish Region of Iraq is the new target for great reserves, hence very attractive for major players.

US and Europe have a direct control over the area, which is why Russia prefers interacting with Syria to have a share from the abundant oil and gas reserves. As pointed out earlier in this article; if Arab Upheaval had not happened, EU and US were planning to oversee a pipeline from Iran to Mediterranean through Iraq and Syria, which would have been the longest in the Middle East, with possible extensions to Lebanon and Greece. Along with Syria being listed as a potential future gas exporter in Table 1, Iran seems to hold the edge to be a prime supplier for Europe with

"Since many of the tribunal masterminds are easily manipulated by money and power, foreign political involvement can easily deteriorate region's fragile structure. Hence, control over tremendous oil reserves, related infrastructures, and agreement deals are subject to be broken by the current authority or insurgency attacks."

its South Pars Gas Field. Syria's geostrategic location placed it on the center stage for rivalry between Saudi Arabia and other Sunni political actors on one side, and Iran and its Shiite proxies on the other in a struggle for regional dominance. The proposed pipeline would also provide flexibility to Europe as an alternative to its main gas supplier Russia. Especially after Russia's military intervention in Ukraine and Europe's unsuccessful attempt to suppress the insurgent opposition, this new pipeline would reinforce Russia's dominance of the energy supply routes. For some reason, The Arab Spring's arrival at Syria to start the democracy walk for Syrians and the Russian intelligence to destroy EU and US' genuine plan coincided.

"The so-called Arab Spring started from Tunisia in late 2010 and brought out the hunger for democracy throughout North Africa and the Middle East. In fact, many Arabs had no intentions to have the right to elect or to be elected but they only cared about having better living conditions."

Attempts for possessing nuclear enrichment technology and dismantling of the Iraqi dictator by US gave Iran an opportunity to assemble all the Shiites in the Middle East. Perhaps, US had not counted on the fact that Iran could to manage to build a Shiite corridor from Persia to Mediterranean when it invaded Iraq. US concentration on establishing so-called Kurdish Regional Government (KRG) in the North was a genuinely designed plan because American and European companies would have control over large oil and gas reserves in this region and that KRG would provide a gray area between Sunnis, Shiites and Turks. Russia especially after the big drop in oil prices and its oil revenues decided to gain advantage in the energy game. Russians made a pact with Iran and China to support Syrian Government against rebel groups so that they could save the Shiite corridor to Mediterranean but they underestimated American intelligence as so-called Islamic State (Daesh) fighters were born in one night and appeared to control more like the half of Syria and Iraq. Interestingly, Kurdish Region is safe and sound as it is not disturbed by Daesh.

Europe's attempts to find an alternative to Russian gas by the help of US require more puzzle pieces put together. All the pipeline alternatives make Turkey stand out as a better option because Turkey has long been an ally of Europe and US. It will never pose a threat to Europe since it is not an oil exporting country and it has religious ties with Arabs, which will always secure the pipelines. Making Turkey an energy corridor to transport Middle East and Caspian gas to Europe might be the key to resolve the fight over oil because all the oil and gas would be aggregated in Turkey and then distributed to Europe. That way if any of these providers having an issue with Europe decides to cut oil, Turkey would be able to flow the oil and gas over the other two. Additionally, competition among the producers would have to make noticeable discounts, which Europe might have never gotten directly.

SUMMARY

The so-called Arab Spring started from Tunisia in late 2010 and brought out the hunger for democracy throughout North Africa and the Middle East. In fact, many Arabs had no intentions to have the right to elect or to be elected but they only cared about having better living conditions and grasping their shares from the great amount of the capital passing through their soil. The resentment caused by energy games in the region have brought good results in some and worsened the conditions in the others. At last, some countries learned from their mistakes and corrected them for better but some are still making the same mistakes over and over again.

Democracy might be a correct path to walk through for Arabs. It might provide peace over disputed areas and calm the lives of innocent people. However, there are set backs since some countries' aim such as Russia and Iran's differs from that of the American and European coalition. China's involvement in the area is not as aggressive as Russia and Iran's but a notable fact is that the number of Chinese companies operating in these states is increasing day by day due to lower costs they offer. Russia is exporting oil and gas to Europe but it, with its unavoidable military power, seems to have a high-hand controlling the oil sources outside its borders. Syria serves as the most attractive and closest place for Russia to start with because of the continuing war that suits the cause. At last, Turkey has to pay great attention to what is happening in

the neighboring states as an active war started with the energy game right outside of its southern border places an economic hardship due to the refugees and political disputes that corrupts stability. No matter what the outcome is, Turkey has to be in this energy game and play a key role to resolve the conflict because energy means oil & gas for the Middle East. Within the concept of energy and energy politics, Turkey is an inseparable part of the Middle East and Turkey has to be the controller of oil and gas markets as it is located between the producer and the consumer!

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"No matter what the outcome is, Turkey has to be in this energy game and play a key role to resolve the conflict because energy means oil & gas for the Middle East."

IRAN IN THE ENERGY GAME WHILE PASSING THROUGH THE ENERGY DOOR

by Necdet Karakurt, Oğuzhan Akyener, Serhat Çubukçuoğlu, Mehmet Apaydın and Ali Maraşlı

"While Iran's ambitious plans to reach pre-sanctions oil output is welcome by keen observes in western energy circles, the truth is that Iran will need years to repair the damage on its existing infrastructure to reach that capacity amid sharp increase in domestic consumption."

"Iran is expected to gradually lift trade barriers and receive an influx of western technology to help modernize its aging infrastructure."

INTRODUCTION

The Middle East is often referred to as a perennial geopolitical hotspot, the bedrock of shifting power play of partnerships, and constant shift of alliances – all in the midst of emerging and demising local powers. Iran sits at the epicenter of this political, economic and social development in the neighborhood. On one hand, as a prominent OPEC member, Iran quietly aims to exert influence through energy diplomacy in its relentless pursuit to elevate its rank from a regional to global power status. On the other hand, resting on a young, educated population with rich energy reserves and vast terminal capacity on the Gulf, Iran's engagement in bold expansion policies has an underlying intention to boost its hegemony in the region and to play the role of a great power in world political affairs.

Iran is the second largest economy in the Middle East and North Africa (MENA) after Saudi Arabia – its main regional rival, whose economic activity and government revenues still depend largely on oil revenues and therefore remain volatile.[1] While the western sanctions have reduced Iranian oil exports by about two thirds, causing Iranian currency "Rial" constantly to depreciate its value, the World Bank estimates that Iran will grow by 1.9% in 2015.[2] Iran's current oil production is just over 3 million b/d[3] and while this is expected to increase after the lifting of all sanctions, in reality, it can add no more than 300,000 – 500,000 b/d barrels to its actual oil production due to fast depleting oil fields and underinvested infrastructure.[4] Before the Islamic Revolution, in 1974, Iran was a regional ally of Israel and had received close support of the U.S. administration to start its controversial nuclear program for peaceful purposes, due to fast maturing oil fields and excessive production under the Shah regime. The situation met with bitter sanctions in the wake of post-revolution Iran-Iraq War, when Iran tried to achieve military self-sufficiency and re-initiated the program, casting serious concerns in the west towards Iran's hidden agenda.

While Iran's ambitious plans to reach pre-sanctions oil output is welcome by keen observes in western energy circles, the truth is that Iran will need years to repair the damage on its existing infrastructure to reach that capacity amid sharp increase in domestic consumption. With oil production is at its highest levels since 1960s and a world-wide excess output of 2m b/d, the profitability of such an investment on the scale of $200 billion[5] is questionable as oil markets already face a persistent glut that has more than halved prices in the past 16 months.[6] OPEC's published official statistical data that puts Iran's proven oil reserves at 157 bb has been falsified by various researches, the average of whose estimates is between 30-35 bb.[7] In fact, perhaps ironically, Iraq, OPEC's second largest oil producer has almost the double of this amount at 77 bb, proven but undeveloped reserves, with production cost of $1 per barrel in contrast to $3-$4 in Iran.[8]

With the nuclear accord signed between P5+1 and Iran in Vienna on 14th of July 2015, Iran is expected to gradually lift trade barriers and receive an influx of western technology to help modernize its aging infrastructure. This will increase capital investment; enable development projects, and increase spending. As oil prices begin to surge towards $60-$70 mark by 2017, Iran will expand trade with its partners, although it is still far over the horizon to see its production capacity to jump to 5.7m b/d level, or even the 4.8m b/d, as targeted by Iran's Ministry of Energy.[9]

OIL & GAS MARKET OVERVIEW

Based on the IHS and USGS databases, with

more than 400 billion boe of 2P oil and gas reserves, Iran has a bright future in global oil and gas industry. However, exploration and production activities (E&P) has been considerably constrained for more than 3 decades related to Arab-Israeli War, Iraq-Iran war, sanctions, and so on. Vast majority of the development wells in Iran were drilled before the 1980s; that is why, Iranian fields can be described as undeveloped resources in oil and gas sector.

INSTITUTIONAL FRAMEWORK

Ministry of Petroleum is fully responsible for E&P policy in Iran's oil and gas sector. The National Iranian Oil Company (NIOC) plays a key role as a subsidiary of the Ministry of Petroleum. NIOC has the option of signing contracts with the IOCs under the authorization of the Higher Council of the Economy.

LEGAL FRAMEWORK and FISCAL TERMS

Iran's contract system can be divided into two different categories; both of which can be named as buy-back contracts and the new IPC (Iran Petroleum Contract) respectively. Iran's legal framework initially was constructed with the 1987 Petroleum Act. The 1987 Petroleum Act was accepted as the initial governing law but it is not considered as sophisticated frame for petroleum operations. 1988 Direct Taxation Act later brought buy-back contracts into the system.

In buy-back contracts, the contractor shoulders all risky investments. Return of the investment is agreed on a remuneration fee (an allocation of production remaining after royalty -officially called Priority Percentage Right- and cost recovery based on a fixed fee) with a fixed rate of return negotiated at the beginning of the contract. Buy-back contract forbids the foreign private ownership depending upon the Sharia Law. Due to lack of investment, partially modifications happened in buy-back contracts in 2003 (associated with 2002 Law on Attraction and Protection of Foreign Investment), especially in cost recovery system, income tax system (reduced to 25%), and remuneration fees.

The new IPC term effectively entered into force on November 14, 2015. As a result of the sanctions' expansion, political change and financial conditions pushed Iranian government to establish a new contract type to attract foreign investors. After the implementation day of JCPOA (Joint Comprehensive Plan of Action, also known as the ''Nuclear Agreement"), Iran anticipates to flow 300,000 to 500,000 bbl. oil per day in a year period. When compared to buy-back contracts, IPC includes incentives and investment options that will attract foreign investors (extension of E&P periods, payments based on re-scale etc.). IPC also gives an option to enter into JVs (joint ventures) with NIOC. Since it is a new contract type, availability of all fiscal materials is not online yet.

UPSTREAM MARKET

Glorious days of Iran as an oil producer and exporter date back to 1979 before the Islamic Revolution to throw the Shah. During the shah regime, Iran produced nearly 6 MMbo/d oil. The new republic could never manage to surpass the 6 MMbo/d production rate due to some complications in the oil field management. These complications might be exampled as establishment of National Iranian Oil Company (NIOC) to oversee all the exploration and production activities in the country, all the staff working in the oil industry being foreign, sanctions applied against Iran, and low oil prices up to 2000s. Iran tried to compensate high costs of Iraq war by its oil revenues and kept the production rates as high as possible. Being dependent on oil revenues resulted in early maturation of the producing fields since Iran was not able to gain access to necessary technical equipment due to sanctions. Rise in oil prices after 2000 notes the increase in exploration activities since Iran again became an attractive oil rich country to invest for International Oil Companies (IOC).

Nevertheless, Iran was able to add new discov-

"Iran will expand trade with its partners, although it is still far over the horizon to see its production capacity to jump to 5.7m b/d level, or even the 4.8m b/d, as targeted by Iran's Ministry of Energy."

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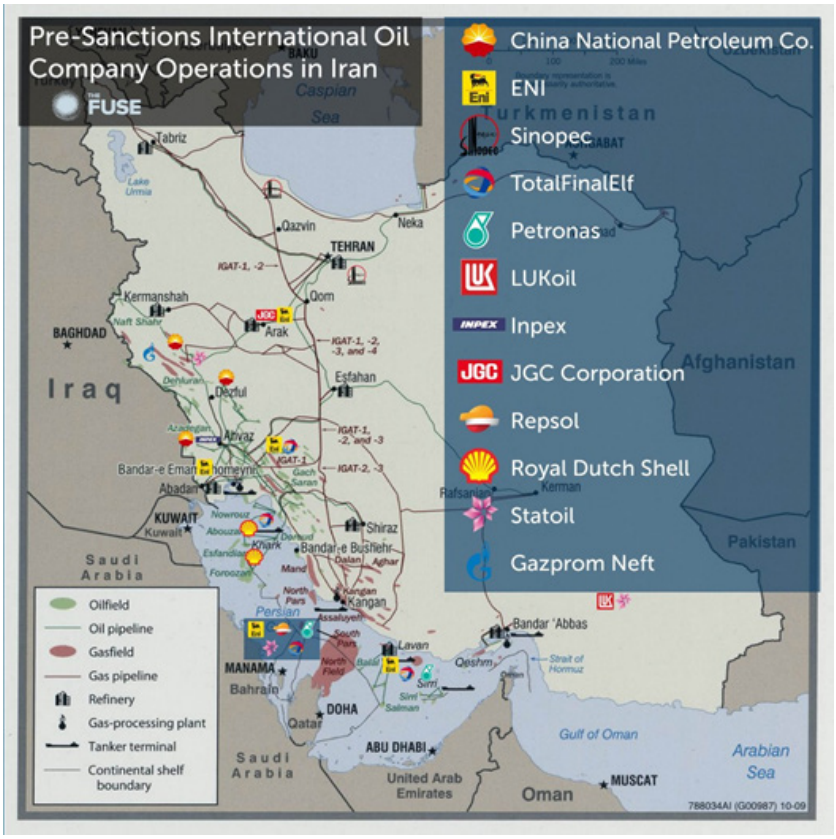
"Natural gas discoveries also increased Iran's potential for reestablishing its reputable power in the energy game by the help of IOCs. However, new sanctions by US and reinforced by EU troubled IOCs' flexibility and caused them to leave Iran."

eries to its oil reserves. Natural gas discoveries also increased Iran's potential for reestablishing its reputable power in the energy game by the help of IOCs. However, new sanctions by US and reinforced by EU troubled IOCs' flexibility and caused them to leave Iran. Map 1 shows the operating IOCs before the latest sanctions. These days, none of those companies is active in Iran. Sinopec and CNPC of China are the only companies that operate in the country as it can be seen from Figure 1, in which the displayed production amounts by IOCs are limited to CNPC in 2015.

Iran's current petroleum contracts are based upon buyback contracts (for the last 20 years), under which the government, upon discovery, buys the extracted oil in the producing fields. This type of contracts limits the profit of foreign investors, as they prefer finding better deals to market oil elsewhere. Buyback contact mechanism coupled with the latest bans on investments made IOCs leave the Iranian E&P sector but Iran premises to change its current petroleum contracts by newly proposed Iran Petroleum Contracts (IPC) to favor foreign investments. After the ease of sanctions related to Iranian nuclear program by an agreement on April 2, 2015, Iran introduced its new IPC at Tehran Summit in November 2015. However, Iran's new IPC did not get enough attention by IOCs as Iran is expected to revise the proposed IPC to replace the current buyback contracts.

Iran's oil and gas reserves are validated as one of the world's largest reserves – second in gas and fourth in oil (See Figure 2). Map 2 illustrates the distribution of oil and gas fields across Iran's basins. According to IHS Energy's Iranian market briefing: The majority of Iran's remaining oil resource resides in the predominantly onshore Zagros Fold Belt, which remains Iran's key oil producing province. Gas resource is centered largely in the offshore South Pars Field in the central Arabian Province. The Zagros Fold Belt also has sizable remaining gas resources.

"Iran's oil and gas reserves are validated as one of the world's largest reserves – second in gas and fourth in oil."



Map 1: IOCs that were operating in Iran before the sanctions.[10]

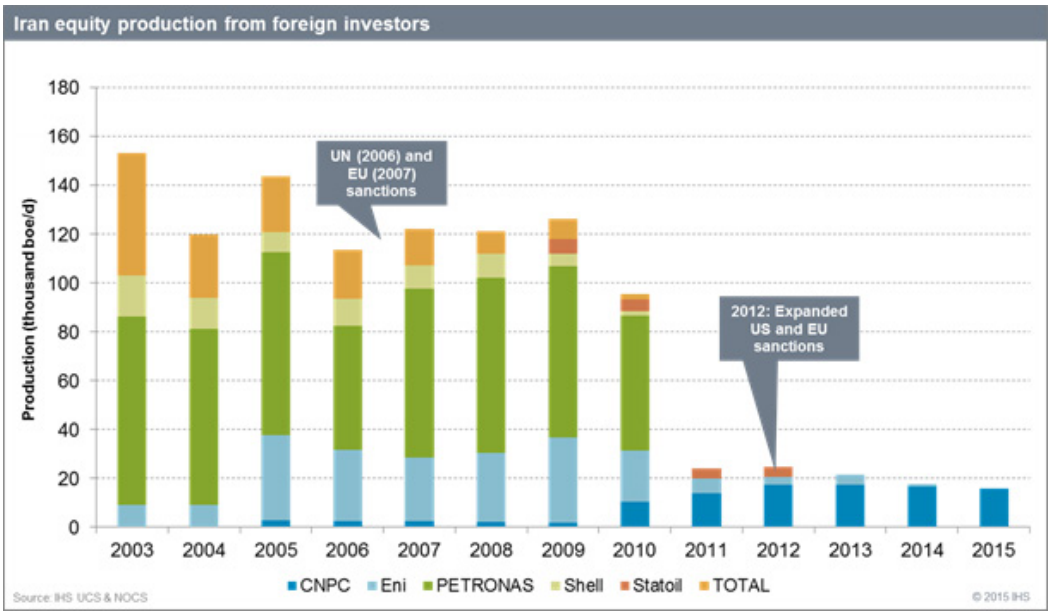
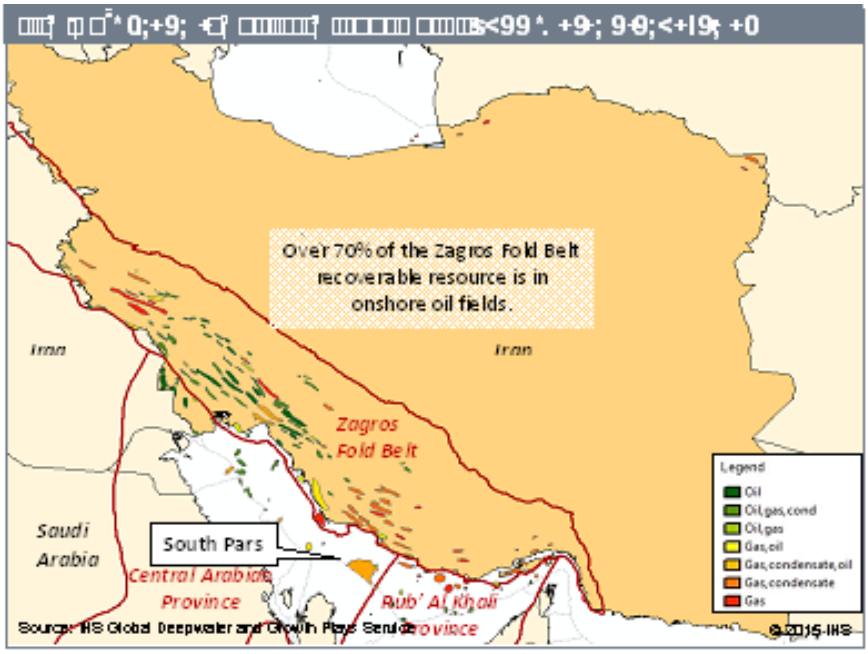


Figure 1: A graphic display of Iran's oil equity production from foreign investors.[11]

from the Central Arabian Province has partially compensated for a sharp decrease in production from the core Zagros Fold Belt oil-producing province. New volumes during this period are largely tied to increased production from the Persian Gulf and onshore oil fields bordering southern Iraq (both areas which received foreign investment through the Iranian buyback contract structure), as well as condensate production from the South Pars gas field.

Drilling activity in Iran has been muted since around 1980, implying that the Iranian resource base has not had the benefit of the considerable advances in reservoir imaging, drilling, and completion technologies over the past 35 years. Again, this suggests substantial scope for production increases through application of modern technologies, while also pointing to the relatively unexplored nature of the Iranian resource base.[11]

"Gas resource is centered largely in the offshore South Pars Field in the central Arabian Province. The Zagros Fold Belt also has sizable remaining gas resources."



Map 2: A map display of Iran's onshore and offshore oil and gas fields.[12]

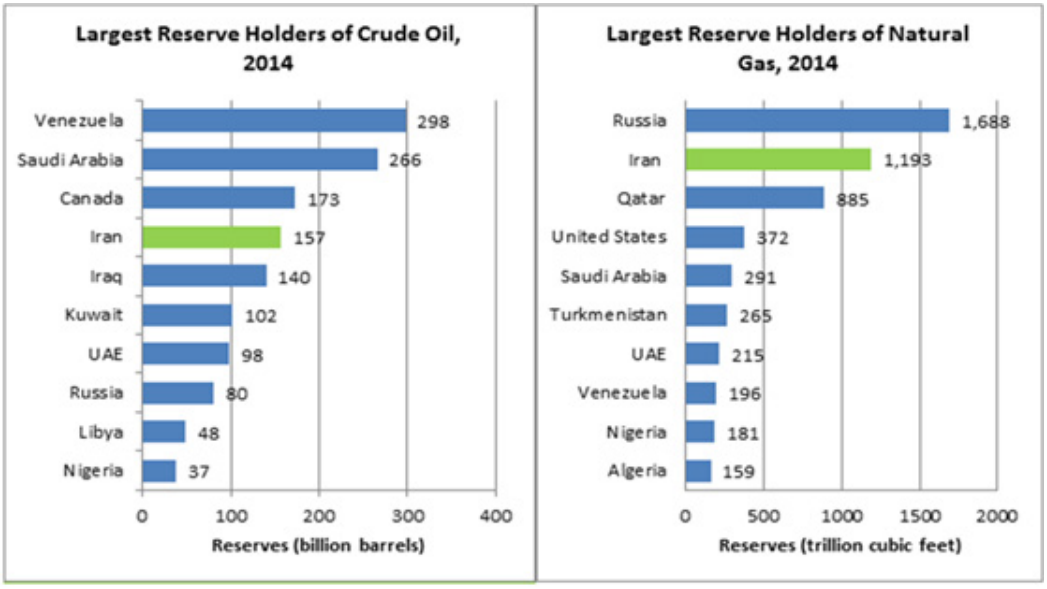


Figure 2: A graphic display of the countries with world's largest oil (left) and gas (right) reserves (Source: EIA).

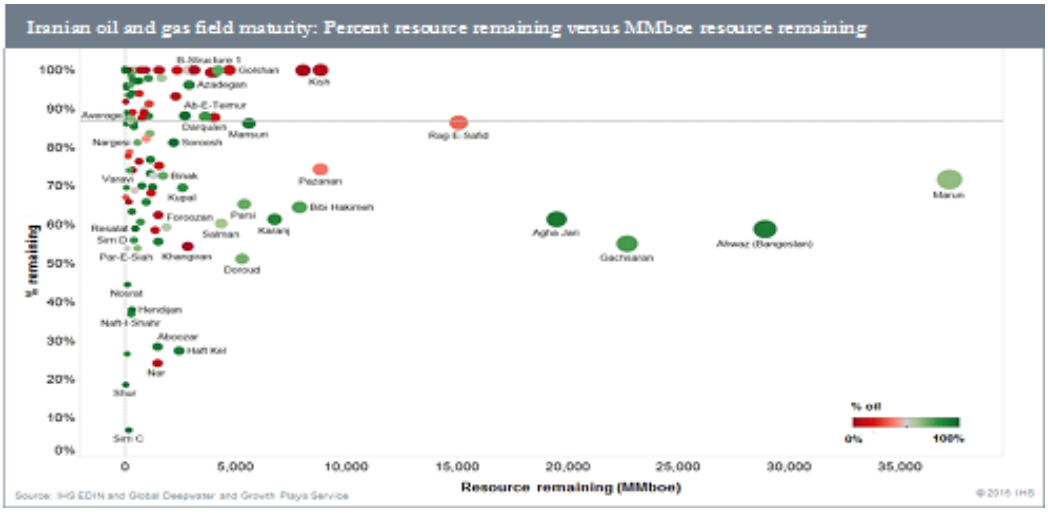


Figure 3: A display of Iran's onshore and offshore oil and gas fields.[13] Red color means the field requires development and green means remaining resources.

"Iranian oil and gas fields' examination states that years of isolation and sanctions have resulted in an underdeveloped resource base. "

"Iran's large discoveries since 2000 have been concentrated on gas reserves and oil production has declined sharply because of the aging oil reservoirs."

Iranian oil and gas fields' examination states that years of isolation and sanctions have resulted in an underdeveloped resource base as it can be seen from Figure 3. It is obvious that many of the gas fields (red colored circles in Figure 3) require development as of those with green colored circles mean remaining oil resources are currently immature.

Iran's large discoveries since 2000 have been concentrated on gas reserves and oil production has declined sharply. See Figure 4 for the increase in Iranian gas production profile throughout the years. As it is clearly visible, much of gas production added comes from the Central Arabian Province, where South Pars Gas Field is located. Much of the gas production covers the domestic market as the demand has grown significantly over the past decade, which is why Iran is focusing on development of gas fields. On the other hand, because of the aging oil reservoirs, Iran has to use much of the produced gas for reinjection to maintain its oil production levels. As a result, Iran finds itself as having to import gas from its neighbor Turkmenistan to compensate the Northern parts of the country's energy requirements. Thus, Iran needs to attract

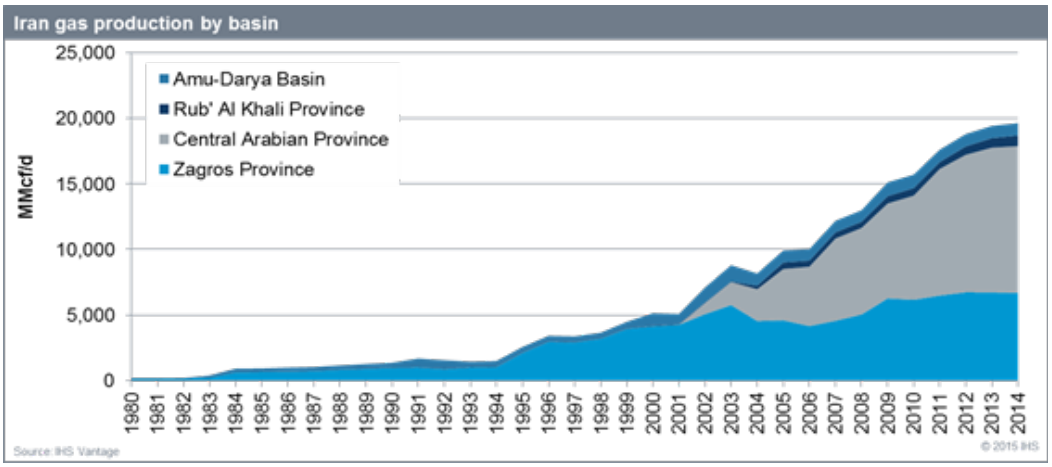


Figure 4: A chart display of Iran's onshore and offshore gas production through the years from 1980 to 2014.[14]

foreign investors with enhanced technology and equipment to develop its large oil and gas fields.

MIDSTREAM and UPSTREAM MARKET

In the concept of midstream and downstream markets of Iran, main oil terminals, refineries, oil and gas pipelines will be perused.

CRUDE OIL & CONDENSATE TERMINALS

The list is given in Table 1. Moreover, Cyrus, Bahregensar, Bandar Mahshahr, Abadan, and Bandar Abbas are the main terminals of Iran to sell its refined products.

REFINERIES & PIPELINES

Iran does not have an international oil export pipeline. All oil pipelines were constructed to transport in-country production to the due ports, terminals and refineries.

However, from the gas pipelines side, although there are in-country gas transportation and distribution lines, as seen from Map 3, there are two gas import pipelines from Turkmenistan to Iran with capacities 13 and 6 bcma. In addition, there are two gas export pipelines from Iran to Turkey and Iraq with capacities of 14 bcma (to Turkey) and 8 bcma (to Iraq). As the future pipelines:

- There is not an important planned oil pipeline for the future
- For gas:
  - Iran to Iraq pipeline capacity is planned to be upgraded up to 12 bcma.
  - Iran to Pakistan (then with a possible

Terminal Name	Storage Capacity (mmbbl)	Location	İnfo
Kharg Island	28	Persian Gulf	Main crude export terminal
Lavan Island	5,5	Persian Gulf	Crude export terminal
Siri Island	4,5	Persian Gulf	Crude export terminal
Neka	1	Caspian Sea	Crude swap terminal
Assaluyeh	On upgrading process, currently more than 4 mmbbl	Persian Gulf	Gas / Condensate Terminal for South Pars Field

Table 1: The list of oil terminals in Iran.

"Iran has to use much of the produced gas for reinjection to maintain its oil production levels."

"Iran does not have an international oil export pipeline. All oil pipelines were constructed to transport in-country production to the due ports, terminals and refineries."

Refinery	Capacity (crude mbbld)
Abadan	400
Isfahan	375
Bandar Abbas	330
Tehran	250
Arak	250
Borzuyeh	120
Tabriz	110
Shiraz	60
Lavan Island	60
BooAli Sina	34
Kermanshah	22
Aras 2	10
Booshehr	10
Aras1	5
Yazd	3
TOTAL	2039

Table 2: Refineries of Iran (Source: EIA 2015 Iran report).

root to India) pipeline with a capacity of 28 bcma.

- Iran to Oman and UAE pipelines are currently on hold due to price disputes.

Iran currently has no LNG terminals to export natural gas. However, Iran is planning to build new LNG facilities as an alternative to boost its gas export volumes that will be the economic option for Iran.

THE NEW IRANIAN ERA: WITHDRAWAL OF SANCTIONS

Iran, having the world's fourth and second largest oil and gas reserves respectively, requires paying a great attention to its international energy politics since from the early 19th century; its economy has been extremely built on oil sector. The sanctions –applied since the 1979 revolution- limited Iran's export capability and isolated it from the west that led Iran apart from the technology, which Iran definitely desires to preserve oil production from its aging fields. Steady growth in population has become a burden on the export numbers since domestic needs increased rapidly that significantly reduced the amount of oil exports. Another negative aspect of Iranian oil industry is that Iran uses natural gas (from the production of its huge gas reserves) to preserve the declining oil production rates. Thus, Iran's current situation from the point of energy window can be described as "The Exhaustion" due to growth in domestic consumption rates, using most of its extracted gas to recover oil production instead of exporting, losing its power in OPEC and not being able to maneuver freely under heavy

"Steady growth in population has become a burden on the export numbers since domestic needs increased rapidly that significantly reduced the amount of oil exports."

Map 3: Gas infrastructure of Iran (source EIA).

	Buyback contracts	Iranian Petroleum Contract (proposed terms)
Contract type	Hybrid service contract with some elements of PSC	JVs with NIOC
Approach to development phases	Separate contracts for exploration and production	Integrated contract
Contract length	Typically 3–8 years for exploration and 3–12 years for production, with exceptions	20–25 years (7–9 for exploration and 15–20 for production)
Calculation of contractor fees	Guaranteed internal rate of return agreed up front, based on: approved project capital costs; production forecast; crude market price with 2% annual escalation or agreed gas sales price; assumed operating expenses of 3% or 5% of annual development costs for onshore and offshore fields, respectively; and financing costs	Terms to be adjusted over the course of the contract according to the progress made and can be paid in oil; fees linked to oil prices
Compensation for risk	Contractor fee calculated based on a range of factors	Payments to IOCs on a sliding scale, with riskier developments paying more
NOC/state equity	Post-2003 buyback contracts give NIOC the right to a minimum 10% equity stake in any project of its choosing	n/a
Remuneration schedule	Payment commences following the completion of development operations and handover to NIOC (after a production threshold is reached); payments are made over several years	IOCs to be paid in installments once production begins, with full payments only after the plateau target is reached; payments are made over several years

Table 3: Outline of Iranian contract types (Source IHS).

economic and political sanctions.

Current conditions push Iran to increase its exports that will help ease the economic burden the country faces these days. Iran has been trying its best to market its gas reserves as Iran succeeded a few gas agreements with Turkey, Iraq, Oman, UAE and some Far East countries including Pakistan. However, Iran, at first, has to provide the gas and then deliver it in accordance with the agreements. There are some troubles to overcome this issue as Iran definitely is in need of reviving its technology, infrastructure and political ties with the west. Lift of sanctions is the first step to take forward; however, complying with the international agreements is going to renounce Iranian nuclear ambitions, which, in the end, happens to be Iran's grand plan to reign over the Islamic World.

Many experts analyzed Iranian resources, technology and infrastructure from their point of views to answer whether or not Iran might be able to meet its goals after the withdrawal of sanctions. Some thoughts are too optimistic because Iran will open the door for IOCs; however, majority thinks negatively because Iran's aging fields lack of investment and technology. This oil and gas reach country keeps its attractiveness to the big investors as they crave for developing large reserves with cheaper production costs. Iran is able to offer large reserves but the fact that many oil fields have been producing since the early 1900s, there awaits huge investment ground to revive these aging fields.

According to Iranian oil minister, Zanganeh; Iran needs roughly $50 billion USD to reach its upstream production goals by 2018. Tehran's target for oil production, condensate and natural gas are 4.7 million bod, 1 mbd and 35,000 mcf/day respectively.[15] IOCs have the necessary budget to meet the demand. The large companies will definitely provide Iran

"Iran might be able to meet its goals after the withdrawal of sanctions. Some thoughts are too optimistic because Iran will open the door for IOCs; however, majority thinks negatively because Iran's aging fields lack of investment and technology."

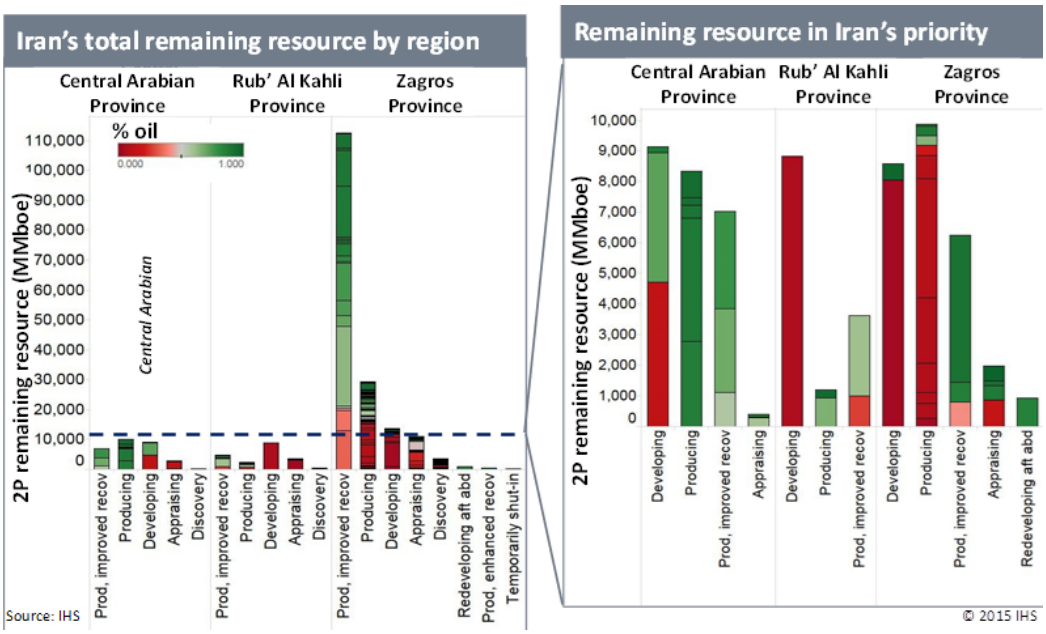


Figure 5: Iran's remaining oil resources categorized by oil regions (Source IHS).

"It is certain that it all depends on what Iran has to offer to foreign investors or how much Iran will be bent on its current energy policies to be an attractive investment ground for IOCs."

with the technology they have been using in and around the world but they will also consider the profit gain. Iran's current petroleum contracts are based on "Buy-back Contracts", which seem to be the most important and also challenging item for Iran's energy agenda. Current and proposed contract types Iran offers is given in Table 3 as it would be detailed in at a conference in London in December but the conference is delayed to be held in the midst of 2016. Iran is trying to encourage IOCs to invest in the country but it shies away from offering international investors its large oil and gas fields (See Figure 5). Iran's aim is to get more from the west as far as technology and investment goes but to give less in return. It is certain that it all depends on what Iran has to offer to foreign investors or how much Iran will be bent on its current energy policies to be an attractive investment ground for IOCs.

Iran plans to hit 4 million bod oil and 35 Bcf/d gas production in a year or two. Even though Iran has the world's largest oil and gas reserves, this unrealistic target (especially for gas) is subject to consideration of Iranian gas production growth that has only increased by an average of 10% for the last two decades. However, Iran has only depleted 5% of its gas reserves.[16] Iran's major problem can be noted as lagging behind its domestic needs. The reasons for domestic rush can be exampled as follows:

- Economic and population growth
- Gas being liquefied and used as a substitute for gasoline and other transport fuels
- Use of gas for reinjection into maturing oil fields in order to maintain oil production

Current natural gas situation in Iran suggests that Iran must develop its giant reserves at a rapid rate to meet its domestic demands and to be able to export the extra gas to lower the economic burden caused by consumption of refined products in the country. If Iran cannot manage meeting its gas production targets, Turkmen gas will continue to cover the gap for the domestic needs.

South Pars gas field, which is the largest gas field in the world, is evidently Iran's main gas asset. Qatar's share of the field is under development that provides stability as a reliable gas export source. Iran's share of the South Pars field, on the other hand, requires more work for development and investment. A few phases have been progressed in recent years but completion of the whole phases requires technology and financial investment that Iran lacks. Additionally, even if Iran achieves developing all the phases, it has to build nec-

essary infrastructure to market the produced gas, which also loads extra financial burden on Iran's economy.

Iran is currently trying its best to build LNG plants and new pipelines to Iraq, Oman, Pakistan and UAE to increase its export potential. However, Iran lacks technology to build LNG terminals and requires foreign investors to succeed such giant projects. As far as the pipelines go, Iran only seems to succeed Iraqi pipeline, which will supply the Mansuriyah power plant. The pipelines to Oman and UAE are subject to price and volume disputes that will eventually result in cancellation of the signed contracts. Pakistani pipeline project is the only viable solution for future gas exports as both countries insist on completing the pipeline even though they experience considerable financing difficulties.[17]

TURKEY'S AIM: THE WITHDRAWAL OF SANCTIONS

Throughout the history, Turkey and Iran have struggled with each other over disputed areas along their borders whereas they both have supported each other to a degree due to being long lasting neighbors. Nowadays, there seems to be struggle times for both countries, where both countries have ambitious plans over the conflicts in the Middle East, each trying to take advantage of the current situation. A misfortune; Iranian economy is worsening day by day due to heavy sanctions from the west. At this point, Turkey, economically outscoring Iran, must commit to being the big brother and extend its "helping hand" to Iran to be able to take the full-advantage of the current situation.

It is evident that Iranian energy sector is vulnerable because Iran extremely is in need of financial support and technology transfer as they are a key necessity to develop the hydrocarbon resources. Additionally, safer pipeline routes to different world markets are necessary to complete the supply and demand chain as far as the oil exports are concerned. Iran's ambition to reach out Mediterranean Sea by uniting Shiites in the region lacks credibility even though Iran's notable influence in Iraqi soil has nourished its political affairs to reign in Iraq. Unfortunately, Iran's political power demonstration halted in Syria as US and EU released a prescription of stronger sanctions on Iran's nuclear deal in 2012 that ended the rise of the Islamic State as a political dominator in the region. On another count, Russia, misguided by Assad, intended to adjust a new balance in the Middle East by enforcing its military power. Russian involvement of anti-terrorist propaganda in Syria complicated the disputes over long-awaited equilibrium in the region.

The first step, Turkey has to achieve, would be thoroughly digesting the geopolitics of the region. Being a bridge or located between importers and exporters have been emphasized for decades but this has not placed Turkey in the spotlight at all. Therefore, new relevant approaches are a necessity to counterbalance the export-import markets in and around its borders. Turkey may not be the ultimate power to resolve/settle all the conflicts in the region but it has a potential to start the fire since it has allied with the west, been brothers with the Arab world and had close ties with Russia. This fact states that Turkey has the advantage of being not only a geographical bridge in the middle but also a cultural, political and influential bridge at the epicenter of all these countries. Hence, Turkey can be an "Energy Center" but it has to realize that its importance is not based on its location. As a result, Turkey's priority has to be building a "Think Factory", which will carefully outline significant factors that raise its geopolitical importance.

The crisis in Ukraine has been exposed Europe's ambitions to secure its gas supplies and routes. Europe's intentions to find other alternatives to Russian gas have ignited the unrest in Syria and Iraq, in which Turkey had to position itself among the coalition forces. The scenario was simple as toppling Assad and securing Syria for transiting gas through a democratic country, where there would be no security threats to the planned pipelines. Assad disobeyed the west and sought support from Iran, Russia and China. It is obvious that he obtained such privilege as he still sits in his office. Hence, Turkey's efforts to be-

"Iran is currently trying its best to build LNG plants and new pipelines to Iraq, Oman, Pakistan and UAE to increase its export potential. However, Iran lacks technology to build LNG terminals and requires foreign investors to succeed such giant projects."

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come an energy center countered some delays in the progress, as the peace in Syria has yet to be settled.

Iran's negative contribution in the Iraqi and Syrian conflicts can be overcome if Turkey can manage to present itself as the long-awaited moderator for Iranian nuclear deal negotiations with the west. This might help Iran to fasten the removal of sanctions so that Iran can obtain technology transfer and foreign investment sooner. At this point, a joint venture between both countries national oil companies might come in handy. And perhaps, Assad's fall should near if he loses Iran's support.

In compliance with being the energy center, Turkey has to make arrangements to find the seller and the buyer. The aim must be to create the market, where Turkey acts as a both buyer and seller. Iran and Qatar provide a good opportunity since both countries share the world's largest gas field, South Pars. The best approach would be to convince these countries to market South Pars gas through Qatar-Iran-Turkey pipeline. This will give an edge to Turkey to be the main gas provider for the biggest consumer, Europe. Turkey should make it clear to and manipulate Europe that it will have an alternative to Russian gas and it will not have to deal with security problems for its energy needs. Having a pipeline crossing Turkish border will also help Iran feed its domestic needs in the Northern provinces. It should be noted that Iranian and Qatari gas through Turkey to Europe has to be analyzed and evaluated from the economic sights of such project since high tariffs, unit production costs and EU gas prices may not be beneficial for the countries involved in this option. However, such projects will provide Turkey with the flexibility to have more control over trafficking diversified gas supplies on the way to become an energy center.

Another important step might be initiating a consortium to settle Caspian Sea's economic borders and make agreements to purchase all the gas in the conflicted areas. Friendly Turkish approach/influence might produce flexibility for all the countries bordering Caspian Sea and resolve their disputes over the oil and gas reserves. This will also strengthen ties with Iran and positively influence its international affairs with the west and Turkish states.

RESULTS & ANALYSIS (ALL TOGETHER)

Most of Iran's revenues come from oil and gas reserves. Even though it is included among countries with the largest oil and gas reserves in the world, it goes through economical and technical hardship. Iran's hydrocarbon resources (mainly oil) have been the dynamo for the country since the start of oil production in 1920s. Oil exports was even able to finance long-lasting Iran-Iraq war but the fact that most of the fields have been producing for about a century, the production rates are on a steady fall. Iran has added new oil and especially gas fields to its bulk reserves after the revolution in 1979. Natural gas reserves have been widely used for reinjection purposes to increase productivity of aging oil fields. Since the revolution population growth gained importance as this caused exaggerated domestic usage of refined products including heating and electricity production.

"The effects of the sanctions implemented on Iran over its nuclear deal not only troubled its economy but also separated Iran from the technology and foreign investment as far as developing the aging oil fields and exporting the excess amount of oil and gas."

The effects of the sanctions implemented on Iran over its nuclear deal not only troubled its economy but also separated Iran from the technology and foreign investment as far as developing the aging oil fields and exporting the excess amount of oil and gas. The situation worsened after 2012 that is when the major oil companies left and Iranian oil exports fall below 2 million bopd. Iran can still be categorized as successful since its oil production is still around 3 million bopd but rising domestic consumption pressures Iran to find alternative solutions to increase its export rates. Being vulnerable, at this current situation, Iran has to agree on the nuclear terms to get a relief from the sanctions. However, Iran wants to step forward on its nuclear practices and it will probably try its best to outmaneuver the west.

Syria is another troublesome fact that complicates Iran's economic and political outlook. Iran, desperately in search of new markets to import its huge gas reserves, felt the need to

ally with Syrian dictator Assad. A Shiite controlled pipeline to the Mediterranean (Iran-Iraq-Syria-Cyprus pipeline) would emphasize Iran's power in the region and that Iran could also interfere Turkey's ambitions to become the "Energy center". Perhaps, Iran's main goal is to isolate Turkey from Sunni world and prevent its rise as the dominator in Arabic Peninsula. Of course, Turkey will never allow a Shiite corridor below its Southern border and will continue to step forward on being an energy center. However, Turkey definitely needs to suppress Iran's behind-the-door-political-counterattacks so that Iran will never interfere with its political actions in the region. The best strategy to follow should be to isolate Russia from the region and most importantly to be Iran's voice against the west. Eliminating Russia can be as simple as convincing Iran and the west to build Iran's nuclear power stations by EU and US. Turkey can moderate the talks, the west can have a chance to control Iran's nuclear activities and Iran, on the other hand, can finally have the nuclear technology for peaceful purposes as they have long been claiming.

Cooperation with the west and Turkey will ease Iran's ambitions to adjust the Middle East on its own since Iran desperately needs the technology and investment from the west. Turkey should not stay behind because EU & US will eventually lift the sanctions and their companies (possibly US companies by joint ventures) will make huge investments in Iran. And why not, Turkey shares the goods?

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"Cooperation with the west and Turkey will ease Iran's ambitions to adjust the Middle East on its own since Iran desperately needs the technology and investment from the west."

COMMENTS ON THE ROLE OF TURKEY AS AN ENERGY CENTER

by Oğuzhan Akyener and Mehmet Apaydın

ABSTRACT

Turkey, due to growing population and economy, faces increasing consumption of energy, and day by day, becomes naturally a center of demand for energy sources in a strategic geography with abundant sources, but unfortunately, all the valuable sources are discovered outside the country borders. Even though public related institutions and private sector do their best to accelerate the exploration projects lately, the outcomes are dissatisfactory and the increase in the production is always far from compensating the increase in energy demand.

The increasing demand and unsatisfactory exploration results lead to more energy shortage, which means higher overdependence of external suppliers. Despite the failures in meeting local energy needs with national resources, abundance of supply is fortunately not far away since geopolitical location of Turkey is able to create some opportunities for its energy supplies. As clearly seen in the world map, Turkey has a position as a bridge between the energy-rich area (covering the Caspian Region, the Middle East and the East Mediterranean Sea) and the demand center, Europe. This leads Turkey to become an important energy corridor in the region.

It is obvious that there will be enormous strategic and economic benefits of becoming an energy corridor between energy producing and consuming giants. However, if Turkey wants to get a bigger share from global energy pie, studies shall focus on forming a real energy center as opposed to being a transit country in this location.

In this paper, the strategic and economic benefits for the situation of Turkey as an energy corridor today and in the future (2035) will be analyzed. Moreover, after defining an energy transit corridor, energy hub, and energy center, the difference between becoming an energy corridor, energy hub, and a real energy center will be mentioned. As a result, opinions on some necessary steps that Turkey shall take to become an energy center will be elaborated and consistencies of Turkey being an energy transit corridor and a real energy center will be analyzed.

"Despite the failures in meeting local energy needs with national resources, abundance of supply is fortunately not far away since geopolitical location of Turkey is able to create some opportunities for its energy supplies."

INTRODUCTION

Many researchers analyzed the energy strategy of Turkey in the last two – three decades over different aspects. In general, all the studies declared that Turkey has advantages and disadvantages related to energy policy when global dynamics and regional politics are considered. It is clear to see that Turkey is not an energy center or an energy hub in recent conjuncture because Turkey is not an energy exporter country, or not even a price maker in energy sector. At this point, a relevant question might appear; "If Turkey is dependent on Russia and other countries in the means of energy, how will it be possible to shift from being the transit corridor to the energy hub or to the energy center? To find a sincere answer to the question, analysis presented in this study concentrates on future projects, the year 2035 forecasts, regional politics, and global dynamics in energy sector.

Today, Turkey can be regarded as an energy transit corridor (actually a crude oil corridor only) between Asia and Europe. Turkey's natural position can be defined as a bridge between energy-rich territories such as the North-East Caspian, the East and South-East Middle East, and Caucasia. With further political developments, Turkey wishes to become an energy hub or even an energy center but it is not easy to become an energy hub with current energy strategies and since Turkey requires brand new energy policies.

In reality, Turkey hosts huge oil and gas pipelines such as Baku – Tbilisi - Ceyhan (BTC), Kirkuk – Ceyhan Oil Pipeline or Baku – Tbilisi – Erzurum Gas Pipeline (BTE), and

is a secure transit way for hydrocarbon transport. However, this fact does not mean Turkey owns nor has a choice to sell or re-sell the oil and gas inside its borders. Moreover, for being an energy center all types of energy resources have to be evaluated i.e. oil and gas are not the only items. As a result, Turkey has to produce, buy, store, sell & trade and transport all types of energy resources to be an energy center. This means a difficult and long term planning and can be followed as a mission that has to be detailed and divided into the applicable steps. Otherwise, undetailed and uncoherent plans will never make Turkey establish successful strategies. Moreover, Turkey's hopeful dreams may not turn in to reality.

A new developing Turkey has the background, vision and capacity to follow successful energy politics. That is why; the first step is to make accurate definitions and evaluations. The second step will include the effective planning to shape the future.

From this point of view, Turkey's current popular theory of being an energy center will be evaluated and analyzed within this study by giving the conceptual definitions.

BEING AN ENERGY TRANSIT CORRIDOR

Being an energy transit corridor technically means the transition of all energy sources via associated systems from one side to other, or in other words, transition of all energy sources such as oil, gas, and electricity from the suppliers' side to the buyers' side via transportation systems.

Turkey is partially an energy transit corridor with its recent features (current pipelines). It consists of a variety of hydrocarbon pipelines, flowing hydrocarbons from Russia, the Middle East, and the Caspian Region, and conveys them to the European market via the Mediterranean Sea4. In current conjuncture, Turkey plays a receiver - transmitter role in oil and gas transportation system.

However, in the concept of her current situation, she is not a gas or electricity transit country but in the new future (expected in 2019) with the start of Shah Deniz Gas Project of Azerbaijan, Turkey will gain the statue of being a gas transit country, too.

BEING AN ENERGY HUB

Technically, being an energy hub is a more complex system than being an energy transit corridor. Energy hub comprises the control mechanism of energy distribution through oil and gas pipelines, nuclear power plants, hydro plants, and other energy resources. Moreover, it provides the exportation or sale options in addition to domestic needs. Therefore, Turkey as a current importer shall have the diversity of resources to be an energy hub and to rise to the exporter level. The diversity shall include huge storage capacities and trade centers built in the national and international territories.

It is available to find some examples for hubs, but they partially include hub properties, such as Henry gas hub or Baumgarten gas hub. Under current circumstances, Turkey is not an energy hub due to lack of oil and gas resources, limited store facilities and restraints on current energy agreements.

BEING AN ENERGY CENTER

In a simple way, being an energy center can be defined as the advance level of energy hub activities. In detail, an energy center needs high level of investment in energy, such as building nuclear power plants, comprehensive oil and gas pipeline infrastructure, increasing number of refineries, LNG terminals, natural gas storage facilities, and so on. In addition, an energy center must provide a sustainable energy system and sufficient energy intensity. An energy center has the authority and power to lead regional or global energy sector via pricing the energy market and regulatory actions.

Some experts use ''energy center'' term for Turkey's future energy disclosure so often, but it seems impossible for the near future

"Turkey is partially an energy transit corridor with its recent features (current pipelines). It consists of a variety of hydrocarbon pipelines, flowing hydrocarbons from Russia, the Middle East, and the Caspian Region, and conveys them to the European market via the Mediterranean Sea."

"An energy center has the authority and power to lead regional or global energy sector via pricing the energy market and regulatory actions."

due to lack of investments, strategic plans, nonbearing huge oil and gas reserves and having no suitable storage facilities.

TURKEY AS AN ENERGY TRANSIT CORRIDOR: TODAY

Initially, it has to be mentioned that Turkey with its current properties, is not an energy transit country. Turkey is considered as an oil transit corridor because as mentioned previously, energy transit zone region must include all the transit options for energy sources such as oil, gas, and electricity (generated from nuclear, renewable, biomass and other due resources).

First, to assess Turkey's current situation as whether or not an energy center, existing infrastructures must be determined. Demand and supply potentials exist but infrastructural facilities are inadequate, which means this equation will not be valuable. Second, potentials of new supply and demand options must be considered together. At last, average transit volumes will show the importance of Turkey to be a transit country.

As it can be seen from the Figure 1:

- Turkey hosts 5 major pipelines and 1 railway in the region that are important for being an oil transit center.
- BTC, WREP, NREP and the railway transport Azeri crude oil to Supsa, Novorossiysk (Russia), Ceyhan and Batumi (Georgia) terminals. (BTC's daily average transport volume is around 600 000 bbl.)
- CPC carries Kazakh crude oil to Novorossiysk terminal. (Daily average transport volume is around 400 000 bbl.)
- Kirkuk (Iraq) – Ceyhan transports the Iraqi oil to Ceyhan terminal. (Daily average transport volume is around 450 000 bbl.)
- By the way of related terminals, oil is shipped to the global market.
- Bosporus is another strategic point of Turkey as a transit zone, in which all Black Sea oil is transported to the global market.

After briefing the infrastructure, the current oil and gas production – consumption (supply / demand) volumes of the related countries (an importer or exporter) in the region are listed in Table 1. Negative values in the supply / demand columns point if the associated country is an oil or gas importer.

Figure 1: Infrastructural facilities that make Turkey an oil transit corridor.[4]

As it can be observed from Figure 2 that shows the supply & demand volumes on map view:

- EU is an important importer and there is a huge supply potential in Russia, Kazakhstan, Azerbaijan and Iraq in the region.

From where Turkey stands;

	CURRENT SITUATION (AVR)					
	OIL (1000 bbld)			GAS (bcma)		
	PRODUCTION	CONSUMPTION	SUPPLY/DEMAND	PRODUCTION	CONSUMPTION	SUPPLY/DEMAND
EU	1500	19000	-17500	146	438	-292
RUSSIA	10800	3200	7600	578	409	169
TURKMENISTAN	239	139	100	69	27	42
AZERBAIJAN	800	100	700	17	9	8
KAZAKHSTAN	1700	276	1424	19	5,6	13,4
UZBEKISTAN	67	65	2	57	48	9
IRAN	3600	2000	1600	172	170	2
IRAQ	3200	1000	2200	1,3	1,2	0,1
ISRAEL	0,5	223	-222,5	7	7,6	-0,6
TURKEY	50	724	-674	0,5	49	-48,5

Table 1: Current oil and gas supply – demand rates in the region.[4,5,6,7]

- Through the Bosporus around 3 million bbl oil is transported per day.
- From the Ceyhan terminal 1 million bbl oil is transported per day.

Figure 1 and 2 prove that Turkey is an oil transit country that currently transits 4 million barrel of oil per day, and reaches the regional oil to the global market.

If Turkey's gas options and the oil transit situations are evaluated, following assumptions can be deducted from Figure 3:

- The European Union is an important demander for gas and the Caspian Region is the main supplier.
- However, due to the lack of infrastructure (such as pipelines or LNG terminals) transporting gas abroad is currently not very economical to trade through Turkey. It will be better to transfer it by using the Russian system.
- That is why, Turkey is not a gas transit country for today, but future conditions and the increase in gas demand might turn Turkey in to a new transit way.

To sum up, lack of infrastructure and lack of investment are the barriers of Turkey to become a gas transit corridor. With current economical inputs, it is not feasible to transit Iranian and Turkmen gas to Europe via Turkey because of the high costs. For such reason, Turkey can be considered as an oil transit corridor from a global perspective.

TURKEY AS AN ENERGY TRANSIT CENTER: 2035

After the assessment of Turkey's current situa-

"Turkey is an oil transit country that currently transits 4 million barrel of oil per day, and reaches the regional oil to the global market."

"Lack of infrastructure and lack of investment are the barriers of Turkey to become a gas transit corridor."

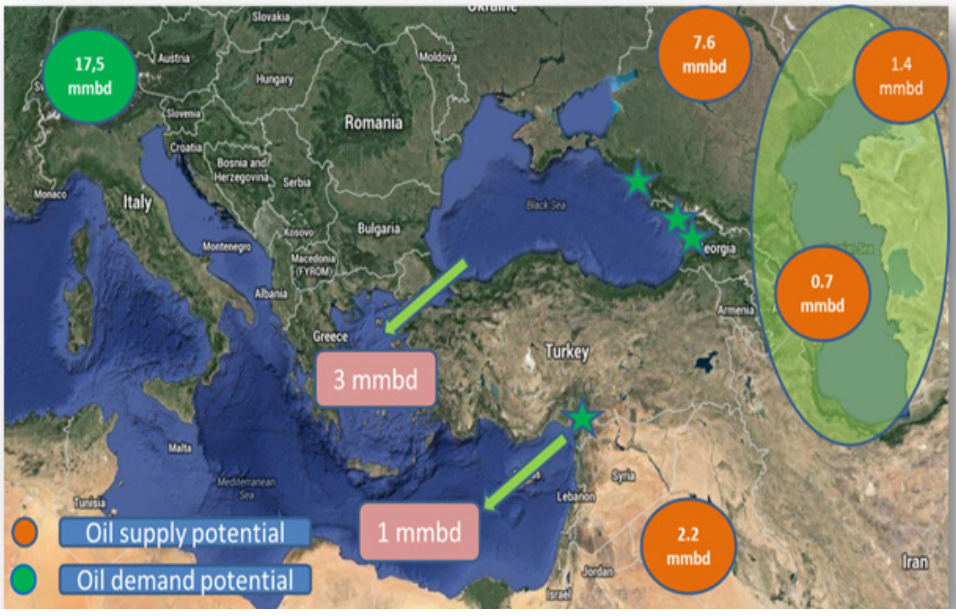

Figure 2: Oil supply & demand volumes in the region.[4]

Figure 3: Current situation of Turkey as a gas transit country.[4]

"Pipeline infrastructure for crude oil transportation will be the same in 2035 because the demand will not grow substantially in 20 years."

tion as an energy transit center in the region, the year of 2035's situation is selected for the analysis. Analyzing the year 2035's conditions, some important assumptions are taken under consideration:

- Best scenario case considers the acceptation of production – supply potentials.
- Oil prices are taken over 100 USD.
- No sanctions on Iran are noted.
- The political stability in the Middle East and Caspian region is provided.
- Massive investment option is available in related countries.
- Terrorism is solved.
- Conflicts between Northern Iraq and Central Iraq governments are solved.

Pipeline infrastructure for crude oil transportation will be the same in 2035 because the demand will not grow substantially in 20 years. For the gas transportation system, new stand-alone pipelines will be constructed with massive investments. Figure 4 gives the new gas pipeline options that will be constructed through Turkey:

- SCP transports Azeri gas to Georgia and Turkey.
- Extended SCP (SCPX), TANAP, and TAP projects were constructed and transports Azeri gas to the European Union via Turkey.
- Turkish Stream is planned for transporting Russian gas to Turkey and EU. (However, it will be too early to estimate

Figure 4: Major pipeline systems that transfer gas via Turkey to Europe in 2035.[4]

	2035 ESTIMATIONS (AVR)	
	OIL EXPORT POTENTIALS (1000 bbl/d)	GAS EXPORT POTENTIALS (1000 bcma)
RUSSIA	6000	350
TURKMENISTAN	250	140
AZERBAIJAN	250	40
KAZAKHSTAN	2100	60
UZBEKISTAN	0	80
IRAN*	1500	100
IRAQ	6000	8
ISRAEL	0	5

Table 2: 2035 Estimations for oil & gas export potentials in the region.[1,2,3]

the success of the capability of this pipeline project.)

After defining the infrastructures, Table 2 above gives the possible export volume estimations of the supplier countries in the region.

The potential daily oil supply that is shown in Figure 5 can be evaluates as follows:

- Supply potential from the Caspian region will decrease in 2030s. This will result in a decrease in the transit volumes through Bosporus.
- Supply potential from Iraq will increase. Moreover, with additional transportation routes, partial Iranian crude might also reach to Ceyhan terminal. Therefore, estimated transit volumes via Ceyhan terminal will be higher than 1 million barrels per day.

As a result, from the point of view to be an oil transit country, the current situation will not make a considerable change in 2035.

As seen from the Figure 4, new gas pipelines will be constructed up to 2035. This will result in an active gas trading between suppliers and buyers. Figure 6 below displays the supply and demand potentials for the year 2035.

In order to determine the transit volumes through Turkey, assumptions that are given below must be considered, also they can be seen in Figure 7:

- 3 bcma portion of 5 bcma Israeli gas reaches to Turkey.
- 5 bcma portion of 8 bcma Iraqi gas reaches to Turkey.
- SCPX and TANAP capacities are extended, but due to capacity limits, 31 bcma of 40 bcma Azeri gas comes to Turkey.
- As a result of economic assessments, transportation of Iranian gas through Turkey to the European Union via standalone pipeline is not feasible (due to high tariffs and market conditions). On the other hand, Iran can send gas to Turkey for utilizing in the Turkish gas market.

"New stand-alone pipelines will be constructed with massive investments for the gas transportation system."

"New gas pipelines will be constructed up to 2035. This will result in an active gas trading between suppliers and buyers."

Figure 5: 2035 oil transit volumes via Turkey.[1, 2, 3]

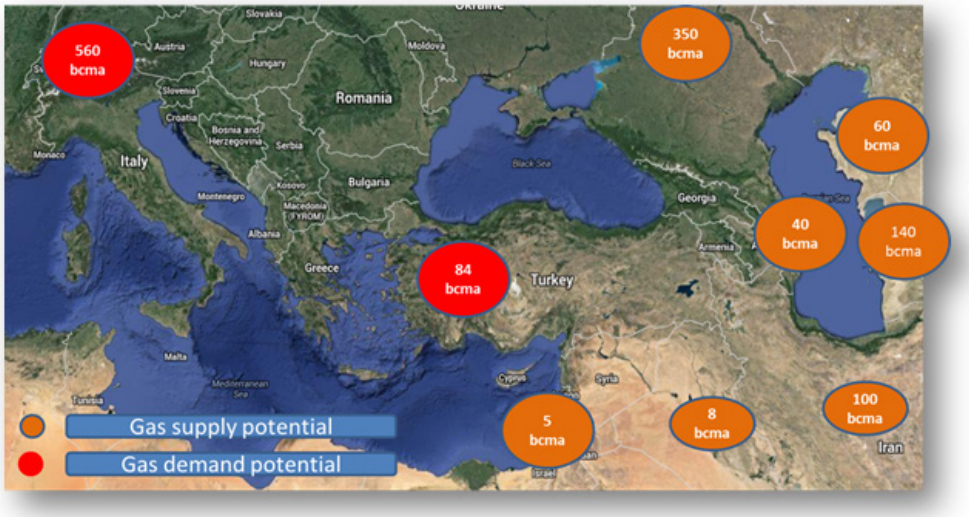

Figure 6: Gas supply & demand potential of 2035 in the region.[1,2,3]

This option will be economical.

- If the construction of the Turkish Stream is successfully completed, then more than 60 bcma gas will be transportable to EU through.
- Turkmen and Uzbek gas transport options are not taken into consideration due to lack of facility, economic conditions, and market limitations. Gas transportation will only be economic, if they transport it to EU through Russia and the Turkish Stream.
- 33% of gas will be used in Turkish Market, and the remaining portion will directly be transferred to EU considering the economic conditions and insufficient facility properties.

As a result of the assumptions made above, the estimated cumulative gas transit volume via Turkey will reach 65 bcma in 2035.

To sum up, in 2035, Turkey will become an energy transit country for both crude oil and gas markets (and actually a gas transit hub). Turkey will provide 4 million barrels of oil per day for the global oil market, and gas supply rate through Turkey will be around 65 bcma with the best scenario case.

"In 2035, Turkey will become an energy transit country for both crude oil and gas markets (and actually a gas transit hub). Turkey will provide 4 million barrels of oil per day for the global oil market, and gas supply rate through Turkey will be around 65 bcma with the best scenario case."

COMMENTS

This study focused on positioning of Turkey in global energy sector and examined the importance by comparing recent and future energy policies. As mentioned in the previous sections, Turkey is an energy importer country, mainly gets oil and gas from its neighbors. As an advantage of having neighbors with considerable amount of world reserves, Turkey is headed to become a transit center year by year.

On the other hand, it is extremely hard to see the future of Turkey as an energy hub or an energy center with current energy agreements and developments. Lack of lobby activities, not being able to develop effective international energy politics, having only a little support from the private companies, universities and civil organizations, diverts Turkey from using her strong geographic position in regional energy dynamics.

Another issue is regarded as investments. Turkey cannot step up in the region without creating massive investments and implementing development plans. Beside these issues, non-governmental organizations have to take a position to support energy investments with feasible solutions. Unfortunately, most of these organizations are against to energy investments like nuclear power programs without creating an effective solution to generate energy from substitution sources.

CONCLUSION

Technically, oil, gas, and electricity sectors

Figure 7: Gas supply to Turkey in 2035.

require separate assessments because each of them has different properties, market conditions that require distinctive developments.

If the year 2015 and the year 2035 rates and policies are compared, there will be no significant changes observed in oil sector in Turkey. Turkey will remain as an oil transit country with the supply of 4 million barrels of oil per day to the global market. However, a potentiality option will emerge, if Iraq (Northern Iraq) and Iran supplies more oil via pipeline systems by using Ceyhan terminal to the Europe and other markets.

In reality, using the Persian Gulf is a more economical way for Iran, but new foreign policies might change the balances. For the central Iraq, Iraq to Jordan pipeline, which is under construction, demonstrates that only northern Iraq oil resources will choose the Turkish root to reach the world market.

At this point, Turkey will absolutely need enhancements in oil storage capacity to provide more trade options via Ceyhan Terminal. It is clear to note that changing the balances in regional pipeline strategies and due investment programs will increase the importance of Turkey in oil transfer. Moreover, making Ceyhan a huge refinery and storage complex will make more crude be handled and be traded inside (by) Turkey. This will result in Turkey being a more important oil trading hub in the future.

As far as future gas policies are concerned, Turkey should increase her storage capacity. This is vital for her to be a gas trader in the future. Hence, in the new future, Turkey will be a gas transit country and the volume of Azeri gas supply will increase. In addition to Azeri gas, Eastern Mediterranean, some small portions of Northern Iraq and with a new route through Russia (through new popular pipeline idea: Turkish Stream) Turkmen gas and more Russian gas will be able to be taken into the boundaries of Turkey for utilization, transition and trade. These options can only be handled with coherent, long term gas strategies, investments, building new storage facilities (inside or outside Turkey), legislations and agreements.

As the nature of geography, Turkey is the connector between Asia and Europe, and in many conditions, using this way for energy transfer is much safer and economical when compared to other options. Transition of Iranian and Turkmen gas to EU is also considered in this analysis, but it is not economic with assumed circumstances. Due to enhancement planning's, increase in gas transfer is highly required. Therefore, if Turkey wants to improve its great importance in the region, limited gas storage capacity will appear as a crucial concern. Due to enhancements in gas transit volume, Turkey might even rent places in other countries to store surplus gas.

In 20 years, electricity generation might accelerate upward associated with possible projects. For instance, Azerbaijan can generate

"Turkey will remain as an oil transit country with the supply of 4 million barrels of oil per day to the global market. However, a potentiality option will emerge, if Iraq (Northern Iraq) and Iran supplies more oil via pipeline systems by using Ceyhan terminal to the Europe and other markets."

electricity from natural gas and transfer it to Europe through Turkey via power plants. Similarly, Iran, Eastern Mediterranean or Iraq can apply the same strategy, too. In regards to these projects, Turkey will need massive investment in power plant construction inside or outside the country. In addition, Turkey needs a new policy to provide diversity in electricity generation from a variety of sources other than oil and gas such as nuclear, biomass, hydroelectric etc.. Domestic production can offset a slight ratio of oil and gas demand from external suppliers, which is extremely important for Turkey.

To summarize, from where we stand, it is not coherent to see Turkey's position as an energy center or energy hub for the next 20 years. Hence initially to be an energy center, Turkey must produce, store, sale/trade, transit all types of energy resources. Secondly, massive investments and long term energy politics are important.

On global scale, Turkey's energy transfer volume is not as important as expected. Due to economic and political reasons today, neighboring countries slightly use Turkey as an energy transit route. The change in Turkey's destiny can be related to unstable political conditions and problems in the Middle East and the Caucasia. Because of increasing terrorism and potential conflicts in our region, Turkey will emerge as a new option for supply security.

"If Turkey wants to improve its great importance in the region, limited gas storage capacity will appear as a crucial concern. Due to enhancements in gas transit volume, Turkey might even rent places in other countries to store surplus gas."

ABBREVIATIONS

AVR: average

BTC: Baku – Tbilisi – Ceyhan Pipeline

SCP: South Caucasus Pipeline

NREP: Northern Root Export Pipeline

WREP: Western Root Export Pipeline

CPC: Caspian Pipeline Consortium

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AZERBAIJAN GAS EXPORT POTENTIAL & RELATED INFRASTRUCTURES FOR EU & TR ENERGY SECURITY ISSUES (UP TO 2050)

by Oğuzhan Akyener

ABSTRACT

Due to increasing demand, gas supply is one of the most strategic energy security issues for huge importers. Caspian region -where important gas supply potentials exist- has always been directly related to the huge importers' energy security issues, such as EU and Turkey.

Azerbaijan as an important gas supplier country located in the Western Caspian Region, and her future gas supplies become more important for the importers mentioned above. Consequently, these importers are forming alliances together with long term plans and developing new projects to import the gas resources from Azerbaijan. As a result of this alliance, politically named as "Southern Gas Corridor, SGC" continues to be developed. In the concept of SGC, transportation of the Azerbaijan gas resources to TR & EU, SCPX-TANAP-TAP and related infrastructures are decided to be constructed.

In this paper, after focusing on the Azerbaijan gas supply potential and gas market, the importance of this potential for European and Turkish energy markets will be described by underpinning the annual demand values. Since Southern Gas Corridor is a long term target, 2050 Azerbaijan gas supply and export potential (in huge gas projects base), including the infrastructural limitations, will be estimated.

"Caspian region -where important gas supply potentials exist- has always been directly related to the huge importers' energy security issues, such as EU and Turkey."

INTRODUCTION

With 0,9 tcm proved gas reserves of total world share of 0.5% and 16.2 bcma 2013 average gas production,[1] Azerbaijan is the 27th country according to the proved reserves and 34th country according to the average annual production rate in the world.[2]

Also not having a significant volume of proved gas reserves and annual production while compared with the huge gas producers in the world and in Caspian Region; some geostrategic, political and commercial issues increased the importance of Azerbaijan in the regional gas politics, mainly for EU & TR.

Main reasons for the increasing importance of Azerbaijan for EU & TR are:

- Azerbaijan resources are convenient for commercially meeting some portions of the increasing gas demand of EU & TR markets (Which is the first step of Southern Gas Corridor Project[3]). Those resources are important for TR's & EU's energy resource diversification strategies.
- EU based professional companies are operating the huge gas fields in Azerbaijan, such as BP in Shah Deniz & Shafag-Asigman, and Total in Absheron.
- Azerbaijan government and gas export strategies are supported by EU, US, TR and her transit neighbor Georgia.
- Azerbaijan is thought to be the first step to transport Caspian resources to TR & EU.
- Due to stable political structure, legislative and security issues, there is a suitable environment in Azerbaijan for investment. In addition to this environment there are also international investors dealing with the future opportunities.
- There are no important technical, technological and logistical risks for the development of new gas projects.

AZERBAIJAN: BEING A MORE POPULAR GAS SUPPLIER

Due to the increasing importance of Azerbaijan for EU & TR, her popularity in being a gas supplier is increasing more than that of

Name	Type	Location	Avr. Water Depth (m)	Operator	Situation	GIP (bcm)
Shah Deniz	Gas/Cond.	Offshore	50-550	BP	Production	1000 (proved)
Umid & Babek	Gas/Cond.	Offshore	50-100	SOCAR	Exploration	200 (discovered) + 400 (estimated)
Absheron	Gas/Cond.	Offshore	450-500	TOTAL	Exploration	350 (discovered)
Shafag Asigman	Gas/Cond.	Offshore	550	BP	Exploration	1000 (estimated)
ACG Deep & Shallow Gas	Oil & Gas	Offshore	120-175	BP	No agreement	No Public Data (discovered)

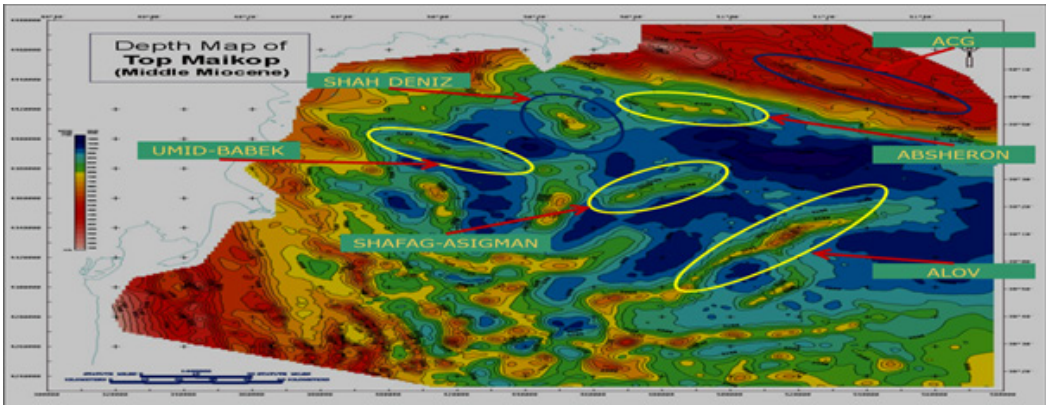
Table 1: Important gas fields and projects in Azerbaijan.

any other huge suppliers. This fact initially is due to the political support especially by EU & US. Moreover, existing producing projects and coherent steps taken for the future development projects are important for Azerbaijan to be successful in gas politics game.

Before focusing on the future gas production and export estimations, current ongoing projects and future gas prospects of Azerbaijan have to be understood. Table below gives brief information about Azerbaijan's important gas fields & projects. The prospects and the fields' locations are shown on Map 1.

Notes:

- Nakhichevan, Bahar Gum Deniz, Bulla Deniz gas – condensate fields and other smaller dry gas / gas-condensate fields will be considered as "other gas resources of Azerbaijan" in the paper.
- Associated gas produced in oil fields are not taken into consideration. Gas produced from such fields are re-injected - flared or used as additional supply for



Map 1: Locations and structures of important gas resources of Azerbaijan.

"Due to the increasing importance of Azerbaijan for EU & TR, her popularity in being a gas supplier is increasing more than that of any other huge suppliers."

		GAS EXPORT PIPELINES				
		Name of Pipeline	From (Supply Country)	Through (Countries)	To (Markets)	Capacity (bcma)
AZERBAIJAN	EXISTING	SCP	AZERBAIJAN	AZ-GEO	TURKEY	8
		GAZI-MAGOMED-MOZDOK	AZERBAIJAN	AZ-RUS	RUSSIA	1
		BAKU-ASTARA	AZERBAIJAN	AZ-IRAN	NAKCHCIVAN	0,5
	FUTURE	SCPX	AZERBAIJAN	AZ-GEO	TURKEY-EU	16
		TANAP	AZERBAIJAN	TR	TURKEY-EU	16
		TAP	AZERBAIJAN	GR - IT	ITALY	10

Table 2: Existing and planned gas export pipelines of Azerbaijan.[4]

"Azerbaijan's oil and gas fields: Shah Deniz Project with 3 phases, Umid-Babek Fields, discovered Absheron gas-condensate field, Shafag Asigman exploration block, and possible shallow and deep gas resources in ACG oil production license.

Azerbaijan in winter seasons.

- Fields which have political conflicts with Iran and Turkmenistan due to status of Caspian are also not taken into consideration.

In addition to these fields and projects, infrastructures to transport the gas are also important for coherent export scenarios. Table 2 shows the general properties of Azerbaijan (and Azerbaijan gas export related) gas pipeline system.

AZERBAIJAN GAS EXPORT POTENTIAL ESTIMATION (UP TO 2050)

In order to estimate the gas export potential of Azerbaijan to TR & EU up to 2050, initially the existing gas producing and important existing licenses, which are on exploration or development period and expected to be taken into production up to 2050, are taken into consideration. These are Shah Deniz Project with 3 phases, Umid-Babek Fields, discovered Absheron gas-condensate field, Shafag Asigman exploration block, and possible shallow and deep gas resources in ACG oil production license. Additionally, other smaller proved and possible reserves, which are already are in production or planned to be taken into production are taken into consideration as the "other gas resources of Azerbaijan".

Moreover, to be able to make coherent estimations, possible risks for development of the related future projects are also commentated. Which are mainly;

- Having not enough drill ships in Caspian to continue offshore exploration, pre-well drillings and subsea completion operations. This may result in delays in the development periods of some resources.
- Due to general unconsolidated sand structure of AZ reservoirs, a big volume of sand is produced. In gas fields, initially this is not an important concern, but for the maturity period of the field, sand management issues have to be considered.
- Due to general expected PVT properties, condensate blockage issues have to be taken into consideration.
- There are high pressure reservoirs and high pressure water zones that might result in drilling and completion problems.
- Oil prices will affect the project economics. Low prices will result in delay in investment for AZ government and foreign companies.
- Gas sales to EU may not be economic due to the unit production and transportation costs.

Additionally, less than 30% of the claimed reserves are proved. Being more than 70% of the future gas resources can be accepted as possible or probable reserves. This fact has to be taken in account for the estimations.

After mentioning the issues above, estimated production profiles of the due gas projects of Azerbaijan and assumptions made in the estimation process are given below:

ASSUMPTIONS TABLE:

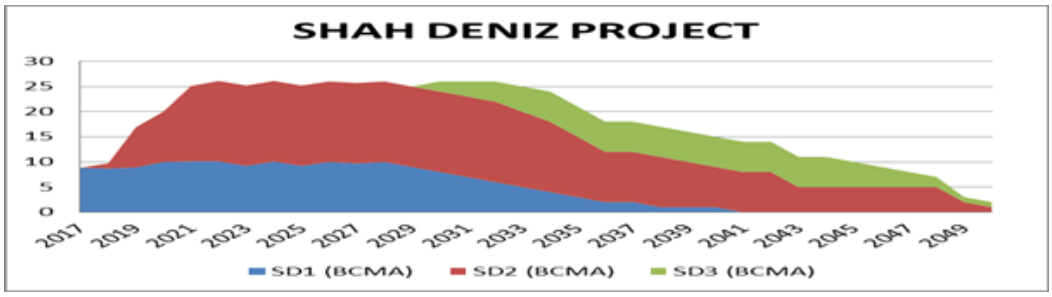
Topics/ Related Gas Projects	Assumptions
Shah Deniz	• Shah Deniz is estimated to be developed in 3 stages. (One additional stage added to have more recovery.) • Production periods are taken up to the life of field (LoF). Hence current PSA's are thought to be extended and abandonment production is assumed as 1 bcma for SD1.
Umid / Babek	• Reserves in Umid field are discovered and probable and in Babek field reserves are possible. Not discovered yet. It is assumed that, enough expected volume of resources exist in place. • For the reservoir properties, production capacities, decline rates, development schedules and strategies, public data taken from Shah Deniz1 and SOCAR's management performance in her other offshore gas fields are benchmarked.
Absheron	• Reserves in Absheron field are discovered and probable. Not proved. It is assumed that, enough expected volume of resources exist in place. • For the reservoir properties, production capacities, decline rates, development schedules and strategies, public data taken from Shah Deniz1 and TOTAL's management performance in her other offshore gas fields are benchmarked. • Some delays for the development of the field are assumed due to the lack of enough drill ships in Caspian, low oil prices and decreasing interest of TOTAL in AZ oil & gas market. • Absheron is estimated to be developed in 2 stages.
Shafag Asigman	• Reserves in Shafag Asigman field are not discovered and all possible. It is assumed that, enough expected volume of resources exist in place. • For the reservoir properties, production capacities, decline rates, development schedules and strategies, public data taken from Shah Deniz1 and BP's management performance in her other offshore gas fields are benchmarked. • Some delays for the development of the field are assumed due to the lack of drill ships and subsea technologies in Caspian and low oil prices. • Shafag Asigman is estimated to be developed in 2 stages.
ACG Deep & Shallow	• Reserves in Deeper and Shallower sections of ACG field are discovered and probable. But not proved. More tests have to be completed in order to model the structures better. It is assumed that, enough expected volume of resources exist in place. • For the reservoir properties, production capacities, decline rates, development schedules and strategies, public data taken from Shah Deniz1, ACG's oil bearing sections and BP's management performance in her other offshore gas fields are benchmarked. • Hence there is not an existing agreement with SOCAR and ACG partners to develop and produce gas from shallow and deep sections of ACG, a service or a PSA agreement is assumed to be signed as soon as possible. According to the assumed agreement, shareholders will not change and BP will remain the operator. • Some delays for the development of the field are assumed due to the lack of drill ships and subsea technologies in Caspian and low oil prices.
Other Gas Fields Production	• All other smaller offshore-onshore gas producing fields are taken under consideration together. • Hence most of the existing fields are mature and there are important production problems (such as, sand production, low pressure, old wells and completions) a soft decline in the total gas production of Azerbaijan from other fields is assumed. • New discoveries, developments of fields in the border of conflicted areas, unexpected increase in oil prices and by this effect new investments in current resources will change the scenarios.
AZ Consumption	• Gas consumption is Azerbaijan is assumed as to increase 1% annually.
Nakhchivan Consumption	• Gas consumption is Nakhichevan is assumed as to increase 1% annually.
Russia Export Volume	• According to the increasing demand in Russia Caucasian region, export is assumed to be increased up to 3 bcm levels and will continue up to 2050.

Table 3: Assumptions for production estimations.

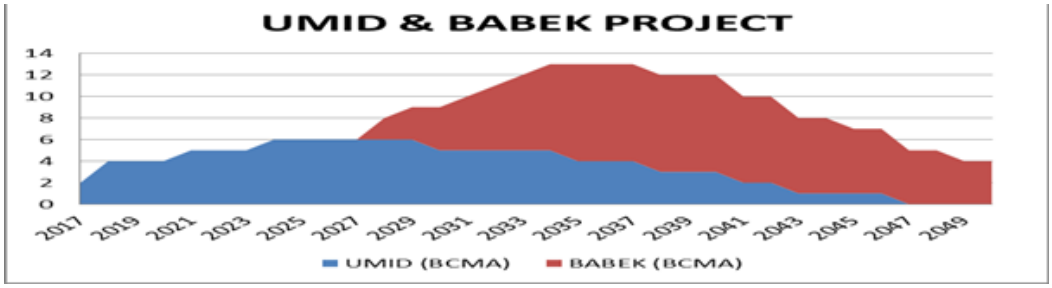
Table 3 below shows the general assumptions taken into consideration, before estimating the future production profiles of the due fields and the consumptions and other related issues to calculate Azerbaijan export potential.

PRODUCTION PROFILES:

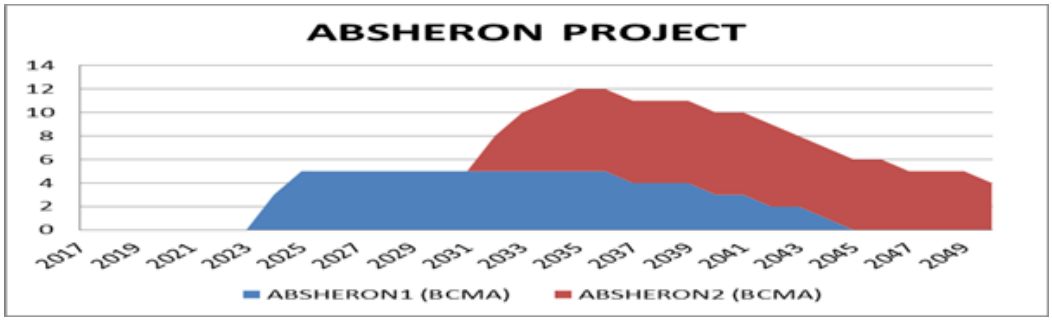
Note that all estimated production profiles given in the following graphs are technically and economically producible volumes, to the end of LoF. Production profiles are extracted by evaluating due assumptions given in the Table 3.



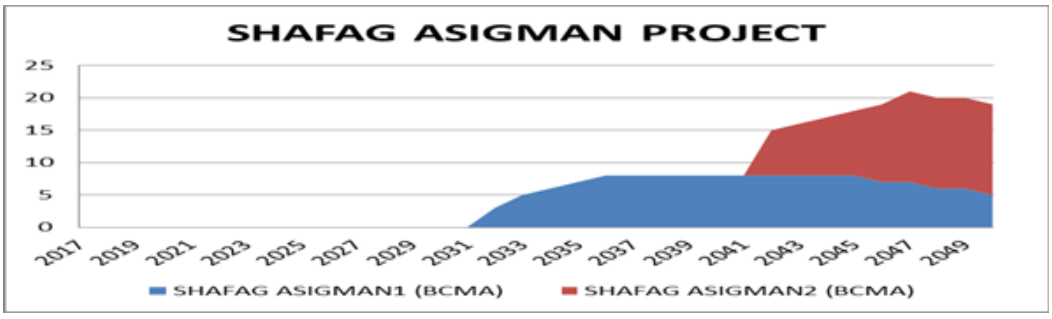
Graph 1: Estimated Shah Deniz Project production profile up to 2050.



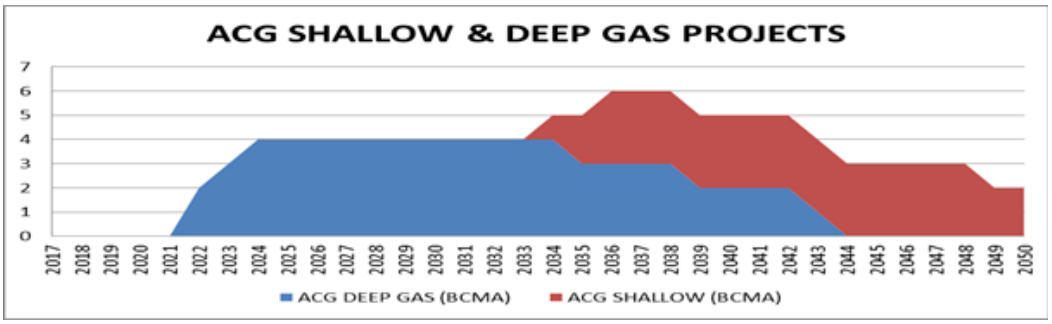
Graph 2: Estimated Umid & Babek Projects production profiles up to 2050.



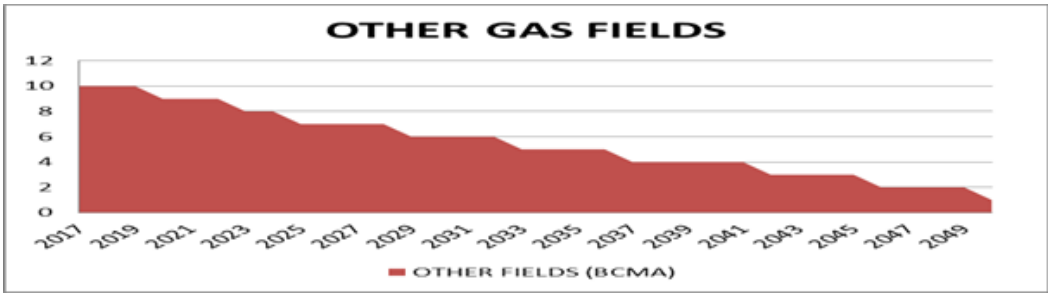
Graph 3: Estimated Absheron Project production profile up to 2050.



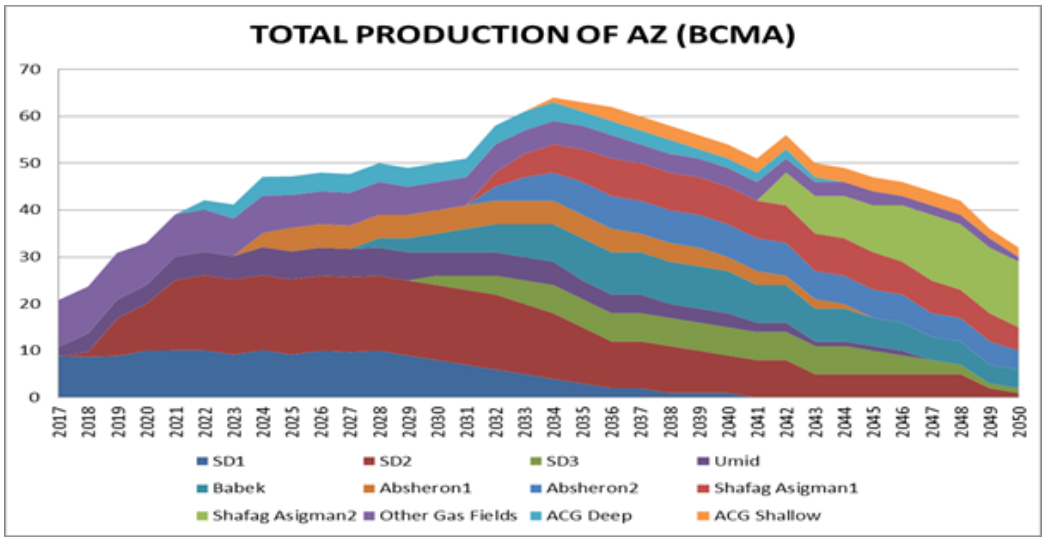
Graph 4: Estimated Shafag Asigman Project production profile up to 2050.



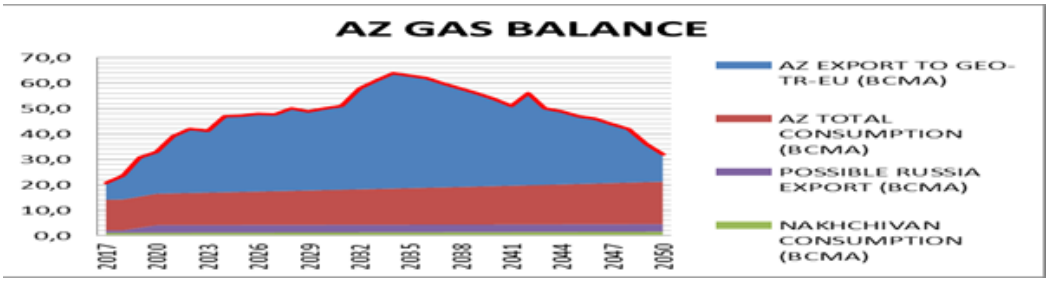
Graph 5: Estimated ACG deep and shallow gas projects production profiles up to 2050.



Graph 6: Estimated Azerbaijan's all other gas fields' production profiles up to 2050.



Graph 7: Estimated total gas production profile of Azerbaijan up to 2050.



Graph 8: Estimated Azerbaijan's gas balance including production, exports, imports and consumptions up to 2050.

"Having only the resource export potential and the market demand is not enough for gas projects to be actualized, therefore commercial transportation structures have to be planned and constructed."

FUTURE INFRASTRUCTURE LIMITATIONS AND EVALUATIONS (UP TO 2050)

Having only the resource export potential and the market demand is not enough for gas projects to be actualized, therefore commercial transportation structures have to be planned and constructed. After estimating the future production profiles and export potentials of Azerbaijan in the section above, in this section, by considering the technical and commercial issues, existing capacities and possible capacity extensions of the export structures will be evaluated.

To start with the initial step of the root, (which is SCP and expanded SCP: SCPX) as seen in the graph below;

- SCP has a capacity of 8 bcma and is enough up to the first commercial production of SD2. Then SCP's capacity will be expanded up to 24 bcma to handle additional 16 bcma of SD2 gas.
- With the new developments and new resources SCPX capacity will not be enough after 2023. Then, a new upgrade of the capacity up to 34 bcma is assumed to be done in 2023. Totally 60 bcm gas will not be able to be transported due to lack of extra capacity of expanded SCPX (SCPFX) between years 2032-2039. However, hence the production expectations are declining after 2034 and it will not be economic to construct a bigger capacity expansion for only 7 years, 34 bcma is assumed to be commercially the best selection. For those 7 years, Azerbaijan may decrease the production in her own operating fields or other export options to Iran or Russia can be put on the table.
- The purpose of selection SCPFX capacity as 34 bcma, while TANAP Expansion is announced as 31 bcma (by SOCAR), is the additional gas will be exported to Georgia.

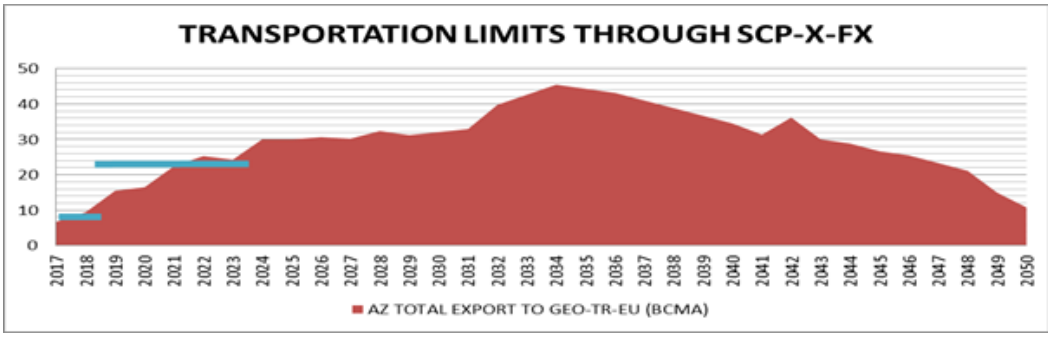
After recalculating the gas volume on Azerbaijan border to export her gas to GEO & TR & EU, including the limitations of SCPX, Graph 10 below is prepared.

According to the Graph 10;

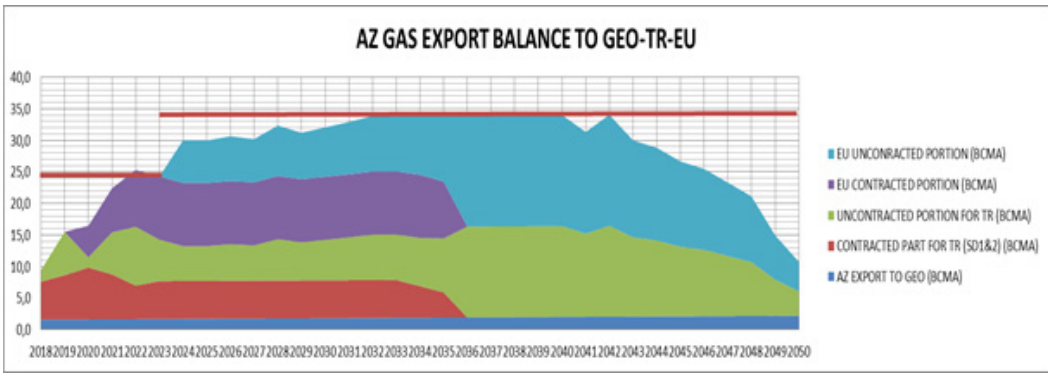
- Georgia sales are assumed to start with 1,6 bcma in 2018 and increase up to 2,2 bcma in 2050. (Moreover, there will be some little free portion in SCPFX for extra supplies to Georgia)
- Again, the red lines show the limitations of SCPX and SCPFX.
- Contracted parts of EU & TR are the public announced data. Additionally, due to the nature of development of gas projects, an increase at start volumes and a decrease at the end volumes are assumed.
- For the uncontracted portions to EU & TR, after benchmarking with announced SD2 sales, 45% of the extra volume (which is equal to total export minus GEO sales minus contracted volumes of TR and EU) is assumed to be sold to TR and 55% portions is assumed to be exported to Italy market.

While the gas is now in the eastern border of Turkey, as shown on the graph11 below;

- 16 bcma capacity of TANAP and around (estimated after due maintenance and



Graph 9: Transportation limits of expanded SCPX to future AZ export to GEO-TR-EU.



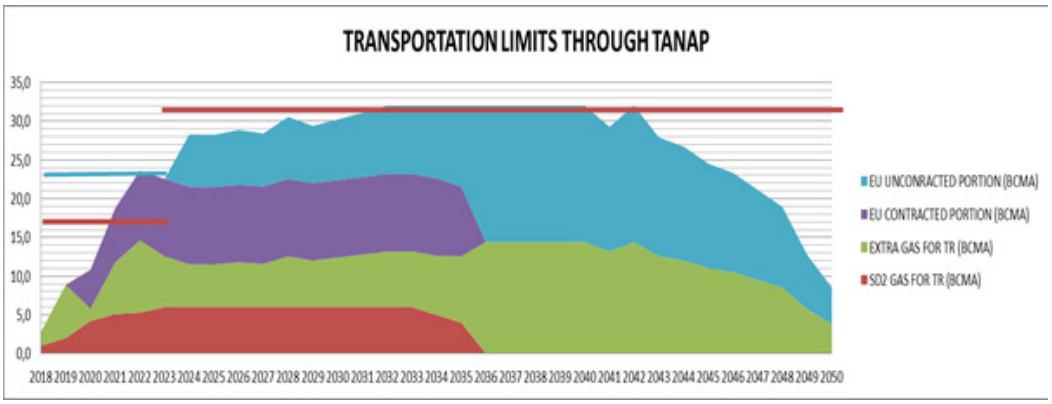
Graph 10: New AZ gas export balance to GEO-TR-EU after the limitations of SCPX and SCPFX capacities.

small expansions) 8 bcma capacity of Eastern Turkish gas pipeline system will be enough for transportation of Azeri gas to mid-Turkey and EU border up to 2023's.

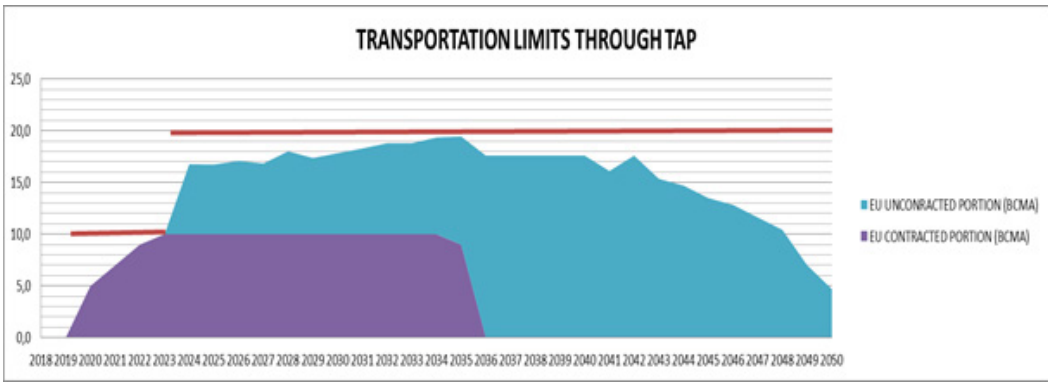
- Then in 2023 the announced plan of SOCAR to expand TANAP capacity up to 31 bcma has to be completed.

While the gas is now in the western border of Turkey for EU, as shown on the Graph 11 above:

- 10 bcma capacity of TAP is enough to transport Azeri gas to Italy market up to 2023.
- In 2023, as announced by the authorities of EU to increase TAP capacity up to 20 bcma, capacity of TAP will have to be expanded up to 20 bcm. Then there will



Graph 11: Transportation limits of TANAP, Turkish gas network and expanded TANAP for Azeri gas export to TR & EU.



Graph 12: Transportation limits of TAP and TAP expansion for future Azeri gas exports to Italy.

"Long term gas planning is an important issue, which has many effective criteria to consider. Reserves, structures, agreements, politics, pipeline capacities, economics, markets and other regional factors have to be analyzed together."

PIPELINE	CAPACITY	EXPANDED CAPACITY	EXPANSION TIME
SCPX	16	34	2023
TANAP	16	31	2023
TAP	10	20	2023

Table 4: Estimated expanded capacities of AZ export pipelines to GEO-TR-EU.

be no capacity limitations for the future export potentials.

As a result of these capacity limitations, estimated capacity expansion years and the new capacities are given in the Table 4.

RESULTS & ANALYSIS

As seen on the graphs and evaluations above, long term gas planning is an important issue, which has many effective criteria to consider. Reserves, structures, agreements, politics, pipeline capacities, economics, markets and other regional factors have to be analyzed together.

As a result of this study, while focusing on the Azerbaijan gas supplies to TR & EU up to 2050, these items below can be listed.

- For Azerbaijan:
  - Azerbaijan has to develop new resources and increase the planned gas production volumes from due projects.
  - Initially, she has to successfully complete the SD2 project and gas export roots with her partners.
  - She has to make plans to organize the expansion of SCPX and TANAP in 2023.
  - She has to resolve current export capacity issues as it limits transportation via SCPFX due to lack of free capacity, between years 2032 and 2039.
  - She has to focus on the exploration and development of new fields to continue to be a gas supplier after 2050. (Gas export potential to GEO-TR-EU root and Russia will be below 15 bcma after 2050 and this will continue to decrease, if there will be no new additional supplies added).
  - She has to find additional resources to infill the free capacities of SCPFX (after 2043), TANAPX (after 2043) and TAPX (after 2036). (The expected free capacities can be seen on the graphs above).
- For Turkey:
  - She has to focus on the possible extra uncontracted volumes of Azeri gas up to 2050.
  - She has to make estimations for additional supplies from Russia - Iran - Iraq - Eastern Mediterranean and LNG options up to 2050.
  - She has to make agreements with Azeri gas supplier companies by considering these scenarios.
  - For price negotiations, she has to keep in mind that, some portion of Azeri gas has to be sold in Turkey for economic considerations. This clue and other possible supplies will strengthen her hand in the due deals.
- For EU:
  - She has to continue to support politically Azeri gas export to EU.
  - Hence, there is an increasing demand for gas in EU; there will be no market problem.
  - Azeri gas volume will be so small while considering the total EU demand scenarios however, for diversification of resources, this root has to be successful.

"For price negotiations, Azerbaijan has to keep in mind that, some portion of Azeri gas has to be sold in Turkey for economic considerations. This clue and other possible supplies will strengthen her hand in the due deals."

ABBREVIATIONS

EU: European Union
RUS: Russia
TR: Turkey
AZ: Azerbaijan
SCP: South Caucus Pipeline

SCG: Southern Gas Corridor

TS: Turkish Stream Pipeline

TANAP: Trans Anatolia Pipeline

GEO: Georgia

GR: Greece

IT: Italy

TAP: Trans Adriatic Pipeline

"X" after pipeline name: Means extension of the related pipeline (Ex: SCPX: Expansion of SCP)

"FX" after pipeline name: Means forward extension of the related extended pipeline (Ex: SCPFX: Expansion of SCPX)

Tcm: Trillion cubic meters

Bcma: Billion cubic meters annually

SOCAR: National Oil Company of Azerbaijan

BP: British Petroleum

SD: Shah Deniz Gas Project

LoF: Life of Field

GIP: Gas in Place

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ENERGY SECURITY STRUGGLE IN CASPIAN REGION FROM THE VIEW OF IMPORTANT PIPELINE PROJECTS

by Oğuzhan Akyener

ABSTRACT

Caspian Region encloses the countries having important energy resources (oil & gas), which attracts all major energy players in the world. As a result of this appeal of the energy resources; from the view of supply and demand security, there is a critical balance and a very complex struggle among these major players.

To analyze the oil and gas supply-demand balances in the field of energy security policies: in the first place, it is better to define the main players in the region. Furthermore, in order to evaluate the long-term development plans; it is very important to examine the planned and existing transferring infrastructure in the region (pipelines, ports, transformation facilities, railroads, etc.).

In this study, initially, by mentioning the importance of Caspian Region for world energy markets, portfolios of the important players who are active and who want to be active in this region will be analyzed. Secondly, definitions of the energy security for each important player in the region will be determined and possible targets for each player's energy security definitions will be estimated. For analyzing these targets and the struggle observed for these targets, after mentioning the relevant resource development plans and the supply/demand potentials, the situations of the existing and planned transportation capacities of the pipelines will be described. By this way, the results of the struggle in energy security in the region will be predicted.

"Having an attractive geo-political importance due to the existing energy resources of the region, Caspian magnetizes nearly all of the important energy players of the world."

INTRODUCTION

Geographically, by involving the countries that have important portion of oil and gas reserves of the world, Caspian is an important region from the sight of energy. In addition to having huge oil and gas reserve potential, standing in between two important energy-demanding markets such as Europe and China-India increases the geo-political importance of the Caspian Region.

Hence, having an attractive geo-political importance due to the existing energy resources of the region, Caspian magnetizes nearly all of the important energy players of the world.

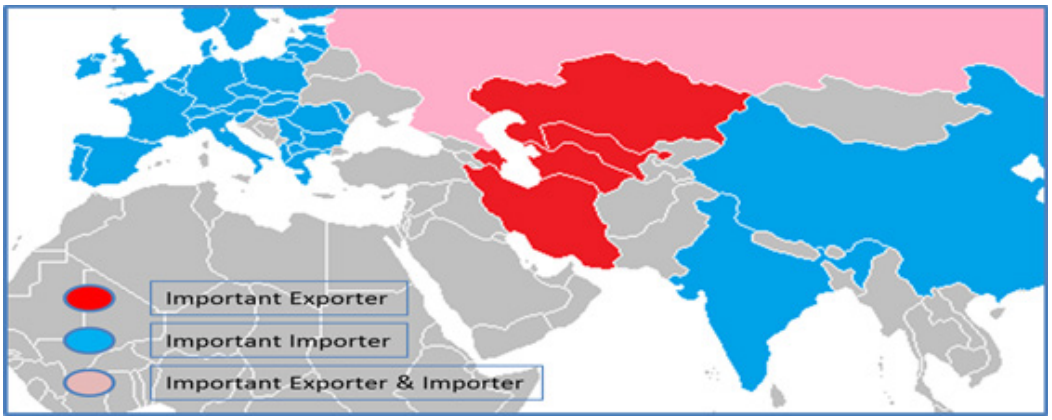
IMPORTANT PLAYERS IN ENERGY STRUGGLE IN CASPIAN REGION

To elect important energy players in Caspian Region; potential suppliers in the region, huge consumers importing from the region and other politically dominant governments have to be studied.

Interests of these players in the region can be observed from oil/gas import – export values, private E&P or service companies working in the region and political attitudes.

Russia, Azerbaijan, Iran, Turkmenistan, Kazakhstan & Uzbekistan are the countries that have existing important energy resources potential in the region. India-China and European Union (EU) can be accepted as the important energy demander (importers) countries from the region. US & Japan are other important energy players which are also active in Caspian Region with their private oil & gas companies (other than important levels of oil/gas imports like EU-China and India).

Hence, not being an importer or exporter, being located far from the region and other geographical conditions, US and Japan will not be considered as important players in the energy struggle in Caspian Region. Indeed, from the sight of parallel political attitudes, US can be accepted as standing at EU's side. US are one of the main dominant countries in the region. By the way, from the energy politics side; US directly support EU's ben-



Map 1: Important players in energy struggle in Caspian Region.

efits in order to weaken Russia and China's involvement.)

Note: Due to very few activities and interests in the region, some important international energy players such as Canada, Australia, Saudi Arabia, Iraq, South Korea etc. are not taken into account.

As a result, as shown on Map 1; Russia, Azerbaijan, Iran, Turkmenistan, Kazakhstan, Uzbekistan, India, China & EU can be accepted as the main important players in the energy struggle in Caspian Region.

Table 1 gives brief information about today's energy statistics of these players.

The reserves, productions, consumptions, demand value (consumption-production), one year total production/reserves values (which will give information about the development and investment rate on the resources) and the GDP dependencies of each players of oil and gas production is given in Table 1 above.

For the future estimations;

Table 2 below shows the future gas consumption estimates of important gas consumers.

The increasing gas demand of China and India can be observed in Table 2 above. Graph 1 below shows the changes in oil import values of the biggest consumers in 2035.

Again, from Graph 1, the huge increase expectations in India and China's oil exports in 2035 in contrast to the decrease in EU, US and Japan are observed.

From the suppliers' side in the Caspian region, Table 3 below shows the oil and gas export potential estimates of the Caspian energy suppliers in 2035.

		Azerbaijan	Turkmenistan	Uzbekistan	Kazakhstan	Iran	Russia	India	China	EU
Proved Oil Reserves	billion bbl	7	0.6	0.6	30	157	87.2	5.7	17.3	7.9
Oil Production	m bbl/d	872	222	68	1728	3680	10643	894	4155	1762
Oil Consumption	m bbl/d	98	100	82	265	1971	3174	3652	10681	12700
Demand Volume	m bbl/d	-779	-122	14	-1463	-1709	-7469	2758	6426	10938
1 year Prod/Reserves		0.045	0.133	0.041	0.021	0.008	0.044	0.056	0.086	0.080
RESULT		SUPPLY	SUPPLY	X	SUPPLY	SUPPLY	SUPPLY	DEMAND	DEMAND	DEMAND
Proved Gas Reserves	tcm	0.9	17.5	1.1	1.3	33.6	32.9	1.3	3.1	1.9
Gas Production	bcma	15.6	64.4	56.9	19.7	160.5	592.3	40.2	107.2	153
Gas Consumption	bcma	8.5	23.3	47.9	9.5	156.1	416.2	54.6	146.6	456
Demand Volume	bcma	-7.1	-41.1	-9	-10.2	-4.4	-176.1	14.4	39.4	303
1 year Prod/Reserves		0.017	0.004	0.052	0.015	0.005	0.018	0.031	0.085	0.081
RESULT		SUPPLY	SUPPLY	SUPPLY	SUPPLY	SUPPLY	SUPPLY	DEMAND	DEMAND	DEMAND
GDP	billion$	98	47.5	104.7	231.3	997.4	2504	4784	12380	15630
Oil & Gas Rate in GDP	%	0.38	0.64	0.21	0.30	0.19	0.24	0.01	0.02	0.01
RESULT		DEPENDENT	DEPENDENT	DEPENDENT	DEPENDENT	DEPENDENT	DEPENDENT	X	X	X

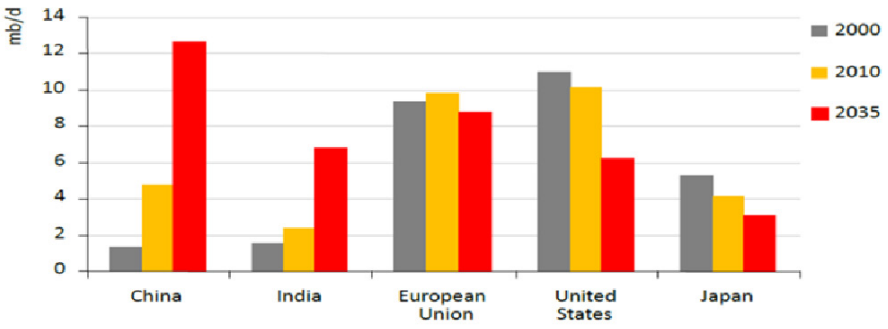
Table 1: Energy statistics of the main energy players in Caspian Region.[1]

"Russia, Azerbaijan, Iran, Turkmenistan, Kazakhstan & Uzbekistan are the countries that have existing important energy resources potential in the region. India-China and European Union (EU) can be accepted as the important energy demander (importers) countries from the region."

	2008	2015	2020	2025	2030	2035	2008-2035*	Change vs. NPS 2035**
OECD	**1 541**	**1 615**	**1 691**	**1 773**	**1 865**	**1 950**	**0.9%**	**192**
North America	815	841	872	924	986	1 052	0.9%	138
United States	*662*	*661*	*668*	*700*	*741*	*786*	*0.6%*	*122*
Europe	555	574	608	636	653	667	0.7%	38
Pacific	170	200	210	213	226	231	1.1%	15
Japan	*100*	*118*	*122*	*123*	*127*	*127*	*0.9%*	*10*
Non-OECD	**1 608**	**2 070**	**2 328**	**2 611**	**2 912**	**3 182**	**2.6%**	**405**
E. Europe / Eurasia	701	755	786	824	857	876	0.8%	38
Russia	*453*	*474*	*487*	*504*	*522*	*528*	*0.6%*	*25*
Asia	341	576	715	864	1 049	1 244	4.9%	309
China	*85*	*247*	*335*	*430*	*535*	*634*	*7.7%*	*239*
India	*42*	*81*	*104*	*134*	*176*	*234*	*6.5%*	*57*
Middle East	335	428	470	536	592	632	2.4%	23
Africa	100	139	154	164	170	173	2.1%	9
Latin America	131	172	203	224	245	258	2.5%	26
Brazil	*25*	*48*	*66*	*76*	*88*	*98*	*5.1%*	*21*
World	**3 149**	**3 685**	**4 019**	**4 384**	**4 778**	**5 132**	**1.8%**	**597**
European Union	*536*	*553*	*587*	*609*	*621*	*636*	*0.6%*	*38*

Table 2: 2035 World gas consumptions[2] (units are bcma).

"For both import and export to be continuous, secure and economic, diversification of resources and markets, decreasing transportation costs, obtaining political-economic stability are important."



Graph 1: 2035 World oil imports.[3]

	Oil (bbld)	Gas (bcma)
Azerbaijan	250 000	40
Turkmenistan	250 000	140
Uzbekistan	0	80
Kazakhstan	2 100 000	60
Iran	No Estimation Due To Sanctions	No Estimation Due To Sanctions
Russia	6 000 000	350

Table 3: 2035 Caspian energy suppliers' export estimations.

As seen from Table 3, in 2035, there will be a decrease in Azerbaijan and Russia's oil export capacities (mainly due to production decline in maturing fields). For gas export potentials, all the players will increase their supplies.

ENERGY SECURITY DEFINITIONS FOR EACH PLAYER

Generally, for an exporter country, energy security means to be able to continue economically and safely for exporting her resources. In the opposite side, for an importer country, to be able to economically and safely continue to import demanded resources.

For both import and export to be continuous, secure and economic, diversification of resources and markets, decreasing transportation costs, obtaining political-economic stability are important. That is why; these factors are important energy security issues for all players. To briefly describe main energy security definitions for each player in the region:

AZERBAIJAN

- An important oil and gas exporter in the region:
  - Today having an oil exporting capacity of more than 750 000 bbld
  - Today having a gas exporting capacity of more than 7 bcma
- Due to existing & planned pipeline projects and geopolitical conditions, Azerbaijan becomes the energy gate of Caspian Energy Resources to Europe (Although it is more economical to transport some energy resources in Caspian Region to Europe through Iran or Russia, due to EU & US strategies, Azerbaijan is the unique political choice).
- New resource potentials are mainly gas and all are usually deep offshore (Means: not easy to develop).
- International huge oil companies are interested for investment.
- Main energy security targets are:
  - To develop new offshore gas fields with the foreign investors
  - To access to European gas markets via the planned pipelines
  - To be an important gas supplier for EU and by this way get EU & US's political supports
  - To continue to securely access existing markets: for gas - to Turkey and Georgia; for oil - to Ceyhan, Supsa & Novorossiysk
  - To get more production with the new investments and development plans from the most important oil field ACG
  - To have more control over the existing and future projects in Azerbaijan
  - To construct more offshore drilling platforms for continuous development activities in Caspian Sea
  - To reach gas export capacity of 50 bcma in 2035
  - To solve conflicting claims over the maritime and seabed boundaries of Caspian Sea with Iran & Turkmenistan
  - To be an energy hub in the coming 30 years by transporting Turkmenistan and Kazakhstan oil & gas resources via existing and planned pipelines
  - To construct the region's biggest refinery and become an important oil products supplier in the region
  - To construct gas power plants and become an electric supplier in the region

TURKMENISTAN

- An important gas exporter in the region:
  - Today having an oil exporting capacity of more than 100 000 bbld
  - Today having a gas exporting capacity of more than 40 bcma
- A lack of sufficient foreign investments.
- Being located far from the important markets.
- Lack of sufficient oil export pipeline infrastructure.
- Majority of gas is exported to Russia and some portion of gas is exported to China and Iran.

"Azerbaijan becomes the energy gate of Caspian Energy Resources to Europe due to existing & planned pipeline projects and geopolitical conditions."

"Majority of Turkmen gas is exported to Russia and some portion of gas is exported to China and Iran."

- Important portion of gas reservoirs are high pressure and temperature reservoirs and have high percentages of H2S and CO2; means not easy to develop due to economical & technical aspects.
- Due to important gas reserves, having attraction of all other players in the region.
- Main energy security targets are:
  - To get attraction of new foreign investors and develop more gas fields
  - To continue to securely access to Russia, Iran and China's gas markets
  - To increase the capacity of transportation to access China's gas markets
  - To access to Pakistan, India and European gas markets via planned pipelines
  - To complete the construction of these relevant pipelines (TAPI & Trans Caspian)
  - To reach gas export capacity of 230 bcma in 2035 (expected to be more than 140 bcma)
  - To reach oil export capacity over 1 million bbld in 2035 (expected to be more than 250 000 bbld (due to expected increasing condensate production; but new infrastructures to transport will be needed)
  - To complete East-West pipeline inside Turkmenistan and have the ability to transport South East resources to the Caspian Sea markets (Then from Trans Caspian to EU (also seems uneconomic))
  - To solve conflicting claims over the maritime and seabed boundaries of Caspian Sea with Iran & Azerbaijan

UZBEKISTAN

- An important gas exporter in the region:
  - Today having a gas exporting capacity more than 9 bcma
- A lack of sufficient foreign investment.
- Being located far from the important markets and land locked in all sides.
- A lack of sufficient export pipeline infrastructure.
- Majority of gas is exported to Russia and some portion of gas is exported to China and Iran.
- Important portion of gas reservoirs are high pressure and temperature reservoirs and have high percentages of H2S and CO2; means not easy to develop due to economical & technical aspects.
- Due to important gas reserves, having attraction of all other players in the region.
- Main energy security targets are:
  - To get attraction of new foreign investors and develop more oil and gas fields
  - To continue to securely access to Russia, Kazakhstan & Kyrgyzstan's gas markets
  - To increase the capacity of transportation to access Russia's gas markets
  - To access to China's gas markets via Central Asia-China Pipeline after capacity extension
  - To reach gas export capacity of 80 bcma in 2035
  - In the short term; increase gas to liquid converting process capacities to reduce oil imports
  - To explore and develop possible oil shale reserves
  - To construct new facilities to decrease flaring of associated gas and increase usage (Today nearly 2 bcma gas is flared)

KAZAKHSTAN

- An important oil exporter in the region:
  - Today having an oil exporting capacity of more than 1,4 million bbld
  - Today having a gas exporting capacity of more than 10 bcma
- International huge oil companies are interested for investment but also there are some obscurities on legal regulations.
- An important oil exporter for European Markets (with more than 50% of oil production) and also China (more than 15%).
- All gas exports are transported to Russia

(Mainly for gas processing plants).

- Geographically important dependency to Russia for oil exports.
- More than 85 percent of gas produced in Kazakhstan is associated gas. Nearly 5 bcma part of gas production is reinjected.
- Main energy security targets are:
  - To continue to securely access to existing oil markets through Russia, Azerbaijan and also China's oil markets
  - To develop the giant oil field Kashagan and continue developing of new phases of other 2 giant fields; Tengiz & Karachaganak
  - To reach oil export capacity of 2,5 million bbld in 2035
  - To have more control over the existing and future projects in Kazakhstan
  - To increase the capacity of transportation to access China's oil markets
  - To complete the construction of Eskene-Aktau Pipeline for domestic oil transportation, and domestic natural gas pipeline system for gas distribution and for meeting the gas import demand from Uzbekistan and Russia
  - To construct Trans Caspian and Kazakhstan-Turkmenistan-Iran Oil Pipelines for market diversification of oil exports
  - To reach gas export capacity of 60 bcma in 2035

IRAN

- Iran holds the world's second largest proven gas reserves and world's fourth largest proven oil reserves.
- Very important oil & gas exporter in the region:
  - Today having an oil exporting capacity of more than 1,7 million bbld
  - Today having a gas exporting capacity of more than 10 bcma (Only Turkey is importing gas from Iran)
- Is a member of OPEC.
- Holds the Strait of Hormuz, which is an important route for oil exports of Persian Gulf Countries.
- International sanctions negatively affected all parts of the oil and gas market in Iran including; the export & import movements, development of new fields, new transportation projects, foreign investments and etc. (For example: In spite of the above oil export capacity, today Iran can export less than 800 000 bbld).
- If Iran cannot find a peaceful solution to stop the sanctions and change all scenarios, then the main energy security targets can be:
  - To continue to securely access to existing oil markets, which are 50% China & India, 20% Japan & N. Korea and 20% Turkey & Spain & Italy & Greece
  - Find some back doors to perforate the sanctions such as:
    - More swap agreements in oil & gas trade movements
    - To increase the swap capacity; making investments in anti US & EU countries
  - Prepare suitable legal legislations for foreign investors to make investment in development projects in Iran
  - Develop shared reservoirs as specially South Pars Field:
    - By developing gas fields, export the gas as LNG by constructing relevant facilities
    - Make agreements with Turkey to sell extra gas, develop the transportation capacities and make Turkey to construct an LNG facility if needed
    - Make suitable agreements with Pakistan for gas export
      - Assist Pakistan for her internal gas distribution system
    - Develop the construction of Iran-Iraq-Syria Gas Pipeline

RUSSIA

- Russia holds the world's largest proven gas reserves and world's eighth largest proven oil reserves.

"International huge oil companies are interested for investment in Kazakhstan but also there are some obscurities on legal regulations."

"International sanctions negatively affected all parts of the oil and gas market in Iran including; the export & import movements, development of new fields, new transportation projects, foreign investments and etc."

- Very important oil & gas exporter in the region:
  - Today having an oil exporting capacity of more than 7.4 million bbld
  - Today having a gas exporting capacity of more than 175 bcma
- In addition, an important gas importer in the region.
- Russia – EU's largest energy resources importer (2009).[4]
  - 36% of the EU's total gas imports originate from Russia
  - 31% of the EU's total crude oil imports originate from Russia
  - 30% of the EU's coal imports originate from Russia
- The EU – Russia's largest trade partner for the energy goods.[5]
  - 80% of all Russian oil exports go to the EU
  - 70% of all Russian gas exports go to the EU
  - 50% of all Russian coal exports go to the EU
- Most of Russian parts of the Caspian Sea are unexplored and undeveloped but may hold large hydrocarbon reserves.
- Most important oil producing fields in Russia are mature and having a declining production trend.
- Russia has an extensive domestic and export pipeline network.[6]
- Main energy security targets are:
  - To continue to securely access to existing oil and gas markets (mainly EU, China, Japan, Turkey)
  - To continue the market share volumes, dominance and influence on EU oil & gas markets
  - By importing oil or gas from Turkmenistan – Kazakhstan & Uzbekistan, increase export capacity (also buy cheaper and sell with higher prices)
  - Get prepared for oil & gas supply infrastructure for the increasing demand in China
  - For having an alternative gas route to Central Europe, avoiding Ukraine's territory, construct south stream gas pipeline
  - Make investments to explore new oil & gas resources
  - Use the technology, some enhanced recovery methods and make investments for new phases of development to avoid decreasing production trends in the important maturing oil fields

"Caspian region -where important gas supply potentials exist- has always been directly related to the huge importers' energy security issues, such as EU and Turkey."

INDIA

- India is the fourth largest energy consumer in the world after US, China and Russia.[7]
- Very important oil & gas importer:
  - Today having an oil importing capacity of more than 2.7 million bbld
  - Today having a gas importing capacity of more than 14 bcma
- Most of the oil imports are supplied from the Middle East countries (64%) and only lower than 6% rate is coming from Iran.
- All natural gas demands are met by (usually long term) LNG imports and the internal gas production (In 2011, India was the 6th largest LNG importer in the world).
- There is an important incremental rate in oil and gas demand for India.
- In addition, India is an important oil importer, due to the refinery capacity; she is a net exporter of petroleum products.
- Up to 2.6 tcm unconventional gas resources (coalbed methane) potential is estimated to exist in onshore and offshore India.
- Main energy security targets are:
  - Meet the increasing energy demands
  - Make India an energy independent country;
    - Development and exploration of unconventional resources (such as coalbed methane and shale gas)
    - Investment on new exploration and development projects

- Decrease the usage percentage of motor fuels
- Energy efficiency
- Make investments on gas pipeline infrastructure to meet the increasing gas demand
- Construct TAPI pipeline and import Turkmen gas
- If there is a solution for the US sanctions on Iran; construct IPI (Iran-Pakistan-India) Pipeline to import Iranian gas
- Increase LNG terminals import capacities and make more long-term agreements with the sellers
- With the Indian oil and gas companies, take part in important oil and gas E&P projects all over the world

CHINA

- China is the world's most populous country and the largest energy consumer in the world. Rapidly increasing energy demand has made China extremely influential in the world energy markets.[8]
- Very important oil & gas importer:
  - Today having an oil importing capacity of more than 6,4 million bbld
  - Today having a gas importing capacity of more than 40 bcma
- Most of the oil imports are supplied from the Middle East countries (50%) and from Caspian suppliers; 10% from Iran, 7% from Russia, 4% from Kazakhstan.
- There is an important incremental rate in oil and gas demand for China.
- Up to 10 tcm unconventional gas resources (coalbed methane) potential is estimated to exist in onshore and offshore prospects.
- Main energy security targets are:
  - Meet the increasing energy demands
  - Diversify supply sources, make long term contracts
  - Development and exploration of unconventional resources
  - Set domestic wholesale energy prices
  - Investment on new exploration and development projects by mostly focusing on western interior provinces and offshore fields
  - Apply enhanced recovery methods for maturing fields
  - Energy efficiency
  - Make investments on construction and integration of domestic oil & gas pipeline infrastructure
  - Increase the oil supply capacity from Russia & Kazakhstan and gas supply capacity from Turkmenistan (also add Uzbekistan to the supplier list)
  - Make relevant agreements and build pipelines for gas supply from Russia to China (two pipelines with total capacity of 80 bcma + Altai Pipeline with capacity 30 bcma)
  - Construct an oil import pipeline from Myanmar to bypass the potential choke point of Strait of Malacca
  - In the short term, complete the construction of gas pipeline from Myanmar (with a capacity of 12 bcma)
  - With the Chinese oil and gas companies, take part in important oil and gas E&P projects all over the world
  - Increase gas storage capacity up to 32 bcm
  - Solve territorial disputes with Japan

EU

- EU is the largest energy consumer structure in the world.
- Most important oil & gas importer in the world:
  - Today having oil importing capacity of more than 10 million bbld
  - Today having a gas importing capacity of more than 300 bcma
- 36% of the EU's total gas imports originate from Russia and around 28% is from Norway, and other important portion is from Algeria, Qatar, Nigeria and Libya.
- A central gas import system and policy

"Most of Russian parts of the Caspian Sea are unexplored and undeveloped but may hold large hydrocarbon reserves."

"India is the fourth largest energy consumer in the world after US, China and Russia."

"Rapidly increasing energy demand has made China extremely influential in the world energy markets."

exists for the union.

- 31% of the EU's total crude oil imports originate from Russia and around 10% from Norway and other imports are originate mainly from Libya, Saudi Arabia, Kazakhstan & Iran, Nigeria, Azerbaijan, Iraq and other middle east countries.
- Some members of EU is directly dependent on Russian gas import, this situation becomes a strategic constraint for the union's energy security issues.
- Main energy security targets are:
  - Continue to meet the energy demand in a sustainable, competitive and secure way
  - Less greenhouse gas and carbon emissions
  - Use more biofuels
  - Increase market competition
  - Focus on the Caspian gas market and work on potential supply possibilities for diversity of resources;
    - For the initial step, transport Azerbaijan gas to EU (with SCPX-TANAP-TAP)
    - For the second step, transport Azerbaijan's future gas to EU (after extending the capacities of existing pipelines and also construct IAP)
    - For the third step, transport Iraq or/and East Mediterranean Sea gas to EU (after the extension of constructed infrastructure in the previous steps and also construct Nabucco West)
    - For the fourth step, transport Turkmen gas to EU (Trans Caspian) (but seems not-economic)
  - Check for other gas supply potentials via pipeline or LNG
  - Develop a Strategic Energy Technology Plan to develop technologies in areas including renewable energy, energy conservation, low-energy buildings, fourth generation nuclear reactor, clean coal and carbon capture
  - Develop an Africa-Europe Energy partnership for the continent to be a sustainable energy supplier for EU
  - Decrease gas imports, increase efficiency, use more renewables
  - Develop and implement common energy policies with all EU members

IMPORTANT PIPELIES IN THE REGION & CAPACITIES

Pipeline capasities and regional energy players are listed in Table 4.

ANALYSIS

To check all the players' 2035 extra supply and demand potentials on Map 2 & 3 (2035 value – today's value):

In 2035:

- EU does not need extra oil supply so; main item for EU energy security is gas.
- China and India need very important amount of oil supply and they will not meet their demand only from the Caspian Region. Moreover, oil supply in the Caspian region will decrease (as 1.2 million bbl/d) in spite of the expected production increase in Kazakhstan. (The assumption is made by considering that there will not be a solution for the sanctions on Iran. If a solution to the sanctions can be addressed, Iran will change all the oil supply potential in the region. Otherwise, India and China will have to find oil supplies from the Middle East-North America or Africa).
- From this view, meeting both oil and gas demands are the most important energy security issues for India & China.
- There is totally 428 bcma extra gas supply with the Caspian Region players and 895 bcma extra demand from the region. This means struggle in gas demand security will be deepened.
- For logical analysis of this struggle, some other items also have to be considered such as:
  - Other gas demanding markets those can get supplies from this region such

		OIL					GAS				
		Name of Pipeline	From (Supply Country)	Through (Countries)	To (Markets)	Capacity (million bbld)	Name of Pipeline	From (Supply Country)	Through (Countries)	To (Markets)	Capacity (bcma)
AZERBAIJAN	EXISTING	BTC	AZERBAIJAN	AZ-GEO-TR	WORLD	1,2	SCP	AZERBAIJAN	AZ-GEO	TURKEY	8
		WREP	AZERBAIJAN	AZ-GEO	WORLD	0,15	GAZI-MAGOMED-MOZDOK	AZERBAIJAN	AZ-RUS	RUSSIA	1
		NREP	AZERBAIJAN	AZ-RUS	WORLD	0,3	BAKU-ASTARA	AZERBAIJAN	AZ-IRAN	NAKCHCIVAN	0,5
		RAILWAY	AZERBAIJAN	AZ-GEO	WORLD	0,22					
	FUTURE						SCPX	AZERBAIJAN	AZ-GEO	TURKEY-EU	16
							TANAP	GEORGIA	TURKEY	EU	16
							TAP	TURKEY	GRE-ALB	ITALY	10
							IAP	ALBANIA	MONT-BOSN	BALKANS	5
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
UZBEKISTAN	EXISTING						CAC	TURKMENISTAN	TURK-UZB	RUSSIA	100
							BUKHARA-URALS	TURKMENISTAN	TURK-UZB-KAZ	RUSSIA	20
							TASHKENT-BISK-ALMATI	UZBEKISTAN	UZB-KRG	KAZAKHSTAN	3,2
	FUTURE										
							CAC X	UZBEKISTAN	UZB	RUSSIA	+30
							CENTRAL ASIA-CHINA X	UZBEKISTAN	UZB	CHINA	+10
KAZAKHSTAN	EXISTING	CPC	KAZAKHSTAN	RUS	WORLD	0,7	BUKHARA-URALS	TURKMENISTAN	TURK-UZB-KAZ	RUSSIA	20
		KAZAK-CHINA	KAZAKHSTAN	KAZ	CHINA	0,24	CAC	TURKMENISTAN	TURK-UZB-KAZ	RUSSIA	100
		RAILWAY	KAZAKHSTAN	KAZ	CASPIAN	0,34	CENTRAL ASIA-CHINA	TURKMENISTAN	TURK-UZB-KAZ	CHINA	40
		UZEN-ATYRAU-SAMARA	KAZAKHSTAN	KAZ	RUSSIA	0,6					
	FUTURE	ESKENE-AKTAU	KAZAKISTAN	KAZ	CASPIAN	0,76	KAZAK-CHINA	KAZAKHSTAN	KAZ	CHINA	X
		KAZAK-CHINA X	KAZAKHSTAN	KAZ	CHINA	0,16					
		TRANSCASPIAN	KAZAKHSTAN	KAZ	WORLD	X					
		KAZAK-TURKMEN-IRAN	KAZAKHSTAN	KAZ-TURK	IRAN	X					
		CPC X	KAZAKHSTAN	RUS	WORLD	+0,7					
IRAN	EXISTING						KORPEZHE KK	TURKMENISTAN	TURK	IRAN	13
							DAULETABAT-KANGIRAN	TURKMENISTAN	TURK	IRAN	6
							IRAN-TURKEY	IRAN	IR	TURKEY	14
	FUTURE										
							IRAN-PAKISTAN	IRAN	IR	PAKISTAN	28
							IRAN-IRAQ-SYRIA	IRAN	IR-IRQ-SYR	WORLD	X
RUSSIA	EXISTING	DRUZHBA	RUSSIA	BEL-UKR-EU	EU	2	YAMAL1	RUSSIA	BEL	EU	28,5
		BALTIC	RUSSIA	RUS	WORLD	2,1	YAMAL2	RUSSIA	BEL	EU	28,5
		NORT-WESTERN	RUSSIA	BEL	EU	0,3	BLUE STREAM	RUSSIA	RUS	TURKEY	16
		ESPO	RUSSIA	RUS	PACIFIC	0,6	NORTH CAUCASUS	RUSSIA	GEO	ARMENIA	10
							ORENBURG-WESTERN BORDER	RUSSIA	UKR	EU	26
							URENGOY-UZHGOROD	RUSSIA	UKR	EU	28
							YAMBURG-WESTERN BORDER	RUSSIA	UKR	EU	28
							DOLINA-UZHGOROD	RUSSIA	UKR	EU	20
							KOMARNO-DROZDOWICHI	RUSSIA	BEL	EU	5
							UZHGOROD-BEREGOVO	RUSSIA	UKR	EU	11
							HUST — SATU-MARE	RUSSIA	UKR	EU	2
							ANANYEV-TIRASPOL'-IZMAIL & SHEBELINKA-IZMAIL	RUSSIA	UKR	EU	24
							KOBRIN-BREST	RUSSIA	BEL	EU	5
							ST. PETERSBURG-FINLAND	RUSSIA	RUS	EU	7
	FUTURE	BALTIC	RUSSIA	RUS	WORLD	+1	SOUTH STREAM	RUSSIA	RUS	EU	63
		ESPO	RUSSIA	RUS	PACIFIC	+1	ALTAI	RUSSIA	RUS	CHINA	30
		KHARYA-INDIGA	RUSSIA	RUS	PACIFIC	0,24	RUSSIA-CHINA 1 & 2	RUSSIA	RUS	CHINA	80
		RUSSIA-CHINA	RUSSIA	RUS	CHINA	0,3					
INDIA	FUTURE						TAPI	TURKMENISTAN	TURK-AFG-PAK	INDIA	34
							IPI	IRAN	PAK	INDIA	X
CHINA	EXISTING	KAZAK-CHINA	KAZAKHSTAN	KAZ	CHINA	0,24	CENTRAL ASIA-CHINA	TURKMENISTAN	TURK-UZB	CHINA	40
	FUTURE	KAZAK-CHINA X	KAZAKHSTAN	KAZ	CHINA	+0,16	CENTRAL ASIA-CHINA X	UZBEKISTAN	UZB	CHINA	+10+18
		MYANMAR-CHINA	MYANMAR	MYN	CHINA	0,48	KAZAK-CHINA	KAZAKHSTAN	KAZ	CHINA	X
							RUSSIA-CHINA 1 & 2	RUSSIA	RUS	CHINA	80
							MYANMAR-CHINA	MYANMAR	MYN	CHINA	12
EU	EXISTING	DRUZHBA	RUSSIA	BEL-UKR-EU	EU	2	YAMAL1	RUSSIA	BEL	EU	28,5
		NORT-WESTERN	RUSSIA	BEL	EU	0,3	YAMAL2	RUSSIA	BEL	EU	28,5
							BLUE STREAM	RUSSIA	RUS	TURKEY	16
							NORTH CAUCASUS	RUSSIA	GEO	ARMENIA	10
							ORENBURG-WESTERN BORDER	RUSSIA	UKR	EU	26
							URENGOY-UZHGOROD	RUSSIA	UKR	EU	28
							YAMBURG-WESTERN BORDER	RUSSIA	UKR	EU	28
							DOLINA-UZHGOROD	RUSSIA	UKR	EU	20
							KOMARNO-DROZDOWICHI	RUSSIA	BEL	EU	5
							UZHGOROD-BEREGOVO	RUSSIA	UKR	EU	11
							HUST — SATU-MARE	RUSSIA	UKR	EU	2
							ANANYEV-TIRASPOL'-IZMAIL & SHEBELINKA-IZMAIL	RUSSIA	UKR	EU	24
							KOBRIN-BREST	RUSSIA	BEL	EU	5
							ST. PETERSBURG-FINLAND	RUSSIA	RUS	EU	7
							MAGHREB	ALGERIA	MOR	EU	12
							MEGDAZ	ALGERIA	ALG	EU	8
							GALSI	ALGERIA	ALG	EU	10
							TRANS-MEDITERRANEAN	ALGERIA	TUN	EU	30
							GREENSTREAM	LIBYA	LIB	EU	11
	FUTURE						TANAP	GEORGIA	TURKEY	EU	16
							TAP	TURKEY	GRE-ALB	ITALY	10
							IAP	ALBANIA	MONT-BOSN	BALKANS	5
							SOUTH STREAM	RUSSIA	RUS	EU	63
							NABUCCO WEST	TURKEY	EU	EU	20

Table 4: Caspian energy players and existing & future pipeline capacities.

"EU is the largest energy consumer structure in the world."

as Turkey, Japan, Korea and etc.

- Other supply potentials from Africa-North America or Middle East (but more extra LNG capacities have to be constructed for such an option)
- EU policy to diversify gas supply resources and mitigating gas dependency to Russia
- There is going to be a struggle among the gas suppliers in the region (Mainly between Russia and others)
- Effects of unconventional resources in supply and gas prices
- Long and short term gas prices effects
- Pricing, sale & contract mechanisms
- Success possibilities of planned pipelines & development projects
- Iran and the sanctions

After shortly analyzing supply-demand balances in the region between the energy players in 2035, it is observed that the struggle is going to be mainly on the gas resources and gas supply securities.

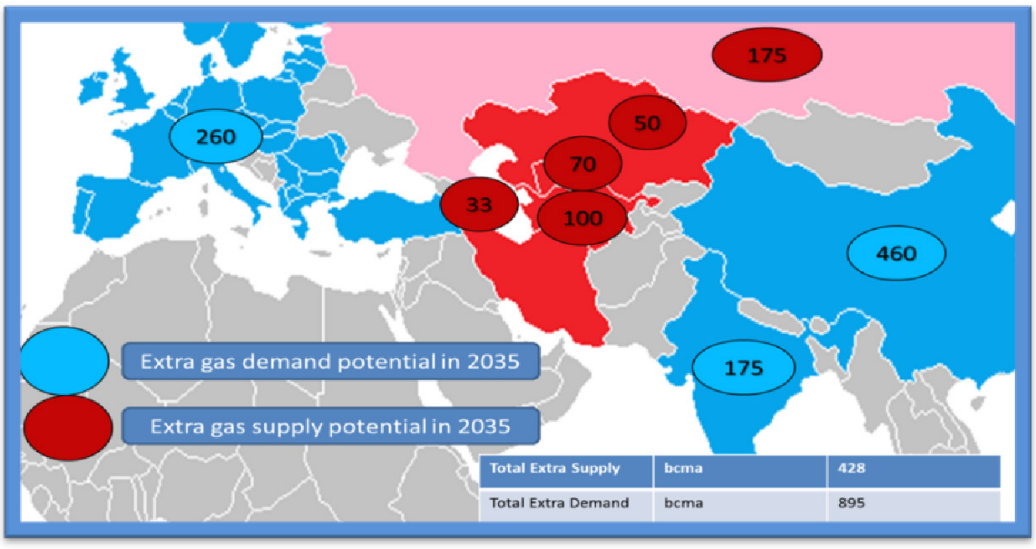
Subsequent to selecting gas for evaluating the supply-demand balances, the other most important factor that is going to determine the results of this struggle and the changes in the balances are the transportation capacities of the gas pipeline projects.

In addition to the suitable capacities of the pipelines, the tariff estimations, transportation costs and the market prices also have to be considered in analysis.

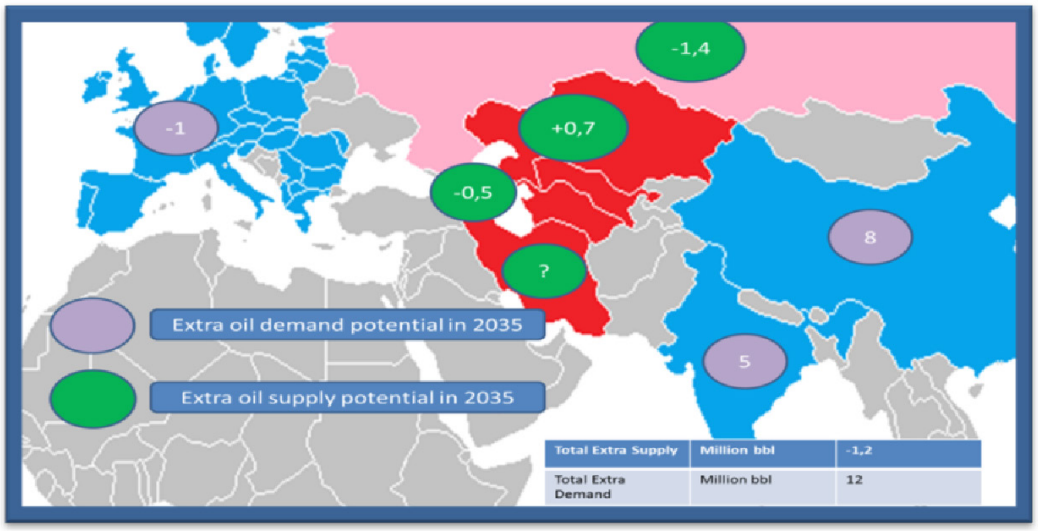
After checking the future available transportation capacities of pipelines in the region (as assuming future pipeline constructions will successfully be completed), Map 4 below is prepared, which is showing each suppliers' transport capacity available in 2035.

As a result of Map 4:

- Both China & India do not have enough planned gas transportation capacities in 2035 to meet their demands. Both countries can negotiate on having more supplies from Turkmenistan & Uzbekistan. For China, always there will be a possibility to have more gas from Kazakhstan and Russia, however, range of extra investments and gas prices are important.
- EU also will not have enough transportation capacities in 2035. New LNG projects, Azerbaijan – North Africa and Eastern Mediterranean gas resources will be important for EU's gas security future.
- Russia will have huge amount of extra supply transportation capacity and to EU (Assuming South Stream with 63 bcma will be agreed with EU and completed). However, it will be better for Russia to agree with China, develop new trans-



Map 2: 2035 Extra gas supplies and demands.



Map 3: 2035 Extra oil supplies and demands (unit: million bbl/d).

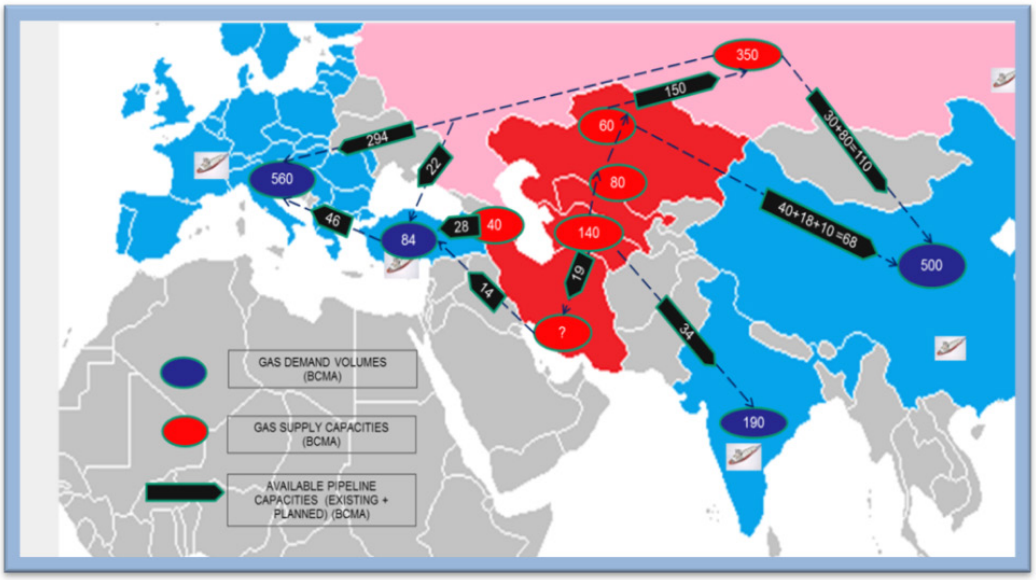
portation facilities and export her gas to huge demander southern neighbor (Also today's sanctions and political problems have to be taken into consideration).

- For Turkmenistan, it will be better to increase the transportation capacities to India and China and make extra exports to those countries. In the EU side; there are important political and economic problems waiting for solutions (economic problems will be more difficult to solve due to the pricing regulations of EU and high tariffs), that is why gas supply of Turkmenistan to EU does not seem to be logical.
- For Uzbekistan and Kazakhstan, both have to decrease gas exports to Russia and make better sale agreements with China and increase their pipeline capacities to China.
- Russia, have to secure her dominancy in all markets and continue to import Caspian gases to export to the other importers.

"In 2035, EU does not need extra oil supply so; main item for EU energy security is gas."

SUMMARY

Energy supply-demand balances in the Caspian Region are very important and should



Map 4: Available pipeline capacities in 2035 (including open volumes of existing lines + new pipelines, units are in bcma).

"Suitable capacities of the pipelines, the tariff estimations, transportation costs and the market prices also have to be considered in analysis."

be very carefully followed by the main players in the region. It is very important to analyze today's and future supply-demand potential scenarios to be able to absorb these balances correctly. In addition to the supply-demand potentials, transportation capacities in the region are also very important.

As a result of this study, it is observed that there are struggles and even more important struggles are expected to happen on gas supply balances between all energy players of Caspian Region. Pipeline capacities and politics are important determining key factors among these balances.

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"Pipeline capacities and politics are important determining key factors for the gas supply balances between all energy players of Caspian Region."

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

by Oğuzhan Akyener

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

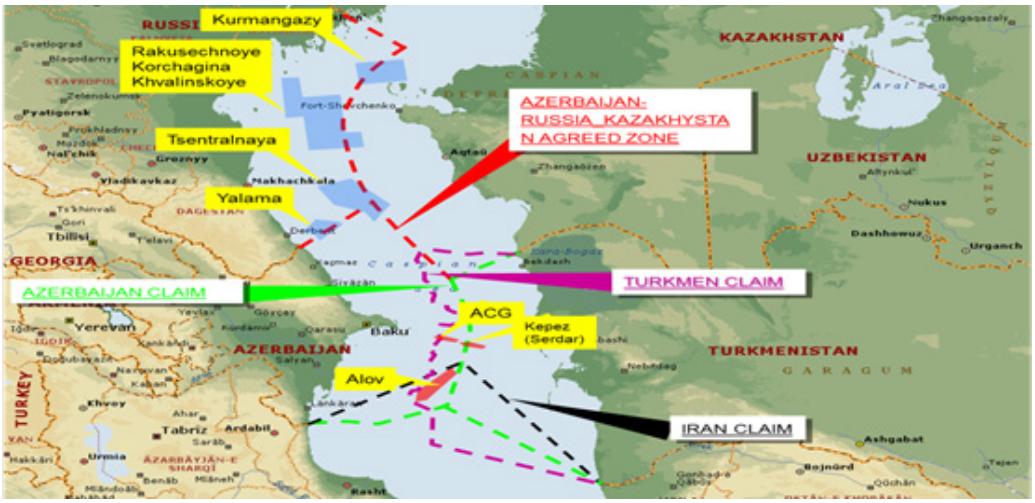
The delimitation of the economic zone between Caspian countries negatively affects the investment possibilities in the region. As seen from Map 1, Turkmenistan has disagreements with both Azerbaijan and Iran but Trans-Caspian pipeline project is affected directly by the conflicts between Azerbaijan and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

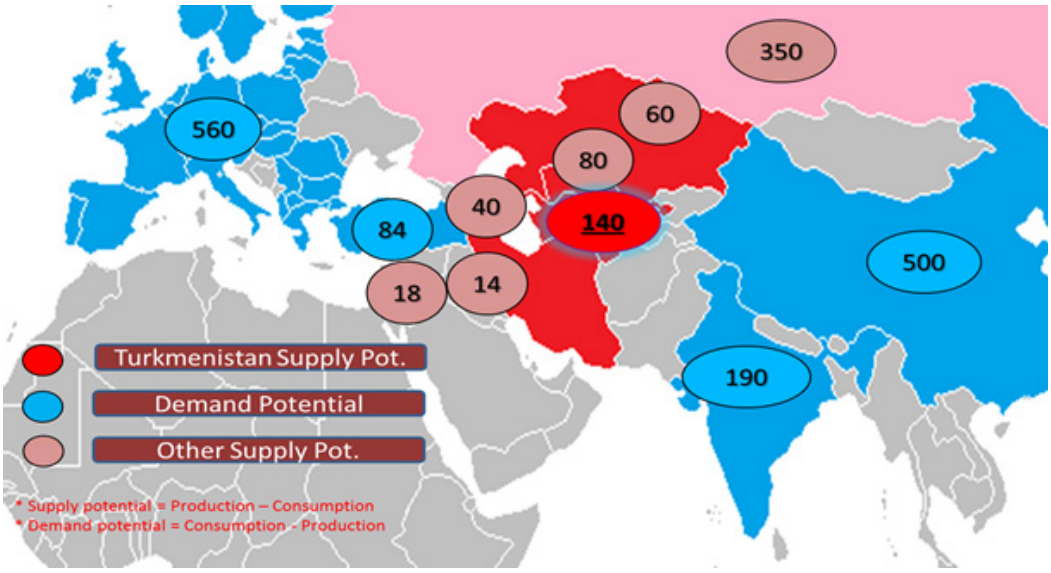
The owner of the project will probably be Turkmenistan and EU and WE support the project. This shows that both Turkmenistan can finance such an investment with her own resources and easily find credit from western funds. As a result, financial milestones do not contain any risks for the project.

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.

"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."

"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.

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.

	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.

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.

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

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."

NORTHERN IRAQ & TURKEY: FROM THE VIEW OF ENERGY POLITICS

by Oğuzhan Akyener and Burak Kayael

INTRODUCTION

Northern Iraq, with the popular name Kurdish Region, by having an estimated 40 billion bbl oil and 8 tcm gas reserves (according to OPEC reports), is a strategic region for Turkey. In addition to oil and gas reserves, other key factors such as historical background, terrorism, ethnical properties, existing disputes with the central Iraqi government, Iran and other countries' strategies in the region affect the positioning of Kurdish Regional Government (KRG) in Turkish foreign affairs.

"Northern Iraq, with the popular name Kurdish Region, by having an estimated 40 billion bbl oil and 8 tcm gas reserves (according to OPEC reports), is a strategic region for Turkey."

In the last decade, new Turkish strategy on improving the social, commercial and political relationships with the KRG made Turkey the most important strategic partner for the Kurds in Northern Iraq. Hence, by neglecting the illegal or unofficial revenue items, sale of oil and gas resources is the vital element for KRG budget. In addition to this fact, by surpassing the Central Iraqi Government (CIG), today the only way for KRG to sell her produced oil to the markets is going through Turkey, via the new built KRG pipeline or via trucks.

"In the last decade, new Turkish strategy on improving the social, commercial and political relationships with the KRG made Turkey the most important strategic partner for the Kurds in Northern Iraq."

As a result of the partnership, today, KRG is exporting around 600 mb/d oil from Ceyhan port of Turkey. Furthermore, many Turkish companies (mostly on construction and food services) are continuing their businesses in KRG governed areas. By estimating the increasing export volumes of oil and by completing the related infrastructures in the upcoming years, gas volumes will result in a stronger KRG and more solid relations with Turkey. However, situation of Syria, and other effects such as Iran's influence in the region, continuing disputes of KRG with CIG, terrorism and ethnical risks for Turkey may change and challenge all the scenarios that have been written. That is why all the items mentioned above also have to be taken into consideration while estimating the future partnerships and interactions between the partners.

As described above, oil and gas resources are the vital elements for KRG and her relations with Turkey. In addition, possible cheaper gas import potential for Turkey from KRG can be important in the future. That is why, in this study, current position of Turkey in Kurdistan will be specified and future possibilities will be analyzed after making an overview of KRG, Iraq and the oil and gas market in Kurdish Region.

HISTORICAL BACKGROUND

Iraq is more important to Turkey than being just a neighbor in the South East with a 331 km long border. It owns 150 billion barrels of proven oil reserves, which brought the rank of being the world's fifth oil rich country. This rank makes Iraq a high potential trading partner for Turkey. Although the relationships between two countries are undulating according to the due time, historical background, other strategic items and mutual economic advantages force both countries having strong interrelations.

It is a known fact that social and cultural relationships between Turks and Iraqis have been continuing since the Ottoman Empire conquered the Arabic Peninsula and ruled the area for over 400 years. Although, in the mid-1920's, newly founded Turkish Republic claimed that the area known as Kurdish Region today should be ruled by her because of historical, social and cultural relationships. League of Western Nations decided that this area to be ruled by Great Britain. Iraq gained its independency in 1932 and was ruled by monarchy and republican governments respectively. Kurdish society in Northern Iraq struggled for independency from Iraq but could only gathered autonomous administration after the first Gulf War. Today, Kurdish Regional Government, which is officially a

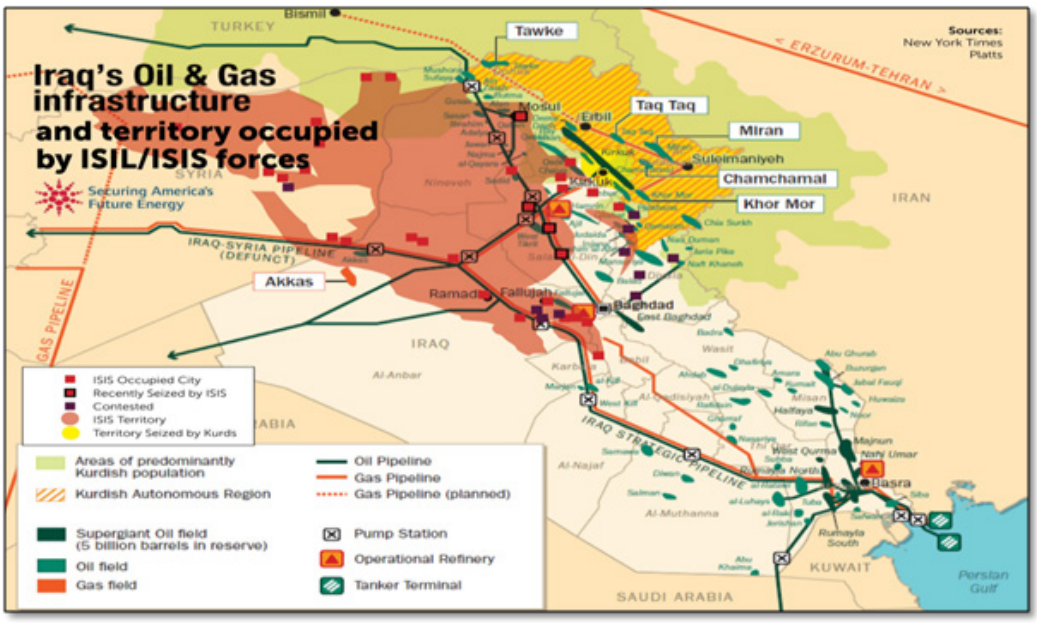
part of the federal government in Bagdad, governs the region and Kurds have some economic and political rights in Iraqi constitution. However, there are important conflicts with the two governments, which seem impossible to resolve. Main conflicts between the central government and the KRG are territorial conflicts (in Kirkuk, Ninawa, Salahaddin and Diyala Provinces) and the right of KRG to sign independent oil/gas exploration and export contracts. Hence, both of these two items are vitally and commercially strategic that makes it hard to find peaceful solutions.

CURRENT STATUS IN KURDISH REGION AND IRAQ

Iraq's unity is no more valid through its all legal territory. This is caused mainly by sectarian and/or ethnical differences among Iraqi people and impotency of CIG. After the fall of the dictator, Saddam Hussein, by US military intervention, an authority gap had occurred in Iraq. Certain terrorist groups like ISIS filled that gap in some regions. Today ISIS is controlling almost 1/4 of Iraq's legal territory and hold the control over important oil and gas reserves and facilities, including some of both KRG's and CIG's areas. Chaos environment created by ISIS deepened the abyss between KRG and CIG, especially for land and income shared between both parties. KRG seized some areas including Kirkuk city, whose legal status should be determined with a plebiscite according to Iraqi constitution, and started selling the oil that KRG had been producing without central government's approval.

As the Iraq's economy shrank 6.4% in 2014, oil and gas sales and the economy created by the sales become more vital for both KRG and the central government. Despite Iraq has 8.8% of world's proven oil reserves it has a share of only 3.8% worldwide production. As hydrocarbons are Iraq's first income source, oil and gas will be surely number one topic for Iraq-KRG relations especially with the fight against ISIS.

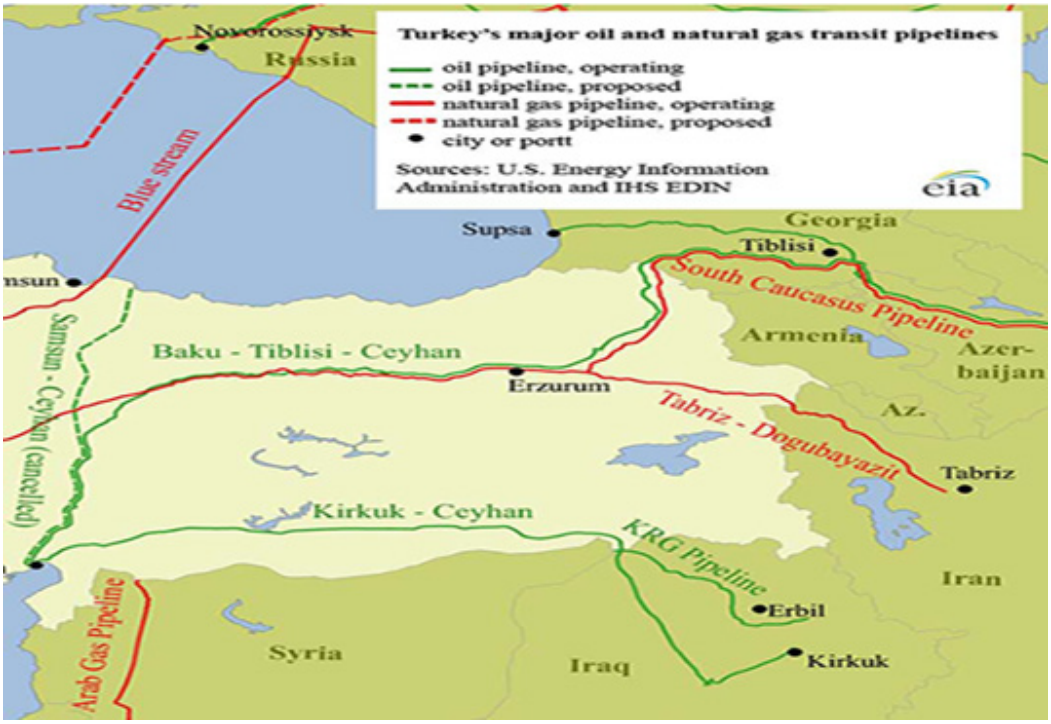
Already stretched relations between Iraq and KRG became more inextricable with the budget crisis. Despite KRG has 17% budget share according to Iraqi constitution, central Iraqi government is delaying or canceling the payments showing budgetary problems as reason. KRG announced that it will market its own production to compensate budget deficit. In addition, federal Iraqi government and KRG agreed on December 3 that KRG will supply 250,000 b/d oil to federal government and will facilitate the export of an additional 300,000 b/d from the fields in Kirkuk operated by the North Oil Company (NOC).



Map 1: Oil/gas fields and latest authority situation in Iraq.[1]

"Today, Kurdish Regional Government, which is officially a part of the federal government in Bagdad, governs the region and Kurds have some economic and political rights in Iraqi constitution."

"As the Iraq's economy shrank 6.4% in 2014, oil and gas sales and the economy created by the sales become more vital for both KRG and the central government."



Map 2: KRG & Kirkuk-Ceyhan pipelines.[2]

"As the Iraq's economy shrank 6.4% in 2014, oil and gas sales and the economy created by the sales become more vital for both KRG and the central government."

Federal government will share the 17% of the total crude sales budget in return. However, this agreement has not activated yet.

KRG started selling her produced oil directly to international markets in 2013 and almost stopped crude oil sales to SOMO (State Organization for Marketing of Oil/Iraqi NOC). According to KRG Ministry of Natural Resources' production reports, oil amount

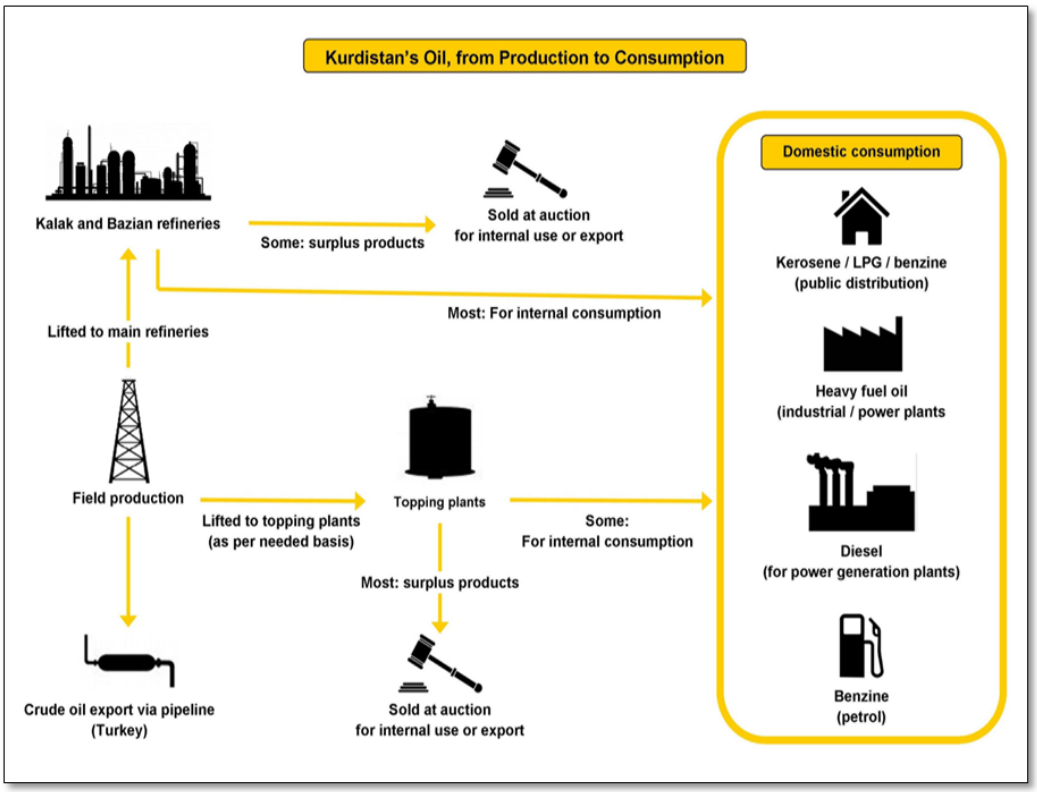


Figure 1: Oil production and marketing process in Kurdish Region.[3]

exported via SOMO decreased from 24.5 million barrels/year (2012) to 8.5 thousand (2013). The massive difference was directed to local refineries, KRG pipeline ending in Ceyhan/Turkey and trucks mainly heading to Turkey.

Iraqi central government sued KRG in USA and some other countries to cease crude oil trade without their control. Despite it had been ceased for a while, hence the KRG Ministry of Natural Resources taken their ships away from Texas and relinquished waiting for sale, the existing lawsuit in the due court in Texas naturally lapsed. However, KRG announced that there remains no legal obstacle to market and sell its own produced oil as the court in Texas dismissed the lawsuit of the central government. This misleading propaganda eased KRG's oil marketing process and paying its debts to IOCs acting in Kurdish Region.

According to some international news agencies, main customers for Kurdish oil are Israel and China. During April – September 2015, KRG exported around 500-600 thousand barrels of oil daily via KRG pipeline and Kirkuk-Ceyhan (Turkey section) pipeline system ending in Ceyhan/Turkey, as shown in Map 2. Pipeline performance, which is sometime halted by sabotages and hot-tap attempts, are the main causes that affect the export amount.

It will be beneficial to explain how oil industry is working in Kurdish Region before stepping into Turkey's energy politics in the area. KRG is using Production Sharing Contract (PSC) system to make agreements with International Oil Companies (IOC). Under PSC arrangements, the exploration and production (E&P) companies bear the financial risk until such time a discovery is made. If there is no discovery made, the E&P companies recover no cost. However, if a discovery is made and the field begins to produce, the company is permitted to use the money from produced oil to recover capital and operational expenditures, known as "Cost Oil". The remaining money is known as "Profit Oil", and is split between the government and the company, typically at a rate of about 85% for the government, 15% for the company. The government's share gets closer to 90% according to the due agreements in the Kurdish Region. This mechanism is summarized in the Figure 2.

According to KRG Ministry of Natural Resources, 50 billion barrels of (proved) oil (almost 1/3 of total Iraqi reserves) is available in their region. KRG is planning to boost daily production to 1 million barrel in the first step and to 2 million in 2019 with the help of 45 companies from 30 countries. Some of

"KRG is using Production Sharing Contract (PSC) system to make agreements with International Oil Companies (IOC). Under PSC arrangements, the exploration and production (E&P) companies bear the financial risk until such time a discovery is made."

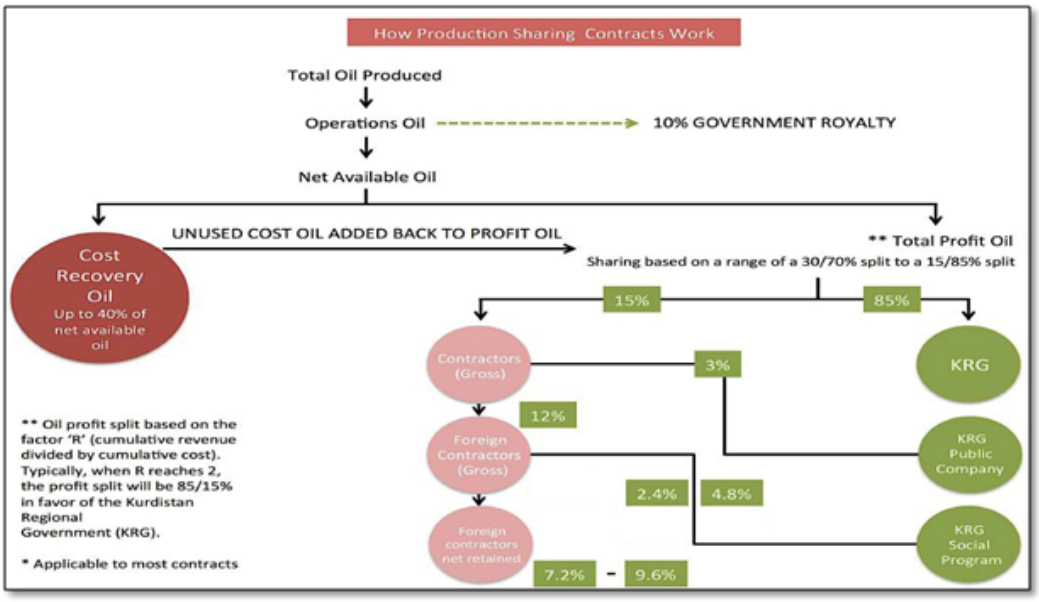


Figure 2: How PSCs work in Kurdish Region (85/15 percentage example).[3]

Oil Field	Discovery Time	Production (b/d)	Reserves (mmbbl)	Operator	Summary Info
Taq Taq	1961	150,000	541	TTOPCO	Production is planned to reach 200,000 b/d (26-46°API). Completed development program in field. Production is directed to Khurmala and then KRG pipeline.
Tawke	2006	160,000	680	DNO	Production is planned to reach 200,000 b/d (24-27°API). Production is directed to KRG pipeline.
Shaikan	2009	43,700	300	Gulf Keystone	Current production is carried with trucks to Habur (17-36°API). Production is planned to reach 250,000 b/d. Planned pipeline to connect field to KRG pipeline.
Demir Dagh	1960	11,000	200	ORYX	Production is planned to reach 40,000 b/d (23-40°API). Current production is transferred with trucks to Habur.
Kirkuk	1927	300,000	8,700	KAR & North Oil Co.	One of the supergiant oil fields in the world.
Khabbaz	1976	29,000	2,000	North Oil Co.	Reserve: 2,000 mmbo & 3 tcf. Production is directed to KRG pipeline. Field very close to Kirkuk city and has very high potential. Field is out of KRG's license system
Jambur	1929	36,000	3,000	North Oil Co.	Production is directed to KRG pipeline. Field very close to Kirkuk city and has very high potential. Field is out of KRG's license system
Khurmala	1950	150,000	N/A	KEPCO	Production is planned to reach 190,000 b/d (34°API). Production is directed to KRG pipeline. Field is 30 km away from Erbil city. Next to field there exists one of the main metering stations of KRG pipeline system (next one on Turkey-Kurdistan border). Gas pipeline is planned to connect field to 1,500 MW Erbil gas power station. Another 1,200 MW gas power station (Khurmala) is planned.
Sargala	2011	6,500	300	Western Zagros	Current production is transferred with trucks to Habur (32-43°API).
Ain Zalah	1936	2,000	100	North Oil Co.	Oil production is directed to Iraq-Turkey pipeline.
Chia Surkh	1903	N/A	250	Genel Energy	Current production is transferred with trucks to Khurmala.

Table 1: Current Kurdish Region oil production and due fields.

Gas Field	Discovery Time	Production (mmcf/d)	Reserves (bcf)	Operator	Summary Info
Khurmala	1950	100	N/A	KEPCO	One of the biggest oil/gas fields in Iraq. Gas production is planned to be directed to Erbil gas power station.
Jambur	1929	120	9,000	North Oil Co.	Gas production is directed to Taza gas power station (belongs to CIG).
Kirkuk	1927	N/A	2,700	KAR & North Oil Co.	One of the supergiant oil fields in the world.
Khor Mor	1928	340	N/A	Pearl Petroleum	Gas production is directed to Chemchemal gas power station.

Table 2: Current Kurdish Region gas production and due fields.

Type (Oil/ Gas)	Discovery Time	Est. Oil Reserves (mmbbl)	Est. Gas Reserves (bcf)	Operator	Summary Info
Peshkabir	2012	32	N/A	DNO	Not producing now.
Summail	2011	N/A	300	DNO	Minor gas production exists.
Simrit	2011	157	N/A	Hunt Oil	Not producing now.
Barda Rash	2009	247	N/A	Afren	Not producing now.
Benenan	2007	70	N/A	DNO	Not producing now.
Topkhana	2011	N/A	1,700	Repsol	Not producing now.
Pulkhana	1956	113	N/A	Turkish Energy Co.	Not producing now.
Shakal	2009	45	N/A	Gazprom Neft	Not producing now.
Kurdamir	2010	600	2,250	Repsol	Not producing now. Oil pipeline is planned to Chemchemal refinery and gas pipeline is planned to Bazian power plant.
Miran	2009	30	4,300	Genel Energy	Not producing now. One of the main gas resources for Turkey-KRG gas agreement.
Bina Bawi	2006	17	7,100	Genel Energy	Not producing now. One of the main gas resources for Turkey-KRG gas agreement.
Bijeel	2010	41	N/A	Kalegran	Not producing now.
Chiya Khere	2011	300	N/A	TAQA	Production is planned to start by mid-2016.
Sheikh Adi	2012	152	N/A	Gulf Keystone	Not producing now.
Ber Bahr	2013	23	N/A	Genel Energy	Not producing now.

Table 3: Current Kurdish Region discoveries.

the companies are mentioned as ExxonMobil (USA), Chevron (USA), Gazprom (Russia), Repsol (Spain), Total (France), Gulf Keystone (USA, UAE, and Kuwait), OMV (Austria), Marathon Oil (USA) Turkish Energy Company (Turkey) and Genel Energy (Turkey).

KURDISH REGION UPSTREAM MARKET OVERVIEW

In this chapter, before giving the current situation of Turkish – Kurdish Region relations and analyzing the future expectations, Kurdish Region upstream market is overviewed in the cases of existing oil & gas production fields, newly discovered fields and due infrastructures related to the market.

OIL PRODUCING FIELDS

From the basis of oil producing fields, current oil production in Kurdish Region and summary information about the due fields are given in Table 1.

GAS PRODUCING FIELDS

Current gas producing fields and summary information regarding the due fields are given in Table 2.

DISCOVERIES

Summary of the discoveries in Kurdish Region is presented on Table 3.

INFRASTRUCTURES

PIPELINES

Pipeline related information is listed in Table 4.

REFINERIES

Current and planned refinery capacities are given in Table 5.

POWER PLANTS

Outlook of power plants is displayed in Table 6.

E&P COMPANIES IN THE UPSTREAM MARKET OF KURDISH REGION

Giving the summary of the current ongoing activities of the E&P companies in the upstream market will be beneficial to understand the situation of the whole market. Below is the explanation of main ongoing upstream activities in Kurdistan:

- Gulf Keystone Petroleum Co. is willing to sell its 20% share in Akri-Bijeel Block. The potential of the block was tested by Bijeel-1 well with a combined flow test of two production intervals bringing ~3.700 b/d of 13°API.
- Tigris i Sverige Co. is looking for farm-in partners for their project in Salahaddin Province. The project is in exploration phase which includes 70 km 2D seismic

Name	From	To	Type (Oil/ Gas)	Situation (Active, Planned, Underconstr.)	Diameter	Capacity
ITP	Kirkuk/ Iraq	Ceyhan/ Turkey	Oil	Active in Turkey side, idle in Iraq	40” 46”	500,000 b/d 1,000,000 b/d
	Taq-Taq	Khurmala	Oil	Active	20”	200,000 b/d
KRG	Khurmala	Habur	Oil	Active	36”	720,000 b/d
	Kor-Mor	Chemchemal	Gas	Active	24”	350 mmscf/d
	Tawke	Habur	Oil	Active		100,000 b/d
	Khurmala	Habur	Gas	Planned	Indefinite	Indefinite
	Summail	Duhok Power Plant	Gas	Active		
	Khurmala	Erbil Power Plant	Gas	Planned	Indefinite	Indefinite

Table 4: Current Kurdish Region pipelines.

Name	Const. Time	Capacity
Erbil Refinery	1st Phase: 2009 2nd Phase: 2011 3rd Phase: 2014	185,000 b/d
Bazian Refinery	1st Phase: 2010 2nd Phase: 2012 3rd Phase: 2017	34,000 b/d (50,000 b/d to be added in 2017)
Tawke Refinery	N/A	5,000 b/d

Table 5: Current Kurdish Region refineries.

and one exploration well, which should be completed before September 2018. Tigris i Sverige Co. has 60% share while Salahaddin Governorate has 40%.

- Repsol SA informed KRG that it wants to relinquish from Piramagrun and Qala Dze blocks. Company completed 915 km and 139 km 2D seismic in the mentioned fields respectively. Repsol also drilled Binari Servan-1, a dry well in Qala Dze field. Other partners are Maersk Oil and KRG with 40% and 20% share respectively.
- Western Zagros is planning to transfer the operatorship of Garmian block to Gazprom Neft. The field consists of two oil fields, Sarqala and Mil Qasim. Western Zagros and Gazprom Neft have 40% share while KRG only has 20%.
- Chevron continues its 2D seismic project in Qara Dagh block, where the operations were suspended in August 2014.
- Gazprom Neft continues its 2D seismic studies in Halabja block where it has 80% share. The total amount of completed 2D seismic lines is expected to be around 870 km by the end of 2015. Gazprom Neft's partner is KRG with 20% share.
- Genel Energy announced that it acquired 36% share of OMV in Bina Bawi field for a price of total 150 million $. By doing so Genel Energy now has 80% share in the block while KRG has 20%.
- Genel Energy has completed 160 sq km 3D seismic in Ber Bahr block where the company spudded the exploration well Ber Bahr-1 in 2011 and explore oil. An appraisal well, Ber Bahr-2 is planned to be drilled in 2016. Genel Energy's partners are Gulf Keystone (40%) and KRG (20%).
- Genel Energy is planning to drill Ber Bahr-2 well to identify water-oil contact in the field. Ber Bahr-1 well was successfully tested and flowed 2.100 b/d 15°API oil and commerciality of field was proven. Gulf Keystone (40%) and KRG (20%) are accompanying Genel Energy in the field.
- Genel Energy sold its 20% share in Chia Surkh block and handed over operatorship to Petoil. Petoil is planning to spud Chia Surkh-12 appraisal well by Q1 2016. Genel Energy will keep 40% share in block with Petoil at 40% and the KRG at 20%.
- Hunt Oil is planning to spud appraisal well Jebel Simrit-5 in Q1 2016. The well is in Ain Sifni block. Afren PLC and KRG have both 20% share in the block.
- ExxonMobil has plugged and abandoned its well Maseif-1 in the Pirmam block. The well was spudded in August 2013 and continued until August 2014, when it was suspended. Well testing operations started in early 2015 and seemed to end negatively. ExxonMobil also temporarily suspended Al Qush-1 well in Al Qush block which was spudded in February 2014. ExxonMobil's partners are Turkish Energy Company (20%) and KRG (20%) in both blocks.
- Gazprom completed drilling two exploration wells, Shakal-2 and Shakal-3, in Shakal block, where the company holds 80% share. No test results released about

Name	Const. Time	Capacity
Erbil Gas Power Station	1st & 2nd Phase: 2008 3rd Phase: 2012	1,500 MW
Khurmala Gas Power Station	1st Phase: 2013 2nd Phase: 2015	1,000 MW
Suleimaniah Gas Power Station	1st Phase: 2010 2nd Phase: 2012 3rd Phase: 2014	1,500 MW
Duhok Gas Power Station	1st Phase: 2010 2nd Phase: 2013 3rd Phase: 2016	1,000 (500 MW to be added in 2016)

Table 6: Current Kurdish Region power plants.

the mentioned wells. The other shareholder in block is KRG with 20% share.

- Korea National Oil Corp. successfully completed and tested its well Massoyi-1 in Sangaw South block, where they have 32% share. Company is planning to spud a new well Massoyi-2.
- Marathon Oil has completed its drilling activity in Mirawa-2 well and temporarily suspended the well to produce in the future. Company also tested Mirawa-1 well in 2013 and the result was positive with 11,000 b/d production. Marathon has 45% of block while Total has 35% and KRG has 20% share.
- Oil Search Ltd. has abandoned its two appraisal wells Taza-2 and Taza-3 because of excessive water flow during well test. Company suspended Taza-1ST2 well as a possible oil producer in 2013. Il Search has 60% share with partners Total (20%) and KRG (20%).
- Hunt Oil temporarily suspended well Maqlub-1 for well testing. Logging, cuttings and gas data has shown hydrocarbon presence. Afren PLC and KRG have both 20% share in the block.
- Kalegran Ltd., which is subsidiary of MOL, finished testing of appraisal well Bijeel-4 and Bijeel-6 in Akri-Bijeel block. Block wells ended with non-movable hydrocarbons in Jurassic age formations. The field was known with discovery in Bijeel-1 well with around 3,000 b/d production. Company continues drilling well Bijeel-10, another appraisal well in the field.
- Western Zagras has suspended well testing operation in Hasira-1 well existing in Garmian block. The flow test was ended due to influx of reservoir formation debris. The preliminary test results were showing 40°API without H2S.
- DNO is planning to drill an appraisal well Peshkabir-2 in Tawke block. Peshkabir-1 well was proven to have oil in 2012. DNO, Genel Energy and KRG have 55%, 25% and 20% share respectively.
- OP Hawler Kurdistan Ltd. is planning to drill appraisal well Zey Gawra-2 in Hawler block. Company announced a successful oil discovery in Zey Gawra-1 well. The well was flowed at full open choke and recovered around 4.800 b/d oil. OP Hawler has 65% share in Hawler block while KRG has 20% and Korea NOC has 15%.
- Abu Dhabi National Energy Co (TAQA) announced test results from Chiya Kere-8 well at Atrush block. Test results show 4.200 b/d 24°API oil and 4.200 b/d 26°API oil from two different formations. TAQA has 39,9% share while KRG, General Exploration Partners and Marathon Oil have 25%, 20,1% and 15% respectively.
- DNO doubles its production capacity in Tawke field by building a 44 km long 24" pipeline ending in Fishkhabour export facility. Field produced ~160,000 b/d oil in 2015, while it was ~90,000 b/d

in 2014.

- Gulf Keystone announced that oil production capacity in Shaikan field has increased up to 40,000 b/d and total commercial production has exceeded 15 mmbo. Company plans to increase field's production capacity to 150,000 b/d by 2016 and 250,000 b/d by 2018. Gulf Keystone is also planning to commence sour gas injection project in the field.
- TTOPCO completed development-drilling program at Taq Taq field. Taq Taq 14-28 (total 15 wells) were drilled and completed between 2011 and 2015. The oil production increased up to 150,000 b/d. The structure was proven to bear oil in 1978 by INOC. The field was awarded to Genel Energy in 2002 and Addax Petroleum farmed in to PSC and formed TTOPCO.

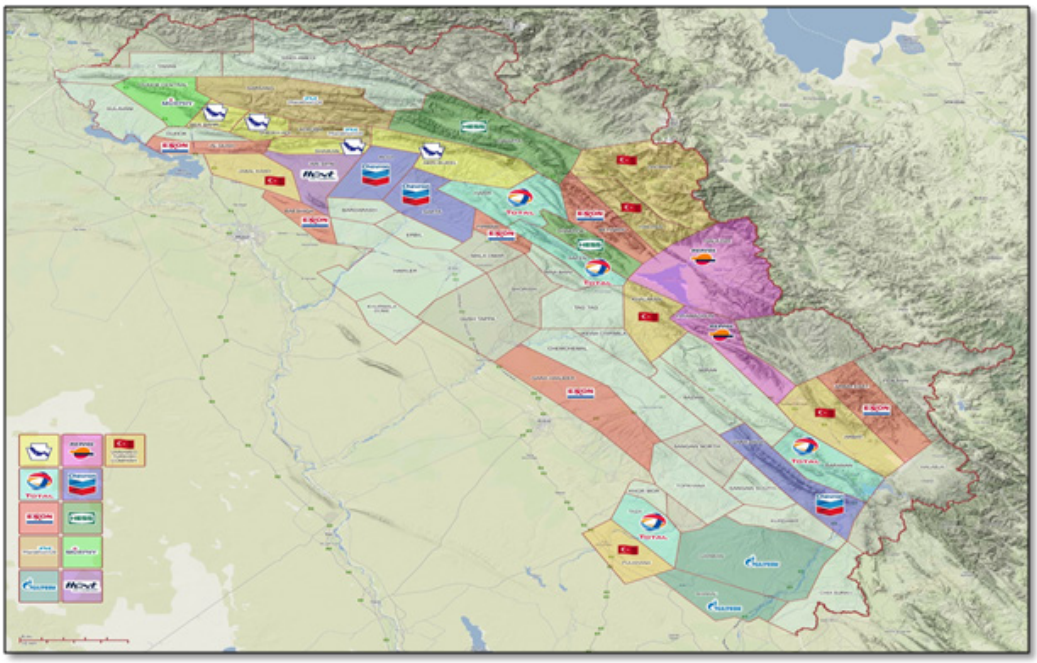
TURKEY'S POSITION IN KURDISH REGION

Initially, it has to be mentioned that, Turkey does not have a stable political position, from the window of CIG, for Kurdish Region in the last decade. Iraq's political unity is an important strategic item for Turkish foreign politics. That is why; Turkey holds her position to encourage CIG's Iraq unity policies. As a result of this position, Turkey states that she will not let KRG to be split from the central government. However, on the other side, with her permission of the KRG's oil export route through her boundaries, without the permission of CIG, Turkey make KRG to gain commercial independency and give her an opportunity to conciliate CIG.

By the help of such permission, Turkey took advantage of KRG to pacify terrorist sources in Kurdish Region and continued the Kurdish evolution processes in Turkey. In addition, Turkey also increased her commercial interactions with Kurdish Region, a kind of gain – gain situation.

From the sight of oil markets, Turkish National Oil Company (TPAO) has four assets in the CIG's territories, Turkish Energy Ministry (TEM) tried to follow a gingerly route in her steps in Kurdish Region (blacklisting policy for the E&P companies working in Kurdish Region is continuing to be applied by the central government). However, discourses of the authoritative of TEM were contradictory by comparing the governmental statements. TEM assured the central government all the time and mentioned she would not let KRG to follow independent strategies without central government approval but the actions tak-

"Iraq's political unity is an important strategic item for Turkish foreign politics. That is why; Turkey holds her position to encourage CIG's Iraq unity policies."



Map 3: Major oil companies and licenses in Kurdish Region (Turkish flag refers to TEC).[4]

en and the results were different. As a result of these conflicts, TPAO was dropped out after winning the tender of block 9, where Kuwait Energy was awarded to explore the oil and is going to start oil production soon. In addition, Turkish Energy Company (TEC)'s attempts in the Kurdish Region resulted with unsuccessful gains without any privileges as just exploration blocks open to any company.

In the other way, two Turkish nongovernmental companies Genel Energy and Petoil have also existed in the region since early 2000's. Then, state owned TEC also bought some licenses in 2012 and 2013. TEC has thirteen, Genel Energy has seven, and Petoil has one PSC partnerships in Kurdish Region.

Genel Energy was the first company to invest in Kurdish Region. They started working in Kurdish Region by signing PSC for Taq Taq field in 2002. Petoil followed them by entering the region in 2003. Both used the flexibility of being private companies for signing contracts with KRG while TEM is still being confused about governmental investing in upstream market Kurdish Region. In 2013, Turkish Energy Company signed seven PSCs to consolidate good relations between Turkey and KRG. Following that, Turkish Energy Company farmed in to six ExxonMobil (exploration) licenses, increasing its share and partnership in Kurdish Region's energy industry. Turkish flag in Map 3 shows the current EPSA (exploration & production) licenses of TEC in Kurdish Region.

"Genel Energy was the first company to invest in Kurdish Region. They started working in Kurdish Region by signing PSC for Taq Taq field in 2002. Petoil followed them by entering the region in 2003."

Beyond these oil/gas licenses, Turkey has a very important role in Kurdish Region. The newly build pipeline (in 2013) from Kurdistan to Turkey, also involving in the disputes on intra-Iraq politics, is the main role player in oil exports to international markets and buyers. This pipeline, with a capacity of 720 mb/d & 36" diameter, which is planned to be expanded up to 1 million b/d capacity, is carrying over 600 thousand barrels of oil daily to Ceyhan and fueling Kurdish Region's economy continuously. As legal obstructions around the world are dismissed, it is now easier and more suitable for KRG to build an independent economy based on hydrocarbons. Turkey will be surely one of KRG's prior customers for oil and possible future gas exports.

Another major milestone in Turkey-Kurdish Region relationship is "Turkey-KRG Gas Sales Agreement", which was signed in November 2013. According to this agreement; KRG wishes to provide Turkey with an initial 4 bcma of gas in 2018 and this volume is estimated to extend up to 10 bcma by 2020. However, in order to make coherent analysis, Kurdish Region consumption, gas production profile, and central government's role on doability of such an export policy are the key determining factors. By the way, currently while Iraq is importing an average 8 bcma gas from Iran -with such a high price of 400 USD/1000 m^3- and this volume is agreed to be increased up to 11.5 bcma, it will not be politically and commercially possible to supply such gas volumes from Kurdish Region to Turkey, by a cheap price. Secondly, gas export to Turkey can only be possible if only Genel Energy's planned gas production (from Miran, Dohuk and Bina Bawi fields, which are undeveloped) and due infrastructures are successfully completed. However, in the near future this option also seems to be difficult to compromise under current conditions because of increasing political instability in Kurdistan, ISIS effect, low oil prices, conflicts with CIG, and due gas fields being undeveloped. 2 – 4 bcma of gas export to Turkey may only be possible after Turkey and KRG overcomes difficult milestones. And this volume is expected to be maximum 4 bcma after 2020's, which will be able to be sold in Turkish gas market, but not to be exported to EU.

From another view, for all companies, it may be more economic and politically encouraged option to produce electricity from the produced gas, if new power plants constructed in Kurdistan, and meet the huge electricity demand in Iraq.

Moreover, Map 4 shows the gas fields and due infrastructures of Kurdish Region. As it can be observed from Map 4, in the current situation, produced gas in Kurdish Region is utilized in Erbil, Dohuk and Chemchemal power plants. Associated gas produced in Kirkuk field is transported to other power plants in the territories of CIG. One other clue that

can be extracted from the map is that KRG is importing diesel to produce electricity. This situation states that KRG will upgrade the power plant as a gas utilizing power plant only and her gas demand will naturally increase. In addition to this clue, while average 1/6 of Erbil's electricity is supplied by these power plants and other portion is produced by personal diesel generators, future gas consumption of Kurdish Region is expected to be more than the existing estimations. This fact may be able to result in high gas consumption in Kurdish Region and no extra gas to supply in the future.

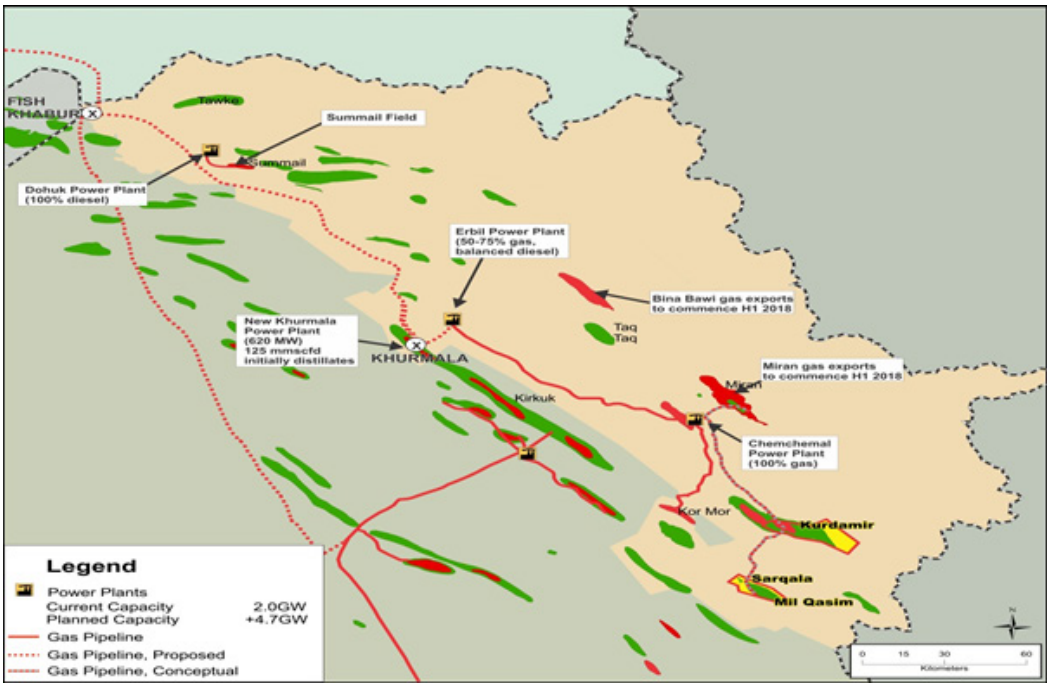
FUTURE POSSIBILITIES & ANALYSIS

As it can be understood from the information presented above, Turkey has changed the game rules by reverting her approach to the Kurdish Region. KRG frankly knows that Turkey is her only chance to be a part of the international energy market, which exactly means commercial independence of her. Global and regional political circumstances allow KRG to act independently to sell her resources and build an independent economy. Turkey stepped forward using her political and economic power and developed positive relations with KRG. This can be accepted as an advantage for the Turkish cabinet for future ventures.

Today, upstream market in Kurdish Region is suffering due to increasing political instability, ISIS effect, low oil prices, and the conflicts with the central government. Dropping oil prices halts upstream activities in the region, which ends with economic downfall for KRG. This may be the best time to make more upstream investments especially in the existing producing fields in the region (not in the unexplored areas). With such ventures, Turkey, with her own governmental structures, will become both the supplier and the demander in the game. Only with some private companies (like Genel Energy) which only have economic concerns for the investments, will not manage and rule the interchangeable games in Kurdish Region.

In addition to the upstream market, it may be a good choice to make investment in gas power plants in Kurdish Region as far as political and economic considerations are made for Turkish governmental and private companies. Hence, if gas production is expected to increase in the region and there is a lack of

"Produced gas in Kurdish Region is utilized in Erbil, Dohuk and Chemchemal power plants. Associated gas produced in Kirkuk field is transported to other power plants in the territories of CIG."



Map 4: Kurdish Region gas reserves.[5]

electricity production to meet the demand, such investments will be economic and encouraged by both KRG and CIG. In the worst case, Turkey shall also use her construction experience in the mid or downstream facilities in Kurdish Region. KRG plans to build 2 new refineries and 3 new gas power plants in the near future (within 5 years).

"Turkey shall also use her construction experience in the mid or downstream facilities in Kurdish Region as KRG plans to build 2 new refineries and 3 new gas power plants in the near future (within 5 years)."

All such new commercial ventures will increase the influence of Turkey in the region. And when these investments are in the energy market, they will be vital for the due governments.

In addition to the activities in Kurdish Region, Turkey also has to increase her commercial ventures in central Iraq. Besides, as her priority she has to maintain and support the political unity of Iraq. But a question has to be asked: "How can it be possible to be an active player in both central Iraq and Kurdish Region?". The answer seems cloudy! Turkey has to follow a strategic and diplomatic role in such relationships. By the way she also has to protect the rights of the Turkmen groups in Northern Iraq. The equation has many unknowns. But the new Turkey, who plans to be prevalent in the region, has to find the solution.

Most of these new commercial ventures in central Iraq will have to be in the oil and gas market. This means to be able to be accepted as an influential investor in Iraqi market, in addition to our relations with Kurdish Region, Turkey's performance in the current ongoing projects will be an important determiner. That is why; TPAO has to successfully complete her promises in the projects where she acts as the operator. Otherwise, relations might close the doors for future investments.

Furthermore, while giving the expectations about the pipeline politics in the region, today's one of the most popular paranoiac opinion, which is "Kurdish corridor through Syria", has to be clarified. It is thought that all the turbulence in Syria is for the Kurdish oil to be able to flow to Mediterranean through the northern Syria. This idea can be accepted as delusional since Kurdistan Region does not initially have such huge volumes of oil export potential. Then, there are not enough investors and a good environment to make rapid developments. In addition, oil has to be transported through the safest and economic route, which is the already existing KRG Pipeline through Turkey. KRG's unofficial support on the Kurdish groups in Syria has to be evaluated from the sight of regional politics. Of course, Barzani in the midterm might have dreamed about being the leader of the huge Kurdistan, including the Northern Syria, while the oil prices are high. However, he must have understood the international balances in the region are a bit different than it may seem. Therefore, a Kurdish government had better have the support of Turkish government to be able to survive among the wolves but on the other hand, Kurds should understand that Turkey would never allow a Kurdish Corridor to the Mediterranean. In addition to the greater Kurdish utopia, Kurdish Region's energy resources will not be enough to feed the utopic country. As a popular Turkish proverb: "There is only one gray donkey for the nine hungry wolves".

As a result, KRG needs Turkey and so Turkey, as the inheritor and the ex-governor of the region, has to increase her influence in the region, by mostly taking place in new ventures in the so-called energy games.

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KEY FACTORS OF RECENT CHANGES IN CRUDE OIL PRICES

by Serdar Gürüzümcü and Mehmet Apaydın

INTRODUCTION

As a well-known fact by millions of people, more than hundred and fifty years ago, Colonel Drake in Titusville, Pennsylvania did the first oil discovery. From 1859 to 2015, the use of oil and its market concept has dramatically changed by producers and consumers. First oligopoly market initiatives can be explained by the dissolution of the Standard Oil with the accusation of illegal monopoly in 1911. Dissolution served as an opportunity to the rise of the multi-national oil companies. Until the 1970s, these large multi-national companies administrated crude oil prices. Then, in 1973, the Arab-Israeli War began and the Organization of Petroleum Exporter Countries (OPEC) had gained the control over crude oil prices. OPEC brought the market-related pricing system, and still, it is widely used as the main crude oil pricing mechanism. With the developments in prices and markets, crude oil trading has become globally available for the access of traders at any time.

"In 1973, the Arab-Israeli War began and the Organization of Petroleum Exporter Countries (OPEC) had gained the control over crude oil prices."

Current oil market is more complex, market fundamentals are never known with certainty and physical dimension of oil has become important in pricing associated with static reserve index (Fattouh, B., 2011). There are many factors that can be effective on daily oil prices (benchmark prices) in different time periods. In this analysis, economic, technological, and political factors were analyzed with the current market conditions.

ECONOMIC FACTORS

U.S. FEDERAL RESERVE BANK (FED) POLICY

The end of U.S. FED quantitative easing policy and thus, the U.S Dollar being powerful with the expectation of subsequent interest rate increase explicitly play an important role on oil price decline, which means that there will be higher interest rates in U.S and that will cause a powerful U.S Dollar. There is a stubborn fact that is an inverse proportion between being powerful U.S. Dollar Index and oil price decline as shown in Figure 1 and 2 below. Accordingly, it can be said that powerful U.S Dollar Index forms main oil price decline trend and vice versa. The reasons behind oil price decline is almost the same as the reasons for commodity price decline, which result from pricing of commodity and oil price by U.S Dollar. Such pricing forces commodity and oil prices to decline while U.S Dollar Index is getting powerful, which can be easily seen in Figure 3. The other reason is that the expectation of U.S Dollar in all over the world return to U.S to gain more interest, which leads the expectation that world growth and investment rates decline in the following years, so oil need and demand are decreasing. Similarly, the beginning of the FED quantitative easy policy in 2008 led U.S Dollar to be weaker with expectation of low interest rate and thus, oil price declines.

SUPPLY AND DEMAND RELATED FACTORS

On a global scale, supply and demand relation is the main factor to shift oil price. The declination of production rates and the failure of new discoveries increased oil price in the history, and as opposed to this, market currently encounters oversupply of oil and oil price has been accelerating downward since the unconventional oil phenomena emerged. Especially, the Americans' great endeavor and success introduced the shale oil production from shale reservoirs by using new techniques in drilling. Due to high flow rate of shale oil into market, oil price has been declining since 2014. For instance, domestic crude oil production of the U.S. was about 4.6 million barrels per day in 2008, and it jumped to 9.2 million barrels per day in 2015, which is doubled in 7 years. As a result of this extraordinary increase in oil supply, U.S. became the largest crude oil producer in the world in 2014.

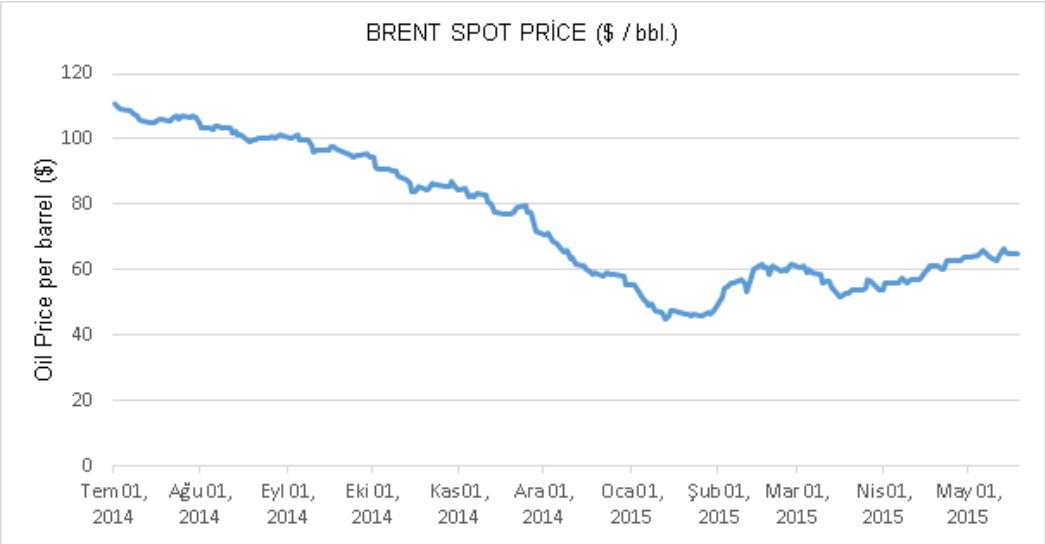

Figure 1: Brent Spot Price Change between July 2014 and May 2015 (Energy Information Administration).

"The market currently encounters oversupply of oil and oil price has been accelerating downward due to high flow rate of shale oil into market, oil price has been declining since 2014."

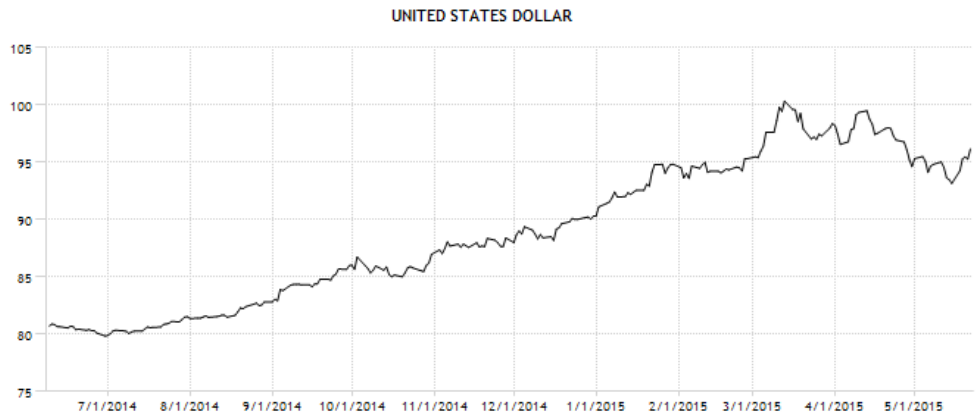

Figure 2: U.S Dollar Index Change versus Euro, Yen, British Pound, Canadian Dollar, Swiss Franc, Swedish Krona between July 2014 and May 2015.

OPEC has also increased its production rates to struggle against the American oil supply. Therefore, with the oversupply, benchmark oil prices quickly dipped at $35 / bbl. at the end of 2015.

Another point that shifts the supply-demand balance is the seasonal consumption rates. Residential and industrial oil use rises in cold periods of the year (during winter) and falls in summer. In addition, winter conditions are harder to pump out oil. That brings a huge oil consumption difference between winter and summer, which will volatile the market, too.

TECHNOLOGICAL INNOVATION AND CHANGE IN COSTS

The most important approach for the petroleum economics is the investment feasibility. It is roughly calculated by comparing the estimated total production multiplied by the unit oil price versus total costs including the time value of invested amount. Recent technological developments become competitive to make costly operations cheaper.

Shale oil and rock oil production via unconventional methods made substantial changes in the industry. Horizontal drilling and hy-

"Shale oil and rock oil production via unconventional methods made substantial changes in the industry."

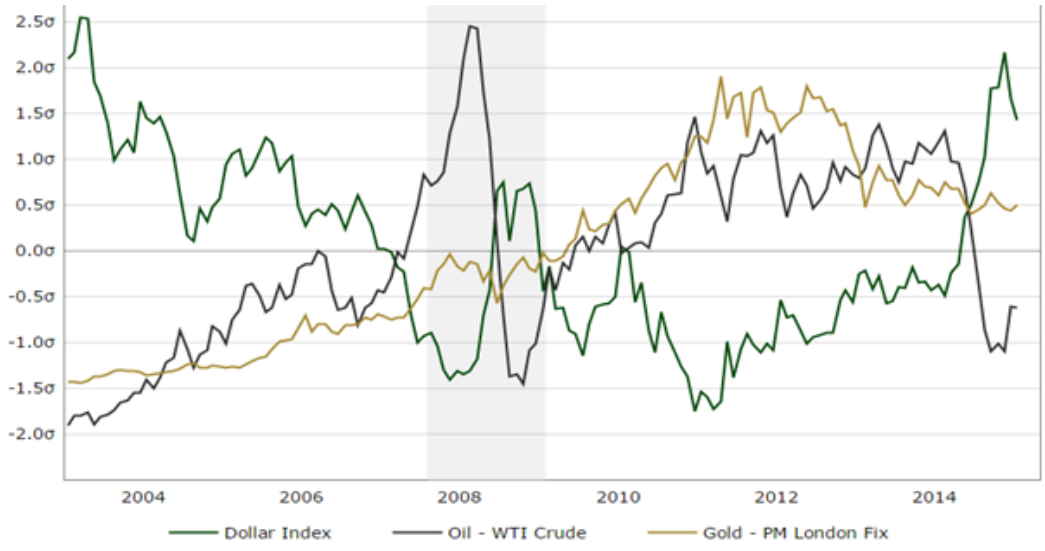

Figure-3: Brent Price versus U.S Dollar Index between 2004 and May 2014.

"Horizontal drilling and hydraulic fracturing technologies created a new era in upstream industry."

draulic fracturing technologies created a new era in upstream industry. Especially, the U.S. and Canada enhanced their domestic oil production by using new methods. As mentioned before, from 2008 to 2015, US domestic oil production is doubled, mostly supply came from the unconventional resources due to decrease in operational costs.

For example, the North Dakota Bakken Field drilling and well completion costs were accounted for $13 million in 2012, as a result of technological innovations and competition, it fell down to $7 million at the end of the 4Q of 2014. Decrease in costs increased the attractiveness of industry, even though the benchmark prices went down. In reality, cumulative costs of unconventional wells are relative higher than conventional wells, but it provides higher rate of return and shortens the payback period due to high initial production rates.

"In reality, cumulative costs of unconventional wells are relative higher than conventional wells, but it provides higher rate of return and shortens the payback period due to high initial production rates."

POLITICAL FACTORS (SUPPLY SECURITY)

Majority of oil producer and exporter countries were formed in a strategical area, in which internal and external problems obstruct oil supply, especially in the Middle Eastern Region, where supply security has become a

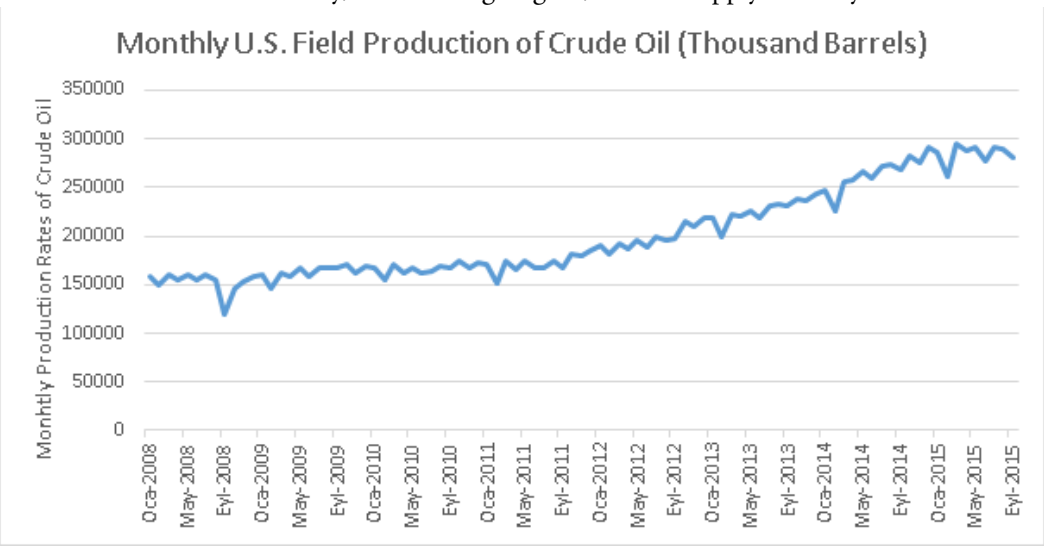

Figure 4: U.S. Field Production of Crude Oil (thousand barrels) between 2008 and 2015 (monthly), (Source: Energy Information Administration).

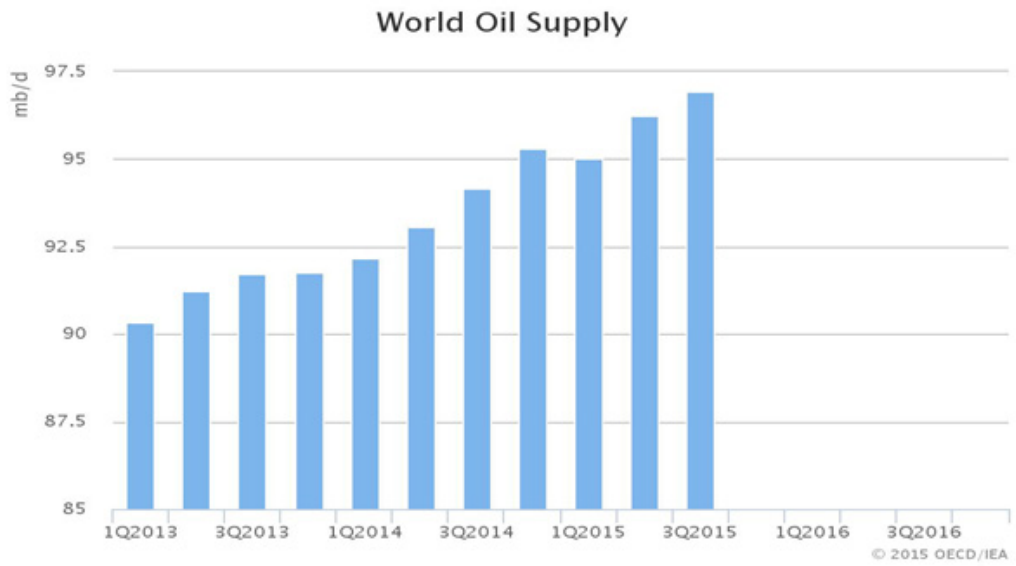

Figure 5: World Daily Oil Supply between the 1Q 2013 and 3Q 2015 (MM bbl. /day). (Source: International Energy Agency).

global threat. The existence of terrorism, lack of authority, religious and denominational issues hamper oil production and directly increase oil prices in both short-term and long-term. These kinds of problems were observed many times in history as listed below:

- Dissolution of Standard Oil
- World War I
- Great Depression Era
- World War II
- 1973 Arab – Israeli War and market shortage
- OPEC Price Control Mechanism between 1973 and 1985
- Iran Islamic Revolution
- 1985 Saudi Oil Supply against the OPEC system
- Iraq – Iran war
- Invasion of Iraq and Afghanistan after 11/9/2001
- 2008 Global Economic Crisis (Domino Effect)
- Arab Spring
- Russian attacks on Ukraine
- Threats of ISIS and Boko – Haram on refineries
- Denominational civil war of Yemen (It turned to Saudi – Iran War)

These problems stimulate high oil price and lack of supply. Currently market faces oversupply, but this will end up soon because shale oil production will reach its plateau level and then sharp decline might occur. American oil supply will decrease up to 400,000 bbl. / day at the end of the first half of 2016, which is mentioned in global reports. Additionally, some projections (including OPEC) claim that oil price will rise up to $70 bbl. in 2017.

CONCLUSION

Due to FED policies, the United States Dollar raised in value. Since oil transactions are done with dollar, oil price dropped.

The growth rates of developing economies' has been declining due to FED & regional monetary policies. As a result of this, consumption of oil (demand) started to decrease, which negatively impacted oil price.

Shale oil boom and new field discoveries stimulated low oil prices.

OPEC and US competition decreased oil prices and narrowed oil profits.

Escalating tensions between Saudi Arabia and Iran might change the movement of oil future market and this might be concluded with upward acceleration of benchmark prices.

"The existence of terrorism, lack of authority, religious and denominational issues hamper oil production and directly increase oil prices in both short-term and long-term."

"Due to FED policies, the United States Dollar raised in value. Since oil transactions are done with dollar, oil price dropped."

On the other hand, if the competition between the US and OPEC continues, market will encounter oil prices less than $35 per barrel in the following months associated with oversupply.

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TURKEY'S ENERGY INVESTMENTS – PROJECTS - POLICIES: AN OVERVIEW UNDER DECISION MAKING APPROACH

by Ahmet Bahadır Şimşek

"By advances in technology, economical usage of alternative energy resources has been a glimmer of hope for energy-strapped countries. The overall interest for energy systems, producing energy just with the costs of installation and maintenance (without incurred resource costs), is increasing."

"Turkey joined officially by signing Kyoto Protocol and accepted the objectives on February 17, 2009. Protocol aims to keep a balance of the levels of greenhouse gas concentration in the atmosphere."

INTRODUCTION

One of the never-ending discussion topics in today's modern time is doubtlessly energy supply. Energy gained even more value with the industrial revolution; nowadays it maintains its importance as an element of strategic balance. Although energy resources are not dispersed homogeneously of the earth's surface, global demand for energy supplies is constantly increasing that allows energy to be used as a strategic weapon. Countries, which are dependent on foreign energy, are on the target of this weapon. Unfortunately, Turkey is one of those countries.

By advances in technology, economical usage of alternative energy resources has been a glimmer of hope for energy-strapped countries. The overall interest for energy systems, producing energy just with the costs of installation and maintenance (without incurred resource costs), is increasing. Considering the fossil energy resource limits, the importance of renewable energy sources can be better understood.

Turkey is not rich in fossil energy resources but has high potential for renewable energy sources. On the other hand, it has a geopolitical location that serves as a bridge between producer and consumer countries in terms of fossil energy resource transmission. It currently hosts various in-use and ongoing oil and natural gas pipeline projects. Turkey holds a unique position between Europe and Asia that has been playing a critical role for centuries. It should eliminate dependency on foreign energy for several reasons, for instance, survival in energy sector, increasing the power in energy domain, becoming a regional dominator.

Turkey should establish stable policies and develop new investments and projects to provide the low-cost energy. That way, Turkey will have the chance to thrive, to reduce foreign dependence, to get rid of political pressure, and to protect its strategic importance. For these reasons, Turkey currently faces a multi-objective-decision-making-problem.

Cases that deal with many conflicting objectives to reach the most appropriate decision-making are described as multi objective decision problems. For the solution of these problems, at first, objectives are determined, and then alternatives that serve those objectives are evaluated. The conflicting objectives are balanced by a set of alternative solutions that maximize total benefits.

Assessing the energy investments, projects and policies with decision-making methodologies can be useful for revealing and interpreting the energy dynamics of Turkey.

ENERGY OBJECTIVES OF TURKEY

KYOTO PROTOCOL:

It is an international agreement that sets targets to industrialized countries to reduce emissions of gases causing global warming. On February 17, 2009, Turkey joined officially by signing this protocol and accepted the objectives. Protocol aims to keep a balance of the levels of greenhouse gas concentration in the atmosphere so that they will not affect the climate. In this context, it is crucial to take control of environmentally harmful gas emissions, to reduce them if possible, and to provide the energy needs from renewable energy sources in Turkey.

European Union:

Three main objectives guide the EU's energy policy. These objectives are to contribute to the competitiveness of the community, to ensure security of energy supply and to contribute to environmental protection on the sustainable development basis. In "Energy

2020 Strategy" that is a document published on 10 November 2010, the EU declared priorities as energy efficiency, integrated energy market, strengthened consumers, consumer rights to choose the supplier, being a leader in energy technology and innovation, strengthened external dimension of energy market. In this context, Turkey, which strives for being a member of the Union, should also adapt these priorities and objectives.

ENERGY CHAPTER:

The opening of the energy chapter for Turkey attempts to fulfill the necessary investments and regulations. In a part of the Turkey's 2015 Progress Report that deals with the energy, some issues are stated as urgent. These are creating a competitive market in natural gas sector working with the EU acquis, implementation of transparent and cost-based pricing system in gas and electricity market, creating a legal framework necessary for the planning and installation of nuclear plants and compliance with EU legislation in the field of nuclear energy.

ENERGY SUPPLY SECURITY:

Another important issue in energy is the supply security. Supply security is a multidimensional concept that includes obtaining low-cost energy, obtaining from sustainable and various sources, meeting variable demand structure and transportation safety. The importance of energy supply security is understood more clearly with the energy crisis. The fall of production, increasing costs, disruptions in energy transport and other negative experiences in crisis times have triggered the development of policy for security of supply. As it is known, the Russia-Ukraine crisis has revealed new energy transportation routes. Therefore, another objective is taking a position to ensure the security of energy supply.

ENERGY EFFICIENCY:

Rising energy problems have brought the necessity of efficient use of energy. Especially in developed countries, energy efficiency studies and policies are gaining importance. Energy efficiency is an issue of reduced energy without compromising the quality of life and production. Other main objective is to establish energy efficiency policies that contain many benefits such as reducing dependence to foreign countries, environmental protection, ensuring security of energy supplies and reducing energy costs.

RENEWABLE ENERGY:

Energy obtained from resources that are capable of refreshing their selves, is classified as renewable energy. Fossil energy resources will supposedly run out in near future and renewable energy sources will be crucial in the long term. Renewable energy has some features that make it very attractive. These are costless source, harmless to the environment, alternative sources of energy, and sustainability. Renewable energy resources are a useful alternative to high cost external energy supplies. In this field, Turkey should increase installed power and incentives, eliminate the infrastructure requirements and provide university- industry cooperation.

ENERGY HUB:

A large part of the reserves of fossil energy sources is located in the immediate vicinity of Turkey. This situation provides a significant advantage in the elimination of Turkey's energy needs and also gives a strategic mission in terms of these resources that can be transferred to international markets. Currently operating Baku-Tbilisi-Ceyhan and Kirkuk-Ceyhan/ Yumurtalık crude oil pipeline, Baku-Tbilisi-Erzurum and The Blue Stream gas pipeline and Trans-Anatolian (TANAP) gas pipeline projects illustrate the importance of the strategic position and mission of Turkey in the energy field. Turkey, while becoming an energy hub, is not contented with only carrying the energy, at the same time it should play a role in determination of energy prices. At this point, Turkey should create an efficient energy market, which includes all energy resources.

ALTERNATIVES

So far, we attempted to describe objectives

"Renewable energy resources are a useful alternative to high cost external energy supplies. In this field, Turkey should increase installed power and incentives, eliminate the infrastructure requirements and provide university- industry cooperation."

in general framework. Hereafter, alternatives that relate to mentioned objectives are presented. Each alternative is thought to be associated with several objectives stated above.

NUCLEAR POWER PLANTS:

Turkey plans to establish two nuclear power plants. The total installed capacity of these nuclear plants is 9280 MW and total cost of these plants is about $ 40 billion. When they are active, they will generate 80 billion kWh equivalents to annually 16 billion cubic meters (7.2 billion dollars) natural gas imports. Nuclear power plants consisting of about 550 thousand pieces will make significant contributions to the domestic industry. The most intense period of construction is planned operational with about 10,000 workers. The contribution to employment is also obvious. In the light of this information, Turkey's nuclear power plant projects are offering a direct contribution to the objectives within the context of energy supply security, and indirect contribution to the objectives under the EU Energy Chapter.

RENEWABLE ENERGY ACTION PLAN:

According to the electric data of 2013, 29% of the production provided from renewable sources, out of which 25% is obtained from hydropower and the remaining 4% is obtained from the other renewable energy resources. Since 2010, strategies that followed in order to increase the share of renewable energy have been useful. In the scope of the Renewable Energy Action Plan, a large number of policies developed at the micro and macro scale. These policies can be grouped under legal, technical and financial titles such as fixed price guarantee system, investment incentives program, financial guarantees for renewable energy projects and promoting land-use fee. Some of them are applied and some of them are in the planning stage. In this direction, Renewable Energy Action Plan provides a direct contribution to objectives of Kyoto Protocol, energy supply security and renewable energy; and indirect contribution to the objectives of energy hub.

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PETROLEUM AND NATURAL GAS PIPELINES

SAMSUN-CEYHAN OIL PIPELINE:

About 3.7% of the world's daily oil consumption is transported through the Turkish Straits. Traffic of oil and petroleum products were 60 million tons in 1996, exceeded 150 million tons in 2008. Samsun-Ceyhan Oil Pipeline, which would by-pass the straits, and has a vital importance to prevent the dangerous and heavy traffic through the straits. As the ending points of this pipeline, Samsun and Ceyhan have significant specifications. Samsun is close to the other terminals in the Eastern Black Sea that reduces oil transportation to minimum. The presence of the Ceyhan terminal will reduce the need for new construction and investments. Moreover, the project stands out as the most suitable project for the environment. With this project, Ceyhan will be an important energy hub and will turn into the biggest oil terminal in the Mediterranean. In this direction, the Samsun-Ceyhan Oil Pipeline provides a direct contribution to the objectives of Turkey's being an energy hub and Kyoto protocol.

TRANS-ANATOLIAN PIPELINE (TANAP):

The objective of TANAP is to transport the natural gas, which is produced in the Caspian Sea, firstly to Turkey and then to Europe. TANAP is going to achieve a connection between the South Caucasus Pipeline (SCP) and the Trans-Adriatic Pipeline (TAP). Thus, the production costs will decrease because TANAP will be built along Southern Gas Corridor in the Eastern parts of Turkey. TANAP provides a direct contribution to the objectives of EU, energy supply security, and energy hub.

ARAB GAS PIPELINE:

It is a pipeline planned to carry Egyptian gas to Europe. A part of The Arab Gas Pipeline is completed and currently providing Egyptian gas to Jordan, Syria and Lebanon. Türkoğlu-Kilis Pipeline, which links Arab Gas Pipeline to Turkey's natural gas transmission system, is under construction. This project has

vital importance for the diversity of Turkey's energy supplies. Arab Gas Pipeline provides direct contribution to objectives of EU, energy supply security, and energy hub.

ENERGY MARKET:

On March 12, 2015, Energy Market Management Company (EPİAŞ) was established as the successor of the official energy market. The main objective is to operate energy markets efficiently and in a more transparent and reliable way. In this context, EPİAŞ provides a direct contribution to the objectives of energy chapter and energy hub.

NATIONAL ENERGY EFFICIENCY ACTION PLAN:

In order to improve the energy awareness in the society, to utilize the renewable energy resources and to increase the energy efficiency and support, "Energy Efficiency Law" was enacted in 2007. The Energy Efficiency Strategy Document published in 2012 puts this law into practice. In this document, actions are grouped under six categories as follows:

1. To reduce energy losses and energy intensity in industry and services sector
2. To expand eco-friendly buildings
3. To provide market transformation of the energy efficient products
4. To improve efficiency of electricity generation, transmission and distribution; reduce energy losses and harmful environmental emissions
5. To reduce fossil fuel consumption, increase the share of public transport in transportation, avoid unnecessary fuel consumption in city transportation
6. To promote effective and efficient energy use in public institutions

National Energy Efficiency Action Plan provides a direct contribution to objectives of energy efficiency, Kyoto Protocol and energy supply security.

RESEARCH & DEVELOPMENT:

R&D projects provide direct contributions to the objectives of renewable energy and to those of EU. Turkey carries out numerous research and development projects in the energy field. Some of them are listed below.

1. Development of the National Wind Energy System (MİLRES): The main objective of the project is to build infrastructure for the establishment of the original and world-class competitive wind industry which has a design and a technology that belong to Turkey.
2. Development of the National Solar Power Plant (MİLGES): It is an R&D project aiming to produce locally necessary components for the production of electricity based on solar energy.
3. Development of the National Hydroelectric Power System (MİLHES): Project aims to develop the local power components to use efficiently the existing hydroelectric potential of Turkey.

CONCLUSION

Energy problems are multi-objective and multi-criteria decision problems. An alternative may help to achieve more than one objective. For example, TANAP provides direct contribution to Turkey's energy supply security, EU, and energy hub objectives. Similarly, each objective can be matched with alternative that contribute to itself.

Following strategies should be adapted as state policies rather than governmental ones. In this direction, energy strategies should be addressed in a long-term planning. The main objective is to eliminate the energy dependence of Turkey. Another important objective is to protect and improve Turkey's regional strategic position and to be a powerful player on the regional energy market. To be successful, Turkey should sort the objectives in terms of importance, economics and applicability. This sorting varies according to decision-makers' evaluation criteria and relative importance.

At the assessment stage, periodic costs, savings, contribution to energy efficiency, contribution to security of energy supply and

"Turkey carries out numerous research and development projects in the energy field:

1. Development of the National Wind Energy System (MİLRES)
2. Development of the National Solar Power Plant (MİLGES)
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"The main objective is to eliminate the energy dependence of Turkey. Another important objective is to protect and improve Turkey's regional strategic position and to be a powerful player on the regional energy market."

contribution to strategic position of alternatives can be determined as the criteria. The important point is the determination of critical factors and weights of these factors. Because of environmental concerns, technological structure and political balance change depending on time, the necessity of updating the critical factors and weights should always be kept in mind.

It is seen that Turkey has many objectives and alternatives in the energy field. Unfortunately, it is impossible to implement all the alternatives for satisfying all the objectives at desired level. Therefore, the questions of what objective should be satisfied with what alternative and in what priority the objectives should be assessed arise. Analytical decision-making methodologies can make it easier. At this point, academia-public or private energy sector collaboration is an important tool to establish future energy policies.

"The questions of what objective should be satisfied with what alternative and in what priority the objectives should be assessed arise."

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COAL: A REALISTIC HOPE FOR TURKEY'S FUTURE ENERGY SECURITY?

by Selçuk Özgen and Ferda Bayrak

INTRODUCTION

As it is well known, energy is the basic element of the social and economic development for any country. Energy consumed in today's world is produced mainly from fossil fuels such as oil, natural gas, largely from coal (87 %), from nuclear and as a smaller proportion from renewable (13 %) resources. European countries have been the biggest energy importers but lately, China seems to carry the flagship as it is going to be the major importer by 2030. Russia is expected to keep its position as the biggest energy exporter country in the world, as it is now.

Turkey's priority on its energy policies is to achieve supplying cheap and quality energy sources continuously and reliably. However, Turkey's energy security has become controversial since some of the analysts recently addressed the issue that Turkey covers its energy demand largely from imported sources. This study analyzes the status of domestic coal reserves and production facilities in Turkey as if it can be an alternative to the imported energy sources.

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ENERGY PRODUCTION IN TURKEY AND THE WORLD

Growing population and industrialization in developing countries cause a rapid increase in energy demand in such countries. Energy that indicates a country's social and economic potential is a mandatory element as a factor of production. There is a linear relation between energy consumption and social development in a country, whereas the more the country develops by economic gains and draws cultural relief, the more the energy consumption increases (Koç and Kaplan, 2008; Koç and Şenel, 2013). Energy finds its place in every stage of everyday life for people who use it and it can be supplied by various chemical, nuclear, mechanical (potential and kinetic), thermal, geothermal, hydraulic, solar, and electrical ways and converted to each other with suitable unique methods. A comprehensive case analysis needs to be implemented both in the world and in Turkey to make a reliable plan to stop the rapid declination of energy resources and to arrange the utilization of renewable energy sources.

The pioneer energy sources are non-renewables like oil, natural gas and coal in the world's energy production. The share of natural gas in energy production increases day by day in the world because of being a cleaner source for the environment. Oil is the most used energy source in the world, which is followed by mined coal with a decreasing consumption rate and natural gas with an increasing production and consumption rate. In all periods to the day, a particular energy source (Coal) was superior to other sources. Oil replaced coal with time, later in the following years, natural gas gained an importance and at last, alternative energy sources are expected to replace them in the forthcoming years.

Figure 1 presents the share of primary energy sources in the world's electricity production in 2012. In the following year (2013), electricity production from primary energy sources was 23,322 TWh. Coal had the biggest share (41.3 %) that was followed by natural gas (21.7 %) and hydraulics (16.3 %) respectively. The share of renewables (geothermal, solar, wind, bio, etc.) was 5.7 %, bigger than the previous year's (5 %).

For Turkey, primary energy production was 252.00 TWh in 2014. The distribution of sources in primary energy production was 47.9 % for natural gas, 29.9 % for coal, and 16.1 % for hydraulics (See Figure 2). The energy production from lignite, geothermal, wind and solar sources was more than the last year's, whereas it was lesser from wood, animal and plant sources.

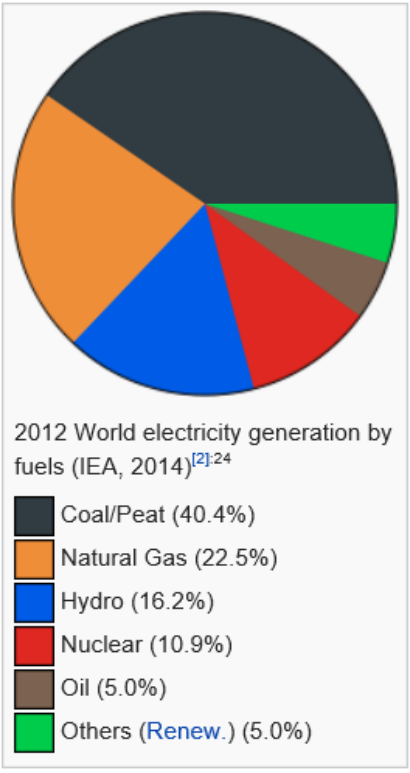

Figure 1: World energy production in 2012 (IEA, 2015).

Figure 3 displays Turkey's energy production and consumption from domestic sources. The ratio of energy consumption to energy production from domestic resources decreased rapidly between the years 1990 and 2011. This ratio was 48.1 % in 1990, and 28.2 % in 2011 (Koç and Şenel, 2013).

COAL RESERVES AND COAL TRADE IN THE WORLD AND IN TURKEY

Coal has become an important asset in the energy world due to some recent developments on clean coal technologies, coal gasification and coal liquefaction processes. According to the International Energy Outlook 2014 Report, coal's share in world electricity generation in 1990 increased from 37.4 % to 40.3 % in 2012 and stood steady since then (Energy Report, 2014).

"Coal has become an important asset in the energy world due to some recent developments on clean coal technologies, coal gasification and coal liquefaction processes."

Due to continuous energy demand globally, fossil fuels are decreasing day-by-day and proven and prediction of the probable reserves are to be depleted in the next millennium. As of 2013, the calculated proven reserve of coal was 891 billion tons and determined to have run out in 142 years' time. Table 1 presents coal reserves in continents.

Turkey's proven coal reserves are owned and operated by public and private sector were calculated as 15.8 billion tons in 2013. Hard coal is extracted only from Zonguldak Re-

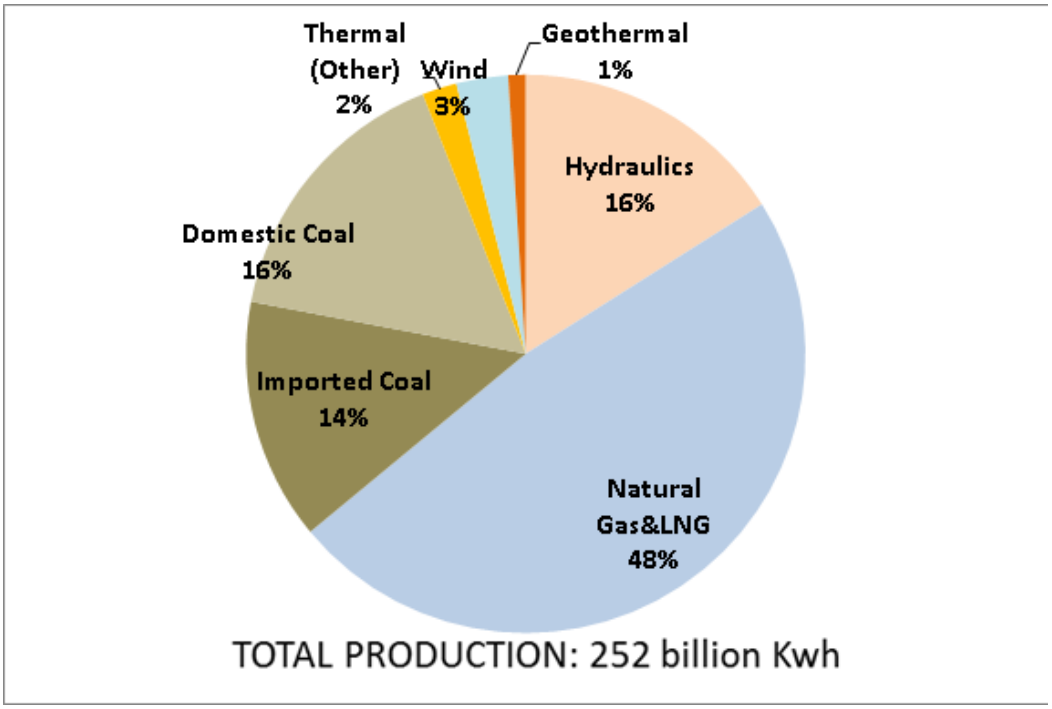

Figure 2: Turkey's electricity generation in 2014 (TEIAS, 2015).

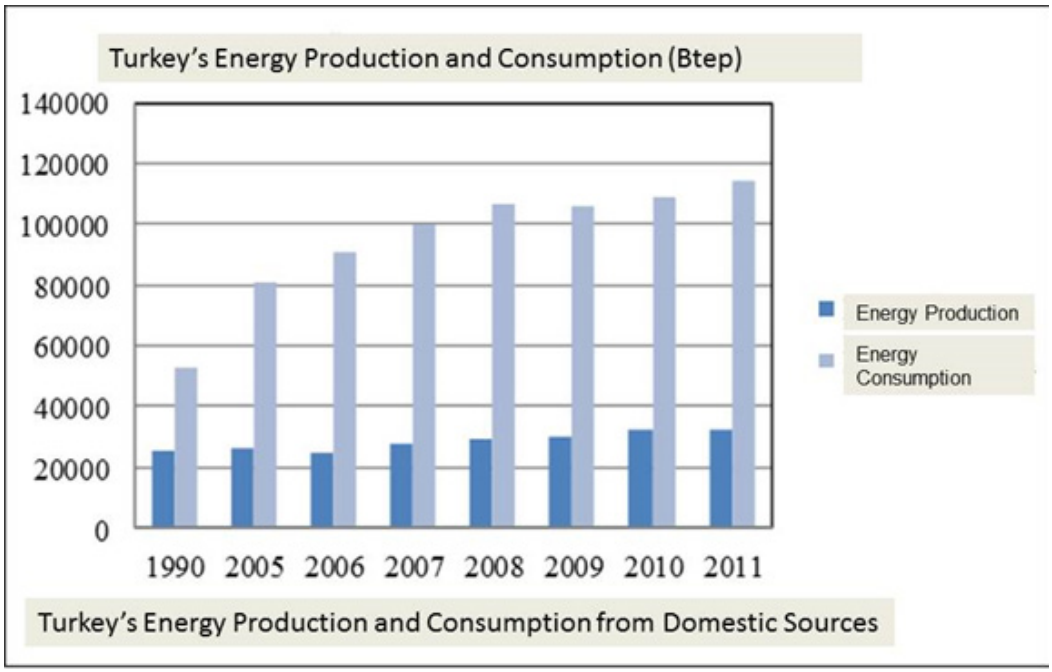

Figure 3: Turkey's energy production and consumption from domestic sources.

"Hard coal is extracted only from Zonguldak Region, and lignite basins are spread over the Middle Anatolia and Aegean Regions."

gion, and lignite basins are spread over the Middle Anatolia and Aegean Regions. Turkey's mineral reserves, prepared by Mineral Research and Exploration Institute (MTA), are presented in Table 2.

It is widely known that calorific values of Turkey's lignites are quite low and studies performed have shown lower heating values of lignites being between 1,000-4,200 kCal/kg, 90 % of which are lower than 3,000 kCal/kg.

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When the global coal trade is examined, almost all of the trade is set up on hard coal. This is because it is not feasible to transport lignite overseas except from short distances between neighboring countries. World coal export reached to 1.255 billion tons in 2012 and only 2.5 million tons of the whole amount consisted of lignite (IEA, 2013). In Turkey, including private sector production, 79 million tons of coal (asphaltite, oil shale, lignite, and hard coal) was produced in 2012. The coal demand has increased in recent years but coal production in Turkey has been decreasing that has resulted in a rise of coal imports. In 2013, the produced hard coal was 2.3 million tons but the imported coal that includes hard coal and lignite was approximately 25 million tons. No export process of coal is realized in Turkey because of the limited reserves and production of hard coal and low calorific values of lignite.

REGION	Hard Coal (Million Tons)	Lignite (Million Tons)	Total (Million Tons)	Ratio (%)
Eurasia	92,557	217,981	310,538	35.8
Asia Pacific	157,803	130,525	288,328	32.3
North USA	112,835	132,253	245,088	27.6
Middle East and Africa	32,722	214	32,936	3.7
South and Middle USA	7,282	7,359	14,641	1.6
Total	403,199	488,332	891,531	100

Table 1: Coal reserves in continents (Energy Report, 2014).

REGION	Total (Million Tons)
Soma	205
Pınarhisar	140
Çerkezköy	495
Eskişehir	1200
Afyon-Dinar	941,5
Ilgın	30,5
Çumra	15
Karapınar	1832
Amasya	9,2
Afşin-Elbistan	1815
Malatya	17

Table 2: Mineral reserves of Turkey (Dagistan, 2012).

ASSESSMENT

Coal keeps its position as one of the main sources of energy in the world. However, Turkey's energy policy in terms of producing energy from imported resources seems to be a bad example. Turkey produces nearly half of its electricity (47.9 %) from imported natural gas, 16.5 % from domestic coal, 16.1 % from hydraulics, 13.4 % from imported hard coal, and the remaining 6.1 % from other sources like wind, solar, geothermal and others. It should be discussed whether all of the energy demand in Turkey could be met by domestic resources although there is a big energy dependency to other countries' resources.

The energy consumption in Turkey was 78 TWh in 1994. It rised up to 150 TWh during 2001 by nearly a 100 % increase and to 255 TWh by a 70 % increase in the year 2014. However, increase in coal production could be succeeded only by 20.8 % in two decades and 34.3% in a decade time (compared with tons of oil equivalent). As a result, it would be wise to say that increase rate in Turkey's energy production by its domestic sources is much far behind the energy consumption rate. In account of these calculations, the production to consumption rate was 43.9 % two decades ago, 28.4% a decade earlier and it was 26.6 % in 2013.

After addressing the decrease in energy production to consumption rates in years, the distribution of the 31.9 mtep of domestic energy production in 2013 should be taken under consideration. It is clear that the 15.5 mtep was from coal as first, 5.1 mtep from hydraulics as second, 4.3 mtep was from wood, animal and plant wastes as third. These were followed by 4.1 mtep of renewable energy sources like geothermal, wind and solar, 2.5 mtep from oil and 0.4 mtep from natural gas. The coal distribution was 14 mtep lignite, 1 mtep hard coal and 0.5 mtep asphaltite.

In 2013, 57.5 million tons of lignite was produced with a decrease of 15.5 % when compared with previous year. Hard coal production was 2 million tons and asphaltite production was 0.9 million tons. Lignite was largely used in power plants for the electricity production (85.4 %), 6.8 % for industrial purposes and 7.7 % for heating households and work places.

As stated earlier in this study, there is a quite notable decrease among energy production to consumption ratios in Turkey. This ratio was 19.2 % in 1993, 12.9 % in 2003, and 12.8% in 2013. The energy consumed was 260 TWh in 2013 and 252 TWh of it was produced in Turkey. This production was mainly from natural gas (43.8 %) and imported coal (13.4 %). Clearly, only 107.8 TWh of energy was produced from domestic sources and the energy produced was 41.5 TWh from domestic lignite sources.

There is a 152.15 TWh energy gap due to outer dependency directly or indirectly. Even though Turkey had the opportunity to meet this gap from domestic coals, it should have produced 200 million tons of lignite instead of currently produced 50 million tons. Installed capacities of power plants using domestic coals should have been four times higher the current ones. Additionally, if the production rate is assumed to be steadfast, it can be deduced that the coal in Turkey will be depleted in 77 years even the reserves are operated by 100 % efficiency.

Consequently, it can be referenced that it would be a dream to fill Turkey's energy dependency gap by domestic coal. Even if it is succeeded, depletion of all the coal reserves

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in the near future would create a big problem. Instead, we have to accelerate renewable energy investments and especially in nuclear as soon as possible so that the energy dependency on foreign resources could be lowered substantially.

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RUSSIAN CHESS ON GAS POLITICS: EVALUATION OF TURKISH STREAM

by Oğuzhan Akyener and Çağrı Şirin

"Due to flustering disputes over Ukraine, initial step was planned as to bypass Ukraine with a new standalone pipeline that will transit Russian gas to Eastern Europe."

"The first key pipeline from Russia to Europe is the Brotherhood Pipeline (PHP), which is active since 1967 (despite the prevention attempts of USA)."

INTRODUCTION

Turkish Stream Pipeline Project (TSP) is the result of the altering Russian gas supply policies toward European Union (EU). Due to flustering disputes over Ukraine, initial step was planned as to bypass Ukraine with a new standalone pipeline that will transit Russian gas to Eastern Europe. However, increasing conflicts between EU and Bulgarian government made Russia take a step forward with a new standalone pipeline project, which is named as Turkish Stream.

In the concept of Turkish Stream, Russia is planning to transport the gas through Black Sea and Turkey and sell it in the Greek border of Turkey. This means, Russia will not have to deal with the transportation of her gas inside EU's borders. Being a self-assured seller, Russia also wishes that Balkan countries on the demanding side to provide their own gas export securities. This shift in Russia's gas sale and/or transportation policies may be an important indicator for the future gas politic analysis of the region.

In another aspect, doability of TSP will result in facing with too many milestones such as commercial, technical, political, market, etc. All these items require careful analysis that will help coherent evaluation of Turkish Stream.

In this study, after giving the historical overview of Russian gas export to EU, which is the determiner for TSP, doability of TSP will be evaluated from the technical, commercial, marketing, political and resource aspects. In addition to this evaluation, after mentioning the main risks for successful completion of TSP, other possible options will also be evaluated for any cases of TSP that may not be successful. Having the result of this evaluation, the future of regional gas politics and Turkey's situation will be analyzed.

HISTORICAL OVERVIEW OF RUSSIAN GAS EXPORT TO EU

Initially, existing key gas pipelines feeding the Europe will be described shortly in the concept of the historical overview of Russian gas export to EU. Latter, the previous steps before the Turkish Stream and South Stream Pipeline will be adverted. After mentioning the infrastructural situation, customer characteristics of Ukraine and the third energy package of EU will also be analyzed.

EXISTING KEY PIPELINES TO FEED THE EUROPE

Russia gas export to Europe started before 1940's with the small volumes of export to Poland. While considering the small portion of consumption volumes, location of the existing resources (which are affecting the transportation costs), lack of existing transportation systems, prices and economical items, gas trade between Russia and Europe could not find a chance to tighten. After the new giant discoveries in 1970s, new pipeline projects and more politically stabilized and industrialized Europe's trade volumes increased.

As seen in Map 1 below, the first key pipeline from Russia to Europe is the Brotherhood Pipeline (PHP), which is active since 1967 (despite the prevention attempts of USA). PHP is also known as Urengoy-Pomary-Uzhgorod Pipeline and has a capacity of 100 bcma and a 4500 km length. As depicted, PHP and its extensions by transiting and feeding Ukraine, meet an important portion of many European countries' gas demands, such as Germany, France, Czech Republic, Slovakia, Austria, Slovenia, Croatia, Italy and Hungary.

Second key pipeline from Russia to Europe is the northern lights pipeline, with a capacity of 51 bcma and a length of 7400 km. This pipeline consists of five major trunk routes with

different capacities and different construction times. However, the main line from Torzhok to Ivatsevich is completed in 1970s.[1] Due to, supplying gas to Poland and Lithuania and its main purpose being to directly supply the Brotherhood Pipeline i.e. her potential being linked to the Brotherhood, Northern Lights may not be accepted in the category of the most important gas import pipelines of Europe.

Third key pipeline, as shown in the map above is the Yamal – Europe Pipeline (YEP). YEP was activated in 1996 to feed Germany. After some upgrades in the compressor stations, the total volume of YEP has extended up to 33 bcma and its average length is 4200 km.

Fourth key pipeline is Nord Stream (we mean "nord stream1") with a total 55 bcma capacity and 1224 km length. Nord Stream Pipeline (NSP) is activated in late 2011 to feed Germany. However, only half portion of this 55 bcma capacity can be utilized due to the sanctions of EU's third energy package.

UKRAINE: A BAD CUSTOMER

By considering the location, existing pipeline capacities and gas storage capabilities, Ukraine is the most important route for Europe's gas supply security politics. For several decades, Ukraine represented a reliable transit platform for Russian gas export to Europe. However, in the aftermath of the independence of the two countries, gas conflicts between Russia and Ukraine started to emerge.[3]

Conflicts mainly are about the gas prices those Russia offered for Ukrainian domestic market. Although Ukraine buys the gas with a cheaper price than the other European countries, hence she knows that Russia is dependent on her to transit gas to Europe, which can be accepted a vital item for Russia's foreign politics, Ukraine every time tried to use this situation for the due gas pricing negotiations and deals. From the other side, Ukraine also is dependent to Russian gas while considering her energy consumption distribution. These situations and the unsolved disputes several times resulted in Ukraine not paying her debts to Russia and Russia cutting her gas supplies to Ukraine. Sometimes Russia erased the piled up debts of Ukraine, however, the situation has never changed.

From the gas transit region to Europe, this conflicts and disputes directly affected the gas transits to Europe. As happened in 2006 and 2009, Russia cut off supplies to Ukraine and Ukraine diverted the European transit volumes to her domestic market, which resulted in gas crises in a few European Countries. As a result of this situation, Russia has been following a new strategy of diversifying her gas transit routes away from Ukraine. South Stream, Turkish Stream and newly proposed

Map 1: Russia to Europe gas pipelines.[2]

"For several decades, Ukraine represented a reliable transit platform for Russian gas export to Europe. However, in the aftermath of the independence of the two countries, gas conflicts between Russia and Ukraine started to emerge."

"In 2006 and 2009, Russia cut off supplies to Ukraine and Ukraine diverted the European transit volumes to her domestic market, which resulted in gas crises in a few European Countries."

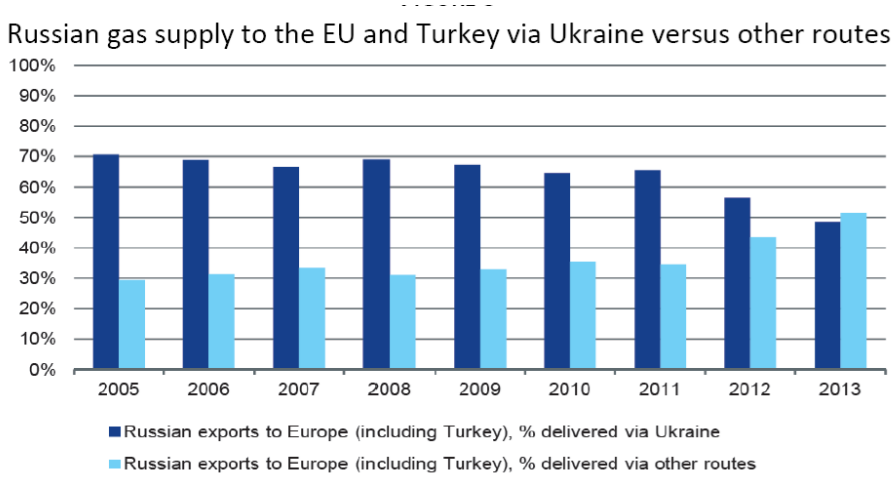


Figure 1: Russian exports to Europe via Ukraine and other routes.[4]

Nord Steram2 gas pipeline projects can be accepted as the results of this new strategy. However, rest of the paper will focus on the SSP & TSP.

The volumetric results of this new strategy can be observed from Figure 1 above. As it can be seen, Russian exports to Europe via Ukraine are decreasing and via other routes are increasing. However, a new project such as TSP is needed for long term solution.

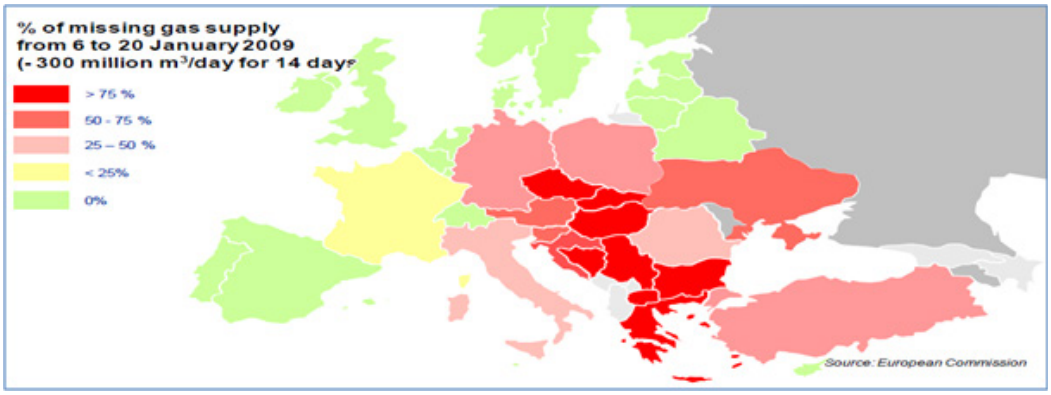
In addition, the South Eastern European countries, red colored in Map 2, are more dependent on the Russian gas transiting through Ukraine, the route diversification strategy of Russia is very important for that region.

"With SSP; Bulgaria, Serbia, Hungary, Austria, Slovenia, Croatia, Bosnia-Herzegovina and Italy markets were planned to be the potential markets."

SOUTH STREAM PIPELINE

As indicated above, there are four gas pipelines, which are the most important structures for Russia to feed the due European countries' gas hunger. In addition to these four lines, South Stream Pipeline Project (SSP) was launched by Russia to feed the Southern and Eastern European markets, in the same concept of bypassing Ukraine. SSP was planned to be a 900 km long offshore pipeline with a capacity of 63 bcma. Nearly 42 bcma of this 63 bcma was planned to be the existing volume being transported through existing pipeline structure transiting Ukraine. The remaining portion will be the new gas volumes for the due customers. As seen in Map 3, with SSP; Bulgaria, Serbia, Hungary, Austria, Slovenia, Croatia, Bosnia-Herzegovina and Italy markets were planned to be the potential markets.

Final investment decision of the SSP was made in December 2012 and the whole project was planned to be activated in 2020. However, SSP created controversy due to non-compliance with the European Union competition and energy legislation, such as the Third Energy Package, which stipulates the separation



Map 2: Percentage of missing gas supplies in 2009 gas crises.[5]

Map 3: South Stream Pipeline project.[6]

of companies' generation and sale operations from their transmission networks. Project was cancelled by Russia in December 2014 following obstacles from Bulgaria and the EU (due to the TEP), the 2014 Crimean crisis, and the imposition of European sanctions on Russia. The project has been replaced by proposals of Turkish Stream and Tesla Pipeline.[7]

Note that TESLA pipeline, which is the possible extension of Turkish Stream in Europe is planned to start from the Turkish border and to end in Baumgarten, as indicated in Map 4.

EU 3RD ENERGY PACKAGE

"The announcement of the Third Energy Package (TEP) in 2011, which outlined the EU's goal to create a liberalized gas market in Europe via the unbundling of vertically integrated gas companies, the imposition of third party access rules and publicized tariffs, marked the start of this progression. It also caused huge concern for Gazprom as it would mean a significant shift in its traditional business model. In particular, it threatened its pricing structure, which had always been based on a long-term oil-linked methodology, and its plans for access to customers via controlled infrastructure."[9] Note that although Gazprom has been working on shifting her price mechanism from the traditional model to hub model, in overall, hub price mechanism does not seem as beneficial as the traditional system for Russia.

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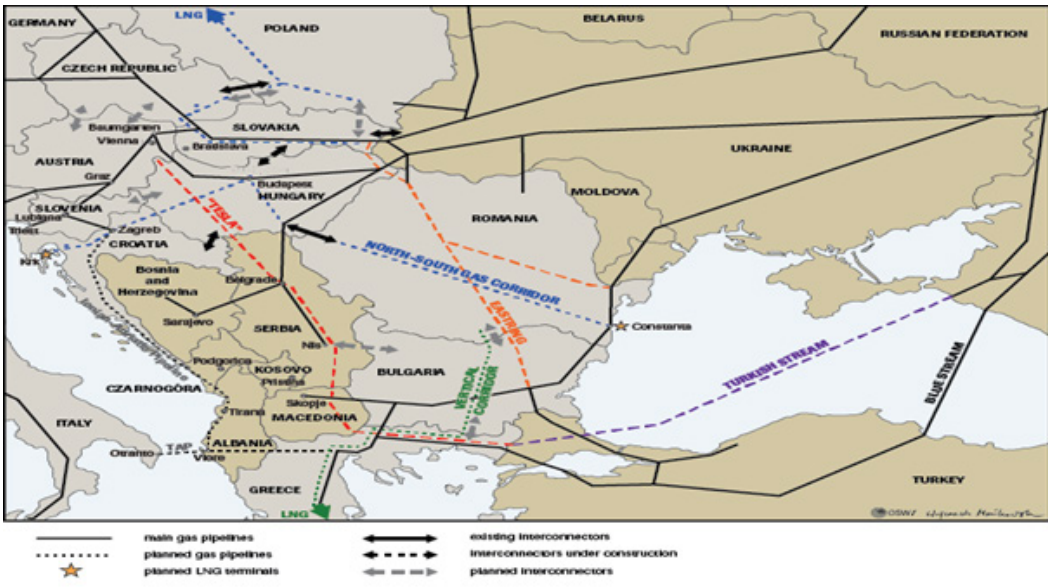


Map 4: CIS & Eastern Europe pipeline system.[8]

"Turkish Stream Pipeline project is the result of altering Russian gas export politics, mainly affected by bypassing Ukraine strategies, TEP and Bulgaria's attitude (suspending the preparatory operations for the construction of SSP in her offshore in 2014)."

"According to the BP Energy Outlook 2035 report: "The EU's natural gas imports increasingly diversify; LNG net imports almost triple by 2035 and account for 30% consumption in 2035 up from 9% today. However, imports from Russia via pipeline remain an important source of supply, growing by 15% and maintaining a market share of around 31% by 2035."

As a result of TEP, firstly, Gazprom's full capacity use of the Nord Stream Pipeline was interrupted by EU Competition Commission. Hence, NSP is connected to Ostsee-Pipeline-Anbindungsleitung (OPAL) pipeline system; this meant a monopolized Gazprom in the case of EU Competition Commission. As a result, Gazprom was forced to use only half capacity of the pipeline.

Secondly, in 2012, again the EU Competition Commission agreed on Gazprom's commercial activities in the Balkan Countries resulting in a monopoly position in due high oil prices. That is why; TED again affected the utilization capacity of SSP's onshore parts after Bulgaria. This means, although Russia transports 63 bcma gas to Bulgarian onshore, she can only transport half of this volume to the European markets, by using her own pipeline. These conflicts resulted in an unexpected shift of Russia from SSP to TSP.

TURKISH STREAM PIPELINE

As described above, Turkish Stream Pipeline project is the result of altering Russian gas export politics, mainly affected by bypassing Ukraine strategies, TEP and Bulgaria's attitude (suspending the preparatory operations for the construction of SSP in her offshore in 2014). Gazprom CEO's statement issued in January 2015 also summaries the shift in Russian export strategy and the shift from SSP to TSP: "The principle of our strategy in relation to the European market is changing. The decision on stopping South Stream is the beginning of an end to our operation model of the market within which we oriented ourselves towards supplying to the end consumer. But you cannot win love by force. If the buyer does not want the purchase to be delivered home, well then perhaps he needs to get dressed and go to the store, and if it happens in winter, get dressed warmer. Well he could also take some package. Which can well be the Third Energy Package, but what counts most is that it should not be empty. In our case, the store is certainly the delivery point on the Turkish–Greek border."[10]

"The offshore part of the TSP will cross the Black Sea bed. Maximal depth along the route will reach 2,200 m. The length of the offshore part will amount to 910 km. As planned, the TSP pipeline will surface on the shore of the European part of Turkey near Kıyıköy with gas delivery point at Lüleburgaz for the Turkish customers, and a border crossing between Turkey and Greece in İpsala serving as delivery point for the European customers. The length of Turkish onshore section will total 180 km. The capacity of four strings totals up to 63 bcma, including 47 bcma to be supplied to the Turkish-Greek border."[11] As can be understood from the information above, 16 bcma gas via TSP will directed to Turkey and the other portion is planned to be transferred to EU. TSP is planned to have four parallel pipelines with each having is 16 bcma capacity. First line is planned to transfer the Turkey's portion and the other three lines for EU.

Off course, transportation of Russian gas from the Turkish border is also important. Hence, SSP was planned to extend to inside the Europe. TSP also has to be planned to link with some other pipeline projects to transport the gas to the customers inside Europe. This issue will be identified in the following sections.

DOABILITY OF TURKISH STREAM: FROM RUSSIA TO TURKEY – GREECE BORDER

The most popular pipeline project to handle due strategies of Russia can be accepted as the Turkish Stream Pipeline project. However, in this step, doability and the future of TSP has to be evaluated from technical, commercial, marketing, political and resource aspects. Political aspects will be the most determinative items for the future of TSP.

TSP: FROM THE MARKETING SIGHT

According to the BP Energy Outlook 2035 report: "The EU's natural gas imports increasingly diversify; LNG net imports almost triple by 2035 and account for 30% consumption in 2035 up from 9% today. However, imports from Russia via pipeline remain an important source of supply, growing by 15% and maintaining a market share of around

31% by 2035." This means, Russian gas demand in EU will increase. In addition, while considering that LNG supplies will be mainly to the coastal countries of EU, increase in LNG supply will not have a significant influence on TSP, where TSP's main interest is not coastal areas (except Italy and Greece).

Moreover, TSP's interest includes the countries that average more than 60% dependency on Russian gas. As pointed out in Map 5, 2014 Russian gas import values of due countries, which are also the possible markets for gas transported via TSP, total 74,31 bcma in the area including Italy and Turkey. By assuming the demand will increase in the coming years, 63 bcma after 2018 will easily be able to find enough market volume in the region. By the way, Italian and Turkish markets also have to be evaluated separately for long term estimations, because of possible LNG and other resource potentials. However, Russian gas again may be the cheaper way of supplies for both countries after comparing with other resources. As the result of these facts, there will be no market risk for TSP doability.

TSP: FROM THE RESOURCES SIGHT

According to the data taken from BP Statistical Review 2015, Russia with 32,6 tcm gas reserves has the 17,4% of the total gas resources in the world, coming after Iran in the ranking. In addition, another important value from the same report is (reserve/production) R/P ratio, which is around 50% for Russia. Which means Russia is developing her fields and has the resource development and investment environment inside.

Furthermore, according to the BP Energy Outlook 2035 report: "Russia remains the largest net exporter of energy with net exports meeting 4% of world energy demand in 2035 and Europe remains the largest importer of gas."

These approaches show that, from the sight of supply volume of gas resources in Russia there is no risks currently for TSP and for the technical life of the pipeline.

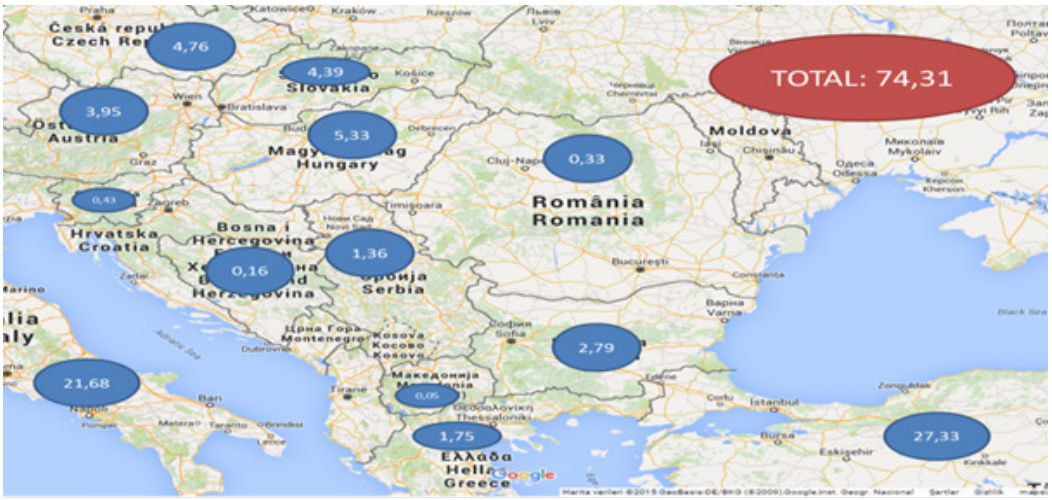
TSP: FROM THE TECHNICAL SIGHT

Turkish Stream, a new gas pipeline from Russia to Turkey will run across the Black Sea from the Russkaya CS near Anapa to Kıyıköy village in the European part of Turkey and further via Lüleburgaz to Ipsala on the border between Turkey and Greece.

660 kilometers of the offshore pipeline route will be laid within the old corridor of South Stream and 250 kilometers – within a new corridor towards the European part of Turkey. The offshore part of the pipeline, which is 910 km in length, will cross the Black Sea bed with Maximal depth of 2,200 m.

The onshore gas pipeline section will stretch for 180 kilometers from the Black Sea coast of Turkey to the border between Turkey and Greece.

"BP Energy Outlook 2035 report: "Russia remains the largest net exporter of energy with net exports meeting 4% of world energy demand in 2035 and Europe remains the largest importer of gas."



Map 5: Russian gas exports 2014.[12]

"Political side is the most important issue that will affect the doability of the project. After the Ukraine conflicts, TEP and Bulgaria's attitude, TSP was the best solution for Russia, although EU currently does not support and US is against the project."

Map 6: Turkish Stream Pipeline project.[13]

The annual gas pipeline capacity will total 63 billion cubic meters of gas. The offshore gas pipeline will consist of four strings with the capacity of 15.75 billion cubic meters each. Gas from the first string is intended exclusively for the Turkish market.

Estimated Cost & Tariff according to the existing technical information for TSP are summarized in Table 1. Note that; cost is calculated by using commercial software and tariff is estimated by benchmarking with the current similar projects. During tariff estimation process, rate of return of the project is accepted as 9%.

TSP: FROM THE COMMERCIAL SIGHT

Hence, Russia is financing the project, which means there are no financial risks. For commercial analysis, initial items given below are assumed:

- Russia's average unit gas cost @ Anapo (including the production and inside country transportation costs) is 30 USD/1000m^3
- Oil prices in the last quarter of 2018 is 75 USD
- Gas prices in EU for the last quarter of 2018 is between 330 – 370 USD/1000 m^3
- Gas prices in Baumgarten Hub for the last quarter of 2018 is 350 USD/1000 m^3

Note that; hence, the existing giant gas fields to supply the TSP are mature and also there are currently existing free capacities in the pipeline distribution system of Russia, as the lowest breakeven point; 30 USD / 1000 m^3 cost is accepted.

With the estimated tariff above, total unit cost of Russian gas in the Turkish-Greek border is (30+180) 210 USD. Up to this point, there is no commercial risk, where EU gas prices will be estimated to be between 330 - 370 USD / 1000 m^3. However, commercial analysis has to be repeated by considering the additional tariffs inside the EU.

Offshore Length	910 km
Onshore Length	180 km
Diameter	4x32"
Capacity	63 bcm
Water Depth	2200 m
Cost	18 MMM$
Tariff @ Greece Border	180 $ / 1000 m^3

Table 1: TSP technical summary.

TSP: FROM THE POLITICAL SIGHT

Political side is the most important issue that will affect the doability of the project. After the Ukraine conflicts, TEP and Bulgaria's attitude, TSP was the best solution for Russia, although EU currently does not support and US is against the project. However, from the Turkish side, the straining and worsening relations with Russia will be able to effect the last investment decision of the project.

Videlicet, the doability of the project has political risks according to the current approaches of Russia, EU, Turkey and US. On the contrary, Balkan countries, as being the customers politically support the project.

BEYOND TURKEY: GAS DELIVERY TO ITALY & BAUMGARTEN

For a planned 47 bcma gas supply via TSP to the due countries in EU, as the end points Austria and Italy, new pipeline infrastructures have to be considered and constructed. Commercial and political issues will be the determiners to select the routes and the due pipeline projects such as TAP extension, Western Nabucco, ITGI, IAP or others. However, continuing workshops between the countries Hungary, Serbia, Macedonia, Greece, Turkey, Albania and Bosnia & Herzegovina give clues about the possible doability of TESLA pipeline project, carrying gas from Turkish – Greek border to Baumgarten. In addition to TESLA, to feed the Italy market, TAP extension or ITGI pipeline projects may also be considered. However, commerciality will again determine the routes, so, all costs and tariffs have to be studied.

TESLA PIPELINE TO BAUMGARTEN

The Tesla pipeline – named after Serbian-American engineer and inventor Nikola Tesla – is a continuation of the controversial Gazprom - backed Turkish Stream. It is planned to cross through Greece, FYROM, Serbia and Hungary, and then reach the gas hub Baumgarten in Vienna.

The length of the pipeline is planned to be 1,300-1,400 kilometers and capacity is 27 billion of cubic meters of gas. According to the public announcements, TESLA is expected to be completed in 2019.

Replacing the scrapped South Stream pipeline, Turkish Stream comprising four lines with a combined annual capacity of 63 billion cubic meters of gas will carry gas from Russia to Turkey under Black Sea. Turkey is to take about 16 billion cubic meters while the remainder will be transited to a gas hub to be built on Turkey's border with Greece, for exports to Europe.

TESLA MARKETS AFTER TURKISH BORDER

Beyond TSP, as mentioned above, 47 bcma gas is assumed to be in the Turkish border for EU's consumption. In addition, by benchmarking with the current trade volumes, 20 bcma is planned to send to Italy. Other 27 bcma will be shared between the other due Balkan countries. By considering the 2014 Russian gas import volumes, for Balkan countries 27 bcma gas volume is assumed to be distributed as given in Table 2.

ITGI PIPELINE TO ITALY

"The ITGI (Interconnector Turkey-Greece-Italy) System is a multi-source import project that will contribute to the European diversification and security of supply by opening the so called "Southern Gas Corridor".[9] The pipeline is designed to transport approximately 15 billion cubic meters of natural gas a year from Caspian, East Med and/or Middle East areas to Italy and Europe through Turkey and

Greece	2
Bulgaria	3
Serbia	1,5
Bosna	0,2
Hungary	5,5
Slovakia	5
Austria	4,5
Czech Rep	4,5
Macedonia	0,1
Slovenia	0,4
Romania	0,3

Table 2: TESLA markets.

"Continuing workshops between the countries Hungary, Serbia, Macedonia, Greece, Turkey, Albania and Bosnia & Herzegovina give clues about the possible doability of TESLA pipeline project, carrying gas from Turkish – Greek border to Baumgarten."

"The ITGI (Interconnector Turkey-Greece-Italy) System is a multi-source import project that will contribute to the European diversification and security of supply by opening the so called "Southern Gas Corridor."

Greece.". In the first option, the re-designed capacity of new ITGI will be 20 bcma.

COMMERCIAL ANALYSIS

Then, by considering the above volumes, routes have to be studied. As depicted in Map 7 from the Turkish border;

- Gas to Bulgaria and Romania will be transported via existing Trans-Balkan Pipeline reverse flow. So, the remaining volume for the other markets will be 44 bcma.
- The remaining volume of 44 bcma has 2 main options to reach the due markets:
  - Option 1: Italy market's 20 bcma share will be transported via a new stand-alone pipeline (which may be a re-designed ITGI) and other 24 bcma portion will be transported in the planned TESLA route and will reach up to Baumgarten.
  - Option 2: 44 bcma including Italy's share will be transported with a 44 bcma capacity TESLA project and Italy will get her portion with a new link from Baumgarten.

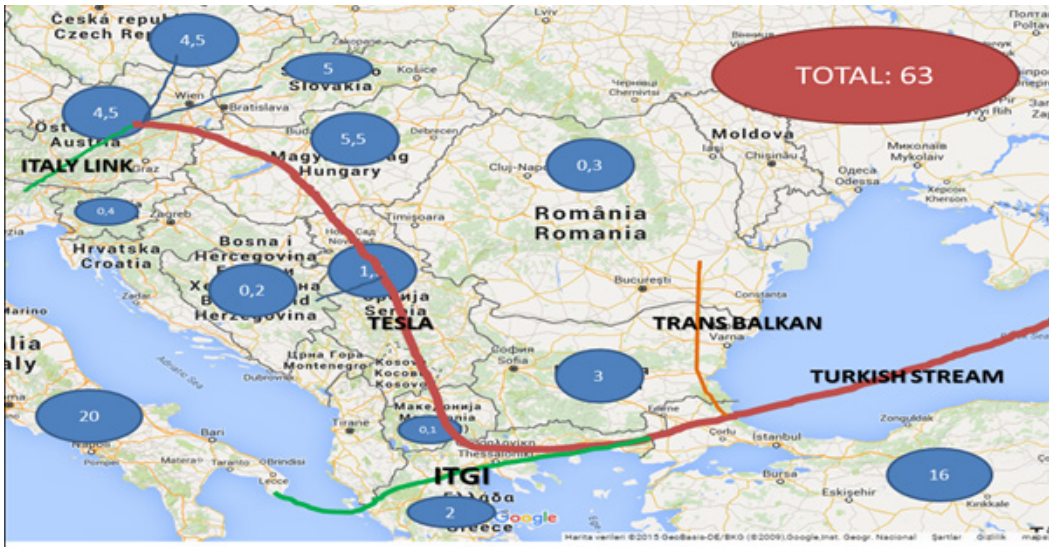
Both options can be observed in Map 7.

OPTION 1:

As indicated above, gas will be supplied through two standalone pipeline infrastructures to Austria via Tesla with 24 bcma, and to Italy via ITGI (or to the small extent via TAP) with 20 bcma. However, extension of TAP is not considered due to possible other gas supplies via TANAP. The extended volumes can be filled with Azeri resources. In addition, TAP can technically be extended up to 20 bcma, so additional 10 bcma will not be enough for Italy's portion.

Cost estimations to see the viability of two routes were evaluated by commercial software and benchmarking procedures are followed for the tariffs. As a result;

- Estimated cost for 24 bcma TESLA: 8 billion USD
- Estimated tariff for 24 bcma TESLA @ Macedonia: 15 USD / 1000 m^3
- Estimated tariff for 24 bcma TESLA @ Serbia: 30 USD / 1000 m^3 (Bosna will get her gas from this point)
- Estimated tariff for 24 bcma TESLA @ Hungary: 70 USD / 1000 m^3
- Estimated tariff for 24 bcma TESLA @ Baumgarten: 120 USD / 1000 m^3 (Czech Rep., Slovakia and Slovenia will get their gas from this point)Estimated cost for 20 bcma ITGI: 6 billion USD (Benchmarked with TAP)
- Estimated tariff for 20 bcma ITGI @ Italy: 140 USD / 1000m^3



Map 7: Extension of TSP and due market's volumes.

OPTION 2:

In this option, All 44 bcm/annum gas goes to Austria and Italy gets her 20 bcma portion via a small link from Baumgarten. So, TESLA will have a 44 bcma capacity. According to the results;

- Estimated cost for 44 bcma TESLA: 14 billion USD
- Estimated tariff for 44 bcma TESLA @ Macedonia: 23 USD / 1000 m^3
- Estimated tariff for 44 bcma TESLA @ Serbia: 45 USD / 1000 m^3 (Bosna will get her gas from this point)
- Estimated tariff for 44 bcma TESLA @ Hungary: 105 USD / 1000 m^3
- Estimated tariff for 44 bcma TESLA @ Baumgarten: 190 USD / 1000 m^3 (Italy, Czech Rep., Slovakia and Slovenia will get their gas from this point)
- Estimated cost for 20 bcma Italy Link: 1 billion USD
- Estimated tariff for 20 bcma Italy Link: 10 USD / 1000 m^3

As a result of these 2 scenarios; the total tariff costs are given in Table 3.

UPDATED COMMERCIAL ANALYSIS INCLUDING THE TSP

Tariff for 44 bcma TESLA @ Baumgarten	190 $ / 1000 m^3
Tariff for 24 bcma TESLA @ Baumgarten	120 $ / 1000 m^3

Table 3: TESLA tariffs.

The new economics of the project including TESLA extension, by considering the previous assumptions, estimated unit gas costs in due points are given in Table 4.

Note that; total gas unit cost at the due delivery point includes the average gas production cost in Russia, inside Russia transportation costs, TSP tariff and due tariffs in due pipelines in the European part up to the delivery points.

According to the results given in Table 4, Scenario 2 is not feasible while assuming the gas prices will be between 330 – 370 USD/1000 m^3 in 2019. Hence, not economic, Scenario 1 has to be selected.

As a result, although the economics are not so satisfactory in Italy, in regards to due assumptions, for all delivery points, netback can be accepted above zero so; TSP will again be doable.

However, if the "unit production + inside country transportation" cost will be higher than 30 USD / 1000 m^3, then Italy or Baumgarten markets may not be the economical options for Russian gas transported via TSP. Therefore, this approach may be able to force TSP not to feed Italy and Baumgarten markets with new standalone pipeline projects. Therefore, cheaper upgrades in the current distribution systems in Europe may be the solution to feed some portions of due markets. This means, there is a chance for TSP to be constructed with less capacity such as 16 + 16 bcma, where 16 bcma is for Turkey and the other portion is for EU, can be transported via the upgraded existing structure.

"If the "unit production + inside country transportation" cost will be higher than 30 USD / 1000 m3, then Italy or Baumgarten markets may not be the economical options for Russian gas transported via TSP."

	Scenario1	Scenario2
Delivery Point	Total Unit Gas Cost (USD/1000m^3)	Total Unit Gas Cost (USD/1000m^3)
Macedonia	225	233
Serbia	240	255
Hungary	280	315
Baumgarten	330	400
Italy	350	410

Table 4: Total unit costs of Russian gas after TSP & TESLA.

"The organization, owners and financial issues of TESLA will have a vital role for the doability of TESLA again due to the TEP."

As an additional final note for TESLA, again due to the TEP, the organization, owners and financial issues of TESLA will have a vital role for the doability of TESLA.

A NEW ASPECT OF BEING TSC ONLY TO BE TWO LINES

As mentioned above, due to economic reasons, there is a possibility of TSC to be constructed as two parallel lines with each capacity of 16 bcma is being discoursed. In this scenario, Russia will construct the 16 bcma pipeline to Turkish coast and then after the legislative and political issues between the EU countries solved, will construct the second parallel line up to the Turkish – Greek border. From the Greek border, gas will be transited via upgraded existing pipeline systems and reverse flows. In this case, not all but some of the Balkan countries such as Greece, Bulgaria, Romania, Italy (via the extended TAP), Macedonia, Serbia and Hungary may share the 16 bcma volume of the second line.

In this case, new costs and estimated tariffs are written below:

TSC Line 1 (16 bcma) to Turkey, Cost (billion USD): 4,2

TSC Line 1 (16 bcma) to Turkey, Tariff (USD/1000m^3): 80

TSC Line 2 (16 bcma) to Greece, Cost (billion USD): 5,4

Note: If the second line will be constructed just after the first line then the cost is estimated to be 4.5 billion USD and tariff will be around 90 USD/1000 m^3.

TSC Line 2 (16 bcma) to Greece, Tariff (USD/1000 m^3): 100

As a result, this case also seems doable according to the commercial analysis.

OTHER ROUTES

"If there will be again unsolved political disputes on the doability of TSP, then there will be two options. Which are turning back to Ukraine transit route and SSP."

If there will be again unsolved political disputes on the doability of TSP, then there will be two options. Which are turning back to Ukraine transit route and SSP.

In addition to these two options, LNG transportation and supply possibility of other markets can be a different solution for Russia as a seller.

TURNING BACK TO GOOD OLD UKRAINE TRANSIT ROUTE

As mentioned above, if the political disputes will not solved on TSP, one of the alternatives is Brotherhood Pipeline, which is one of the oldest pipeline from Russia to Europe through Ukraine.

The pipeline runs from Siberia's Urengoy gas field to Uzhgorod in Western Ukraine. From there, the natural gas is transported to Central and Western European countries. Together with Soyuz and Progres pipelines, it forms the western transit corridor in Ukraine. It crosses the Russian–Ukrainian border north of Sumy. In Ukraine, it takes gas to the Uzhgorod pumping station on the Ukrainian border with Slovakia and to smaller pumping stations on the Hungarian and Romanian borders. The pipeline crossed the Ural Carpathian Mountains and more than 600 rivers including Ob, Volga, Don and Dnepr rivers.

The pipeline is 4,500 kilometers long, of which 1,160 kilometers lays in Ukraine. Its diameter is 56 inches. The total capacity of the pipeline is 100 bcma and it has 42 compressor stations, of which nine are placed in Ukraine.

Besides the advantages of without any current capital investment, the disadvantages can be accepted as being old and disputes between Russia and Ukraine. While considering 1967 is the activation date and assuming the maximum life of a standard gas pipeline is 50 years, this line has to be replaced after 2017 for a reliable transfer. This means, no cost advantage of this pipeline is up to 2017. Therefore, an estimated extra more than 18 billion USD cost will have to be considered. By adding the new additional costs and the current disputes, this option does not seem to be selectable.

ONCE AGAIN SSP

The other alternative, which is already unofficially cancelled pipeline project, is South Stream Pipeline. It is almost the same technical aspects of Turkish Stream. The offshore pipeline is planned to carry 63 billion cubic meters of natural gas per year. It was planned to have four parallel lines with capacity of 15.75 billion cubic meters each. The offshore pipeline was planned to use pipes with a diameter of 32 inches, designed for 4,022 psi of working pressure and having the pipe wall thickness of 39 millimeters. The offshore section is expected to cost 14 billion USD.

Pipeline sections in Bulgaria, Serbia, Hungary, and Slovenia was planned to have capacity at least 10 billion cubic meters per year after the completion of the first pipeline of the project. The onshore pipeline was planned to have eight compressor stations and it is expected to cost 8 billion USD. At least, two gas storage facilities were planned to be constructed, of which one was an underground storage facility in Hungary with capacity of minimum 1 billion cubic meters and another one in Banatski Dvor, Serbia with capacity of 3.2 billion cubic meters.

From the commercial side, both SSP and TSP are estimated to have the similar benefits to the investors. So, political and market related issues will be determinant in such a case SSP to turn back. Moreover, Russia may apply only the offshore section of SSP and give up the onshore part of the pipeline due to the continuing effects of TEP.

LNG & OTHER MARKETS?

In the concept of Russia's target to bypass Ukraine in her gas export policies LNG supplies reaching to other markets via pipelines (such as China) and other pipeline projects through northern Europe to feed the central & southern Europe will not give the economical results to Russian economy as TSP and SSP.

In addition, reaching the other markets such as China is another issue that has to be considered separately. Hence, Russia is planning to sell her resources located in the eastern and central Russia. In the concept of this project, which is called as "Power of Siberia" that has a planned capacity of 38 bcma and by the end of 2018, the 2200-kilometres-long section linking Chayanda field in Yakutia with Blagoveshchensk on Russo-Chinese boarder will be completed. It is further planned to build a section linking Chayanda with the Kovykta field in Irkutsk Region (some 800 km pipeline), and a section from Svobodny in Amur Region to Khabarovsk (1000 km). This will link the Power of Siberia to Sakhalin-Khabarovsk-Vladivostok gas transmission system.[14]

As a result, LNG and other market options will not commercially take the place of planned pipelines and will not be the solution.

ANALSYS & TURKEY'S SITUATION

ANALYSIS: EUROPE

"In 2014, Gazprom Export supplied 146.6 billion cubic meters of gas to European countries. Western European countries accounted for approximately 80% of the company's exports from Russia, while Central European states took 20%. The Western European market (including Turkey) consumes the bulk of Russian exports. In 2014, Gazprom Export delivered 117.9 billion cubic meters of gas to markets in the region. The Eastern and Central European natural gas market is particularly important because of its geographical proximity to Russia. The Russian "blue fuel" takes account of about 3/5 (three-fifths) of gas consumption in the region. In 2014, Gazprom Export sold 28.7 billion cubic meters of gas in this market".[15]

This explanation above shows the importance of Russian gas for Europe. In addition, Russian supplies are a lot more important for the South Eastern European countries, due to the market share. In the concept of the Russian gas export strategy, bypassing Ukraine is a key element for further decisions. That is why; Europe (mostly South Eastern Europe) needs a new route to get the Russian gas. As men-

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"In 2014, Gazprom Export supplied 146.6 billion cubic meters of gas to European countries. Turkey is the second largest gas customer of Russia, after Germany."

tioned above, there are two main alternatives to handle the due capacity being transited via Ukraine. They are South Stream and Turkish Stream pipelines.

Mainly and officially due to the TEP, today and in the future, EU will have disagreements with both the projects. From the offshore technical designs and the economics, both projects are nearly the same. From the demanded onshore parts, where Turkish Stream officially does not have such an extension, again the disagreements will be observed.

From another view, EU needs this volume of gas, which is planned to be transported through SSP or TSP. That is why; although there is no agreement and a solution today, for both EU (buyer) and Russia (seller), a solution to be taken is expected. Hence, this unsolved demand situation will be more difficult than the agreement on one of these pipeline projects for EU.

By comparing SSP and TSP from the side of EU, politically SSP seems a better solution. However, commercially, while considering the high tariffs to transit Italy's gas through Baumgarten, seems a worse selection. Therefore, TSP can be acceptable for EU in the future.

However, at this point the main determiner will be the Turkey – Russia relations.

ANALYSIS: TURKEY

Turkey is the second largest gas customer of Russia, after Germany. In 2014 Gazprom supplied 27,33 bcm[16] gas via the existing pipelines Blue Stream (with 16 bcma capacity) and Trans-Balkan, where the total import gas volume of Turkey was 33 bcma.[17] This means more than 80% volume of Turkish gas was supplied by Russia. This means Turkey is dependent to Russian gas to sustain her energy security. Moreover, the gas power plants realized 47% of electricity production in Turkey in 2014. Although in 2015, this rate has decreased up to 36%[16] levels, natural gas effect on the Turkish electricity market is another important issue for Turkey. From the Russian side, Turkey is the second largest good customer. In such a time, when the oil and gas prices are lower than the expectations, for Russia to keep her relations prosperous with the reliable customer Turkey is important.

"In 2014 Gazprom supplied 27,33 bcm16 gas via the existing pipelines Blue Stream (with 16 bcma capacity) and Trans-Balkan, where the total import gas volume of Turkey was 33 bcma."

In this concept, TSP is beneficial for both Russia and Turkey. With TSP mainly:

- Russia
  - will find a reliable and stable transit country by bypassing Ukraine
  - will be able to reach all demanded markets with the due extensions
  - will supply Turkey gas directly, without any transmitter
- Turkey
  - will find a second direct gas supply from Russia, without a transit country
  - will put an important step on her strategy of being a gas transit center
  - will be able to find a chance to get Turkmen – Uzbek – Kazakh gas in the future
  - will have more chance for more volumes of gas supplies

As a result, TSP is beneficial and important for both Russia and Turkey. In TSP's alternative SSP, Russia has to deal with a less (economically and politically) stable transit country Bulgaria and has to finance the inner Europe part of the pipeline. In addition, she will not be able to use the full capacity of TEP although she finances the whole SSP (including onshore part). However, with the TSP, Russia will be able to reach all her demanded markets with less endeavor, money and struggle. Furthermore, the first step of the project, which is the delivery of Turkish volume, is ready to launch, This means less risk, less work, less money, making EU to think about her own gas demand and less headache.

However, recent events and their results confused both parts. Russia is attacking to the Syrian Turkmens near Turkish border, by claiming that she was bombing the ISIS. On the other side, during these unjust attacks, her aircraft's border violation made Turkey to shoot it down, to protect her own air land. The results of this event badly affected the

relations between these countries. Naturally, there occurred political risks for the doability of TSP.

Russia today, in the concept of TSP, may be studying on new alternative strategies; however, future political moves and actions will show the final results. In addition, it will not be easy for Russia to find another economic way to feed the South Eastern Europe by bypassing Ukraine and without Turkey, while TEP is not deactivated. Commerciality will also be an important factor as the politics before giving the last decisions.

From another view, the losers of cancellation of TSP will be both Russia and Turkey and also EU, if another valid solution cannot be found. However, the gainer will be US, who wants Russia to put in more struggle. (Note: Bulgaria again will be the gainer, however, from the global politics side, this fact is not considered.)

As a result, for the future steps of TSP, both Russia and Turkey have to think about the possible gain-gain philosophy other than taking sharp actions.

TURKISH STREAM OR AGAIN SOUTH STREAM?

There are public statements about the cancellation of SSP; however, there is not an official cancellation letter sent to the Bulgarian government. This currently means that there is a chance for Russia to step back to SSP again. Nowadays, the speeches and declarations of Bulgarian and Russian authorities give the signal about the studies on a shift of TSP to SSP.

By considering the onshore transportation route of Russian gas, with the already worked organizational items, agreements and funding SSP may be one step ahead compared to TSP, where its extension route TESLA is not clear, yet. However, Italy's volumes change the balances in economics and make it uneconomic for Italy to get her gas from Baumgarten, will be another issue to be considered.

As a result of the political conflicts between Russia and Turkey, there is a chance for SSP to turn back to life; however, economical, market related and legislative (TEP) items have to be cleared.

RESULTS

There are five sources for EU to meet her gas demand. First are the politically most suitable and an economic choice, which is Norway. However, the supply volumes of Norway are decreasing. The second is the Russian supplies, which are and which will be the dominant resource according to the volumes and price comparisons. Third are the North African resources that only provide gas to Spain or Italy. Forth are the possible LNG supplies with naturally higher prices. Last is the Azeri supply, which is planned to be started with 10 bcma in 2019's. While comparing these five options, Russia will be the most important supplier in the future as today.

The most important gas supply option for EU: Russian gas has three main routes to follow. Which are Nord Stream, Yamal and Brotherhood pipeline systems. Nearly 60% of Russian gas has been transited via Brotherhood pipeline system to the Europe. So, Brotherhood is the most strategic line for Russia and EU gas trade. From the technical sight, this pipeline system is old and has to be modernized with an estimated cost of more than 18 billion USD. From the political sight, Russia does not want her trade to suffer from Ukraine's unexpected actions and plans to change her trade route by bypassing Ukraine.

As the result of this scenario, South Stream and Turkish Stream pipelines are put forward as alternatives to (some parts of) Brotherhood pipeline system. With South Stream or Turkish Stream Russia will be able to feed the South Eastern Europe and some parts of Central Europe. Trans-Balkan's part of Brotherhood pipeline system will be able to be used for other gas transportations without being dependent on Ukraine.

Initially, the selected route was the South Stream, however, due to some conflicts with

"Future political moves and actions will show the final results. In addition, it will not be easy for Russia to find another economic way to feed the South Eastern Europe by bypassing Ukraine and without Turkey."

EU, Russia shifted from SSP to Turkish Stream. Doability of Turkish Stream is possible by considering the technical, resource based, commercial and market related issues. However, unsolved political conflicts will be the determiner for the future of the project.

Due to worsening relations between Russia and Turkey may be resulted in the cancellation of TSP and a step back to SSP. However, with the current conditions of SSP, this occurrence will not be possible also. In addition, such a step will be resulted in the increased interest of Turkey on other gas supplies such as more Azeri gas, Iranian & Eastern Mediterranean gas and LNG. This will also result in Russia to lose her second big and reliable customer Turkey.

Forward moves on the chessboard over the Middle East & Europe may change all the balance in the region; however, the best and doable option seems to be the TSP and 24 bcma TESLA to feed the due markets.

"Doability of Turkish Stream is possible by considering the technical, resource based, commercial and market related issues. However, unsolved political conflicts will be the determiner for the future of the project."

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ABSTRACT

SOUTHERN GAS CORRIDOR, MILESTONES AND OTHER TURKMEN GAS EXPORT OPTIONS (VIA TURKISH STREAM)

by Oğuzhan Akyener

"EU is the biggest energy importing structure in the world and Russia is her major supplier. EU energy security troubled by increasing political conflicts with Russia rushes EU to diversify her energy supplies. One of the most popular candidates for EU's future energy supply is the Caspian resources."

"According to the information giving on the map, there is an unbalanced gas equation due to total high demand and insufficient total supply potential from the Caspian (except Iran)."

EU is the biggest energy importing structure in the world and Russia is her major supplier. EU energy security troubled by increasing political conflicts with Russia rushes EU to diversify her energy supplies.

One of the most popular candidates for EU's future energy supply is the Caspian resources placed in between Russia, Azerbaijan, Turkmenistan, Iran and Kazakhstan, however, as of today (due to political reasons) only Azeri and Turkmen natural gas resources have the priority for EU's future energy security strategies. These strategies under the forth corridor concept by EU were partly realized through southern gas corridor (SGC) initiated by Azerbaijan. In such a corridor Azerbaijan is planned to be the main supplier country and to a greater extent Turkmenistan and others as well. While Azerbaijan and Turkey will be the transit countries and EU and also Turkey will be the markets in demand.

As there are no important political obstacles for Azerbaijan as the supplier, demand market or transit countries however; unreconciliated political situation of the Caspian Sea is one of the most important milestones for potential supplier Turkmenistan to flow its gas through Caspian to Azerbaijan stepping forward with the corridor since early 2000. Moreover, the political encouragements and support of EU and US, and related parties have not been enough to take tangible steps to resolve the problem.

However, in any case, even if the linkage of Turkmen gas to Azerbaijan flowing through the demand market is assumed politically possible, another important matter will be the economic fundamentals as a determining factor for consideration.

In this paper, initially by assuming the political conflicts on Caspian is resolved, success rate and future of Southern Gas Corridor will be evaluated from the view of capacity point through assessing potential shippers, and of economic parameters, then the place of Turkmen gas in SGC will be evaluated. In addition, for Turkmen gas exportation to EU, other two possible roots: through Iran & Turkey and Russia & Turkey (through new popular line Turkish Stream) will be analyzed in terms of economic parameters affecting the end market competition.

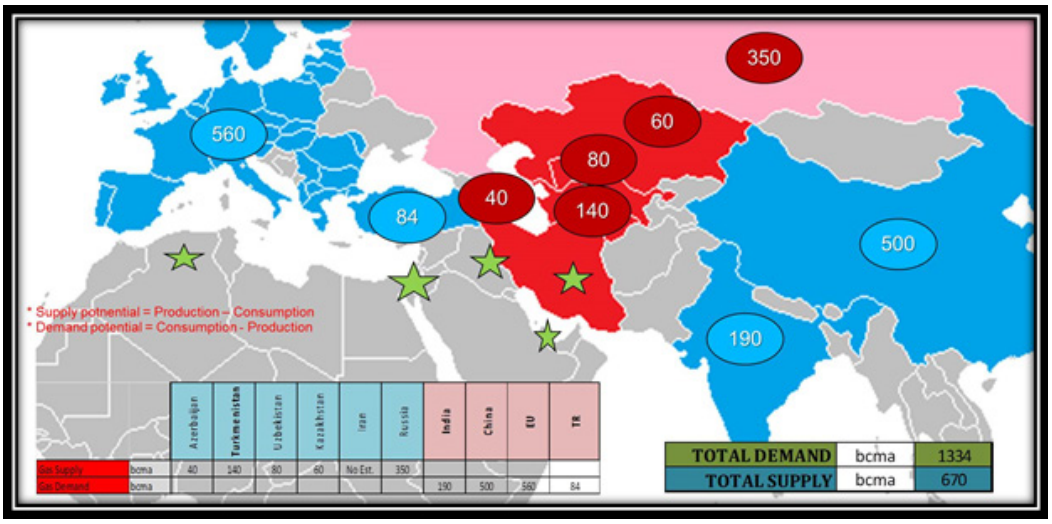
INTRODCUTION

Caspian, involving Russia, Turkmenistan, Kazakhstan, Uzbekistan, Azerbaijan, Iran, is the most important region according to the proved gas reserves potential in the world (46,3% of the world share[1]). Moreover, due to the geographical properties (being located in the middle of the important consumers; China-India-EU & Turkey), importance of Caspian region for world gas politics is increasing.

Due to the nature of the development procedures of huge gas projects, long term planning is vital for logical estimations. Therefore, at least 2035 supply and demand potentials with the economic fundamentals have to be studied.

Map 1 is giving brief information about the 2035 supply and demand potentials estimations of Caspian and related regions.

According to the information giving on the map, there is an unbalanced gas equation due to total high demand and insufficient total supply potential from the Caspian (except Iran). So, minimum additional 600 bcma volume of gas will be demanded annually in the region. This shows the increasing importance of Caspian resources and from the sight of huge demanders; "First comers will get much from the cake.". Moreover, current situation shows that due to the previous agreements and existing infrastructures EU will get



Map 1: 2035 Estimations (Demand – Supply potentials).[2]

the greatest part.

From the general sight; videlicet, middle world (including Asia & Europe) also needs Iran, Iraq, North Africa, East Mediterranean, Persian Gulf & some Pacific resources for their future gas security (So, LNG will play a key role).

After showing the unbalanced gas supply-demand potentials in the region and the struggles growing up, to focus on EU's main energy security targets related with Caspian gas resources:

- For political reasons and diversity of resources, Caspian gases have to be transported to EU.
- Initially, Azeri gas and then Turkmen gas will be transported.
- For additional supply potentials and decreasing the transportation costs, Iran – Iraq and West Mediterranean resources will be able to be adapted to the supply system.
- All transportation will be through Turkey via pipelines.

These ideas are called popularly as Southern Gas Corridor (SGC). In order to have a more coherent analysis, SGC will be divided and investigated in four stages.

SGC IN FOUR STAGES

In general, resources and planned infrastructures for SGC can be studied in four stages according to their tangibility;

SGC STAGE 1

The first stage of SGC is the delivery of Shah Deniz Stage 2 gas to EU. It is continuing. In that concept, capacity expanded SCP (SCPX), TANAP and TAP is planned to transport 10 bcma Azeri gas to EU/Italy Hub after 2018. The view of SGC Stage 1 is given in Table 1.

SGC STAGE 2

The second stage; future Azeri gas (mainly from Umid/Babek and Absheron) is planned to be transported to EU via SCPFX, TANAPX and TAPX after 2025. (Note: TAP capacity is with the maximum expandable 10 bcma, and it can be 20 bcma. So, for additional gas flow above maximum capacity, new infrastructures have to be constructed). The view of SGC Stage 2 is given in Table 2

SGC STAGE 3

The third stage as on the table projects; Iraq – Iran – Eastern Mediterranean gas is to be transported through Turkey to EU via:

- Free capacity of TANAP or TANAPX
- Possible expanded capacity of TANAPX (TANAPFX)
- Revival of NABUCCO

"The first stage of SGC is the delivery of Shah Deniz Stage 2 gas to EU as it is continuing. The second stage; future Azeri gas (mainly from Umid/Babek and Absheron) is planned to be transported to EU via SCPFX, TANAPX and TAPX after 2025."

"The third stage as on the table projects; Iraq – Iran – Eastern Mediterranean gas is thought to be transported through Turkey to EU.

Time Period To Start	After 2018
Related Countries / Political Structures	AZ (Supplier), GEO & TR (Transit), EU/ITALY (Market)
Resource	No risk (Existing proved resources in Shah Deniz Gas Field waiting to be developed. Very low reserve risks, those can be negligible.)
Finance	No risk (All shareholders have necessary finance.)
Infrastructures / Production	No risk (All are in the construction period)
Infrastructures/ Transportation	No risk (SCPX (through AZ & GEO), TANAP (through TR), TAP (in EU). All are in the construction period)
Market	No risk (Enough market capacity in Italy Hub, completed sales agreements)
Economics	Low level risk (Transportation costs, decreasing oil & oil effected energy prices.)
Political Support	No risk (Full political support from AZ, GEO, EU)
Agreements	No risk (All related agreements are signed)
Related Legislations	No risk (Legislative structures are clear and defined.)
Result	Successful
Volume (bcma)	10
Effect on EU 2035 Gas Demand (%)	Less than 2%
Future Risks & Weak Points	Due to increasing competition in EU, gas sale price might go down to unexpected levels. This decrease in sale prices may make the project uneconomic due to transportation costs.

Table 1: SGC Stage 1 analysis.

The view of SGC Stage 3 is given in Table 3.

SGC STAGE 4

The fourth stage: Turkmen gas is to be transported to EU via Trans Caspian Pipeline (TCP) and forward infrastructures in Turkey and EU.

For evaluation of all steps, political support, resources, finance, market potentials, economics, related infrastructures and related legislations (on the related period) have to be considered jointly. The view of SGC Stage 4 is given in Table 4.

All these criteria will be evaluated shortly on a standard table for each stage.

OVERALL CRITICS FOR ALL FOUR STAGES

Notes about the Table 5:

- Overall expectations are taken into consideration.
- "OK" means; there is no risk or no high risk or possible.
- "Successful" means; will be completed successfully.
- "POTENTIAL" means; there is potential for being successful.

As seen on Table 5, only the Turkmen and Iranian gas export to EU via forth corridor may be impossible due to economic reasons. This table also shows that economics is the most important item in addition to political support for such gas project to be successful.

When generally estimating the netback prices and tariffs of each stage on the Table 6, Iranian and Turkmen gas economic risks can be observed.

"Only the Turkmen and Iranian gas export to EU via forth corridor may be impossible due to economic reasons."

Time Period To Start	After 2024 (In best case)
Related Countries / Political Structures	AZ (Supplier), GEO & TR (Transit), EU (Market) (Note for EU Market: With preference due to existing infrastructure Italy or Balkan markets can be selected)
Resource	Medium Level Risk (Hence being in appraisal stage, proven reserves is not clear yet.)
Finance	Low Level Risk (Low oil prices may make contractor or AZ government to delay some investments on development projects.)
Infrastructures / Production	Low Level Risk (No risks for technology, know-how, equipment supply but risks for infrastructures completion time. Hence being in the appraisal stage, a delay in infrastructures will delay the first gas)
Infrastructures / Transportation	Low Risk (Extension of related pipelines is on the table projects and has to be studied more. SCPFX (through AZ & GEO), TANAPX (through TR), TAPX (in EU to Italy), other options to Balkan countries are planned to be used for transportation.)
Market	No Risk (Price computation will determine the end point)
Economics	Medium Level Risk (Transportation costs, decreasing oil & oil effected energy prices, competitive end market price will determine the economy)
Political Support	No risk (Full political support from AZ, GEO, EU)
Agreements	Low Risk (Market and economics will determine the risk factor, if the project is economic then there will be only some delay risks for the agreements hence the projects are in the appraise stage)
Related Legislations	No risk (Legislative structures are clear and defined.)
Result	Potential For Being Successful
Volume (Estimated) (bcma)	4-6
Effect on EU 2035 Gas Demand (%)	1%
Future Risks & Weak Points	Due to increasing competition in EU, gas sale price might go down to unexpected levels. This decrease in sale prices may make the project uneconomic due to transportation costs.

Table 2: SGC Stage 2 analysis.

Note: EU Gas price for 2018 is estimated as 400 USD/1000 m^3, all values are in USD/1000 m^3 unit. All tariff estimations are for the time period after 2018, netback values are without tax, Sta4 Turkmen gas to TR tariff value includes (75 USD for Trans Caspian pipeline and 85 USD for AZ to TR related pipeline for 1000 m^3)[3].

From another strategic view, even if all the steps are to be successfully completed (including the assumption that Turkmen gas option is possible), the total volume is lower than the 10% of EU's 2035 demand. This also shows the success rate of EU's energy diversification plans.

For Turkmen gas to be able to be exported to EU, which seems the greatest volume in the concept of SGC, hence the problem is mainly economic, other options have to be studied for better economics.

TURKMEN GAS EXPORT OPTIONS TO EU

Turkmenistan has the third biggest proved gas reserves in the region (after Iran & Rus-

Time Period To Start	After 2020 (In best case) (Assumed that sanctions on Iran are removed)
Related Countries / Political Structures	IRAN & IRAQ & ISRAEL (Supplier), TR (Transit), EU (Market) (Note for EU Market: With preference due to existing infrastructure Italy or Balkan markets can be selected, but not confined to)
Resource	No Risk (No geological and reserves risks, there are proven reserves but risks exist in available future export volumes)
Finance	Low Level Risk (Low oil prices may make Iran & Iraq governments to delay some investments on development projects.)
Infrastructures / Production	Low Level Risk (No risks for technology, know-how, equipment supply but risks for new infrastructures completion time. Hence some of the projects are being in the appraisal stage, a delay in infrastructures will delay the first gas)
Infrastructures / Transportation	Medium Risk (Possible Pipelines for Transportation: Free Capacity of TANAP according to time period / TANAPX / TANAP FX / new NABUCCO (through TR), TAPX / new standalone pipelines according to volume of gas / ITGI (in EU to Italy), other options to Balkan countries and further EU states All these projects are on the table but as distinct from the second stage, these suppliers are not the shareholders of the existing pipeline projects.)
Market	No Risk (However, price competition will determine the end point)
Economics	Low Level Risk for Iraq and Israel (Transportation costs, decreasing oil & oil effected energy prices, competitive end point price will determine the economy) Medium to High Level Risk for Iran (Production costs, transportation costs and market (end point) sales prices which makes net back value questionable do not let Iran gas to be economic for EU sale)
Political Support	No Risk (Assumed as sanctions on Iran are removed)
Agreements	Low Risk (Market and economics will determine the risk factor, if the project is economic then there will be only some delay risks for the agreements hence the projects are in the appraise stage)
Related Legislations	No Risk for Iran & Iraq, Low Risk for Israel (Antimonopoly & tax issues should be should be solved for Israel.)
Result	Potential For Being Successful (Except Iran gas via pipeline in current conditions.)
Volume (Estimated) (bcma)	Not Clear (As a general estimation: Israel: 4 bcma, Iraq: 3 bcma, Iran: only via LNG export to EU is possible and production capacity and internal consumption scenarios are not clear to be able to make estimation)
Effect on EU 2035 Gas Demand (%)	Not Clear (From Israel & Iraq 1.2%)
Future Risks & Weak Points	Due to increasing competition in EU, gas sale price might go down to unexpected levels. This decrease in sale prices may make the project uneconomic due to transportation costs.

Table 3: SGC Stage 3 analysis.

Time Period To Start	After 2025
Related Countries / Political Structures	TURKMENISTAN (Supplier), AZ & GEO & TR (Transit), EU/ ITALY or BALKANS (Market)
Resource	No Risk (No geological and reserves risks, there are proven reserves but risks exist in available future export volumes)
Finance	No Risk (According to Turkmen fiscal policy but project economics will be determining factor since all finance should be met by contractor.)
Infrastructures / Production	Low Level Risk (No risks for technology, know-how, equipment supply but risks for new infrastructures completion time. Hence some of the projects are being in the appraisal stage, a delay in infrastructures will delay the first gas)
Infrastructures / Transportation	Medium Risk (Possible pipelines for transportation: Trans Caspian Pipeline (through Caspian Sea), SCPFX or new standalone pipeline (from AZ to TR), Free Capacity of TANAP according to time period / TANAPX / TANAP FX / new NABUCCO (through TR), TAPX / new standalone pipelines according to volume of gas / ITGI (in EU to Italy), other options to Balkan countries and further EU states. All these projects are on the table but as distinct from the second stage, Turkmenistan as a supplier is not a shareholder in the existing pipeline projects.)
Market	No Risk (Price computation will determine the end point)
Economics	High Level Risk (Production costs, transportation costs and market (end point) sales prices which makes net back value questionable do not let Turkmen gas to be economic for EU sale)
Political Support	No Risk (By assuming the conflicts in the situation of Caspian Sea are solved.)
Agreements	Low Risk (Market and economics will determine the risk factor, if the project is economic then there will be only some delay risks for the agreements hence the projects are in the appraise stage)
Related Legislations	No Risk
Result	Not Possible to be Successful (Hence being uneconomic in current situations, after assuming Caspian conflicts are solved)
Volume (Estimated) (bcma)	30
Effect on EU 2035 Gas Demand (%)	5.3%
Future Risks & Weak Points	Due to increasing competition in EU, gas sale price might go down to unexpected levels. This decrease in sale prices may make the project uneconomic due to transportation costs.

Table 4: SGC Stage 4 analysis.

sia), with 9.4% of the world share of 17.5 tcm1. Moreover, in 2035 she is estimated to be able to have a 140 bcma gas export potential. Therefore, she is an important strategical supplier for the huge demanding markets in the nearby region, such as China – India & EU.

From this view, EU is making plans and continuing negotiations to export Turkmen gas for more than 10 years. However, in addition to conflicts in the Caspian status, economics is the key factor for these plans to be successful.

As observed in the sections above; Turkmen

"Turkmenistan has the third biggest proved gas reserves in the region (after Iran & Russia), with 9.4% of the world share of 17.5 tcm. Moreover, in 2035 she is estimated to be able to have a 140 bcma gas export potential."

	STAGE 1	STAGE 2	STAGE 3	STAGE 4
Resource	OK	OK	OK	OK
Finance	OK	OK	OK	OK
Infrastructures	OK	OK	OK	OK
Market	OK	OK	OK	OK
Economics	OK	OK	OK (except Iran)	NOT ECONOMIC
Political Support	OK	OK	OK	OK
Agreements	OK	OK	OK	OK
Result	SUCCESSFULL	POTENTIAL	POTENTIAL	NOT POSSIBLE

Table 5: SGC Stages overall critics.

gas export to EU through Caspian Sea – AZ – TR option is not economic. Therefore, other options have to be studied.

In this section, from the economical view, three Turkmen gas export options to EU through; Caspian – AZ – TR, Iran – TR and Russia – TR will be evaluated.

Note: Turkmen gas export to TR market is not included in calculations.

THROUGH CASPIAN – AZERBAIJAN – TURKEY OPTION3

"1442 km pipeline has to be constructed with a cost of 16 billion USD and expected tariff is 180 USD/1000 m3 for 30 bcma Turkmen gas that will be transported from Turkmen border to TR border."

	EU GAS PRICE	GAS UNIT COST	TO TR	TR-EU	E U INSIDE	NETBACK
ST1 AZ SD2	400	125	60	100	80	35
ST2 AZ ADDITIONAL	400	120	60	120	80	20
ST3 ISRAEL	400	100	40	120	80	60
ST3 IRAQ	400	70	50	120	80	80
ST3 IRAN	400	150	60	120	80	-10
ST4 TURKMEN	400	120	160	100	60	-40

Table 6: SGC Stages netback analysis.

Assuming that political conflicts on the Caspian status are solved: Turkmen gas will be transported to EU initially through a new standalone pipeline called "Trans Caspian Gas Pipeline". From AZ to TR (again assuming SCPX or SCPFX will not have enough free capacity for 30 bcma), a new standalone pipeline will be constructed, then through Turkey with a new Nabucco or a similar pipeline will be in demand.

As a result of this option, netback in Turkmen border (excluding the gas transportation cost inside Turkmenistan), after sale of gas to EU is 110 USD/1000 m^3.

Technical properties' cost, tariff analysis of the pipelines, and other related assumptions can be found in the 3rd reference given.

THROUGH IRAN – TURKEY OPTION3

In this option, transportation of Turkmen gas through Iran and Turkey is evaluated. According to this evaluation, for 30 bcma Turkmen gas, from Turkmen border to TR border, a 1442 km pipeline has to be constructed (as shown on Map 2) with a cost of 16 billion USD and expected tariff is 180 USD/1000 m^3. By adding the other transportation costs Table 7 is prepared.

Technical properties cost and tariff analysis of the pipelines and other related assumptions can be found in the 3rd reference given.

	EU GAS PRICE	GAS UNIT COST	TO TR	TR-EU	E U INSIDE	NETBACK
TURKMEN GAS VIA IRAN & TR	400	120	180	100	60	-60

Table 7: Turkmen gas via Iran to EU netback analysis.

	EU GAS PRICE	GAS UNIT COST	TO RU	RU- TS	TS	E U INSIDE	NETBACK
TURKMEN GAS VIA RUSSIA & TR	400	120	20	60	100*	60	40

Table 8: Turkmen gas via Russia to EU netback analysis.

THROUGH RUSSIA – TURKEY OPTION

In this option, Turkmen gas thought to be exported to EU via:

- Initially the existing CAC & Bukhara – Urals Pipelines (From Turkmenistan to Russia, through Uzbekistan and Kazakhstan)
- Then 30 bcma Turkmen gas will be transported through Russia inside gas pipeline system up to the start of Gazprom's new popular project "Turkish Stream (TS)"
- Through TS (Assumed as TS will successfully be completed) or the expanded versions of TS, gas is transported via Black Sea and Turkey to the EU border.

Tariff estimations of this root are given on Table 8.

This option (in the case of realization) might make Turkey a medium size trading hub together with Russian gas in terms of source and liquidity.[4]

Note: Political issues between related countries, the situations of the existing old pipelines, free capacities of gas pipeline network inside Russia (after 2020) is not taken into consideration for the tariff estimations above.

Additional Note: For the tariff estimation of TS, by using the IHS QUESTOR software for such a 30 bcma gas transportation, with 54" pipe diameter and middle quality thermal isolation material, pipeline capex is estimated as 10.1 billion USD (including the compressor stations). Then the tariff is estimated as 100 USD/1000 m^3. This cost and tariff estimation is for a standalone pipeline in the same root of ST. So, for an already existing ST, tariffs will be cheaper. However, as a worse case tariff of ST for 30 bcma Turkmen gas is assumed as 100 USD.

As seen from the Table 8 above, this option is the only economic option that can be successful.

Map 2: Trans Caspian & Trans Iran Pipelines from Turkmenistan.[3]

RESULTS & ADDITIONAL BENEFITS OF 3rd OPTION

As seen from the general economic views, according to the netback values (without tax), only the through Russia – Turkey option is coherent for Turkmen gas to be exported to EU. The other two options might be considered following the solution of Caspian conflicts and Iran sanctions but the future of those acts are unforeseeable.

This option, as an idea, has to be studied and improved and taken into consideration as a new route for SGC, although Russia will be an arbiter as a transit (pipeline owner) country. Besides, future estimations show that Russia will continue to be the most important exporter for EU. As written in BP Energy Outlook 2035 – EU & Global Reports: "EU (via pipelines) remains the largest importer of natural gas and imports from Russia that has an important remaining source of supply, growing by 15% and maintaining a market share of around 31% by 2035.". Therefore, if EU really needs Turkmen gas resources, she has to act more political.

"EU (via pipelines) remains the largest importer of natural gas and imports from Russia that has an important remaining source of supply, growing by 15% and maintaining a market share of around 31% by 2035."

In addition, with such a new gas corridor from Turkmenistan – Russia – TR to EU, possible future gas exporters such as Uzbekistan and Kazakhstan may also be added to the system as the gas suppliers to EU.

Besides, this will be the most beneficial option for Turkey, increasing importance of being a gas trading hub strategy. By this way, this hub concept will be at reach.

SUMMARY

SGC's popularity for EU and the related regions is increasing due to increasing demand of EU and other huge demander competitors such as China and India. In the concept of SGC, initially Caspian resources and additionally Iran, Iraq and Israel gases are planned to be transported to EU.

The focus on the Caspian resources states that Azeri step will be completed successfully in late 2018. However, as for the other Caspian supplier options Turkmenistan, there are no tangible steps have been taken.

Although some EU authorities claim: "after the solution of the Iranian sanctions, Turkmen gas will be exported to EU via both Azerbaijan and Iran"[5], hence being uneconomic in the current situations, these are not coherent notions.

For gas politics to be successful, although all the milestones in reserves, markets, legislations, and technics are progressed, if the projects are uneconomic, then no investor, finance and agreement steps can be taken. Therefore, in order for SGC plans to be consistent, in addition to political steps, economics have to be considered.

As described in the paper, in current situations, gas export option of Turkmenistan via Azerbaijan and Iran to EU may not be commercially possible. In addition, Iran gas export to EU, via pipeline through Turkey, is in the same situation. Thence, other commercially possible and coherent options and solutions have to be considered.

Turkish Stream, which is the changing face of Gazprom's gas export politics with the pros and cons for EU may also have positive sides with new strategic targets. Assuming TS to be completed and capacity expanded, Turkmen gas and additionally Uzbek and Kazakh gas will be able to find a chance to be transported to EU economically (through Russia and TR). Then, this option will also be profitable for EU, Russia, Turkey, Turkmenistan, Uzbekistan and Kazakhstan.

To sum up, in this paper, after giving brief information about the SGC, mainly economic concerns of the SGC stages are explained and a new approach for Turkmen gas to be exported to EU is described.

From the sight of Turkish energy policies; hence having Turkey an extended resource diversified gas market and trading hub, this approach might be a strategic energy target for Turkey to put an effort on.

Note: Special thanks to Dr. Tayfun Yener

Umucu for his remarks on Russian root for Turkmen gas.

ABBREVIATIONS

EU: European Union

RU: Russia

TR: Turkey

AZ: Azerbaijan

SCP: South Caucus Pipeline

SCG: Southern Gas Corridor

TS: Turkish Stream Pipeline

TANAP: Trans Anatolia Pipeline

GEO: Georgia

TAP: Trans Adriatic Pipeline

TCP: Trans Caspian Pipeline

ITGI: Interconnector Turkey – Greece – Italy Pipeline

"X" after pipeline name: Means extension of the related pipeline (Ex: SCPX: Expansion of SCP)

"FX" after pipeline name: Means forward extension of the related extended pipeline (Ex: SCPFX: Expansion of SCPX)

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"Assuming TS to be completed and capacity expanded, Turkmen gas and additionally Uzbek and Kazakh gas will be able to find a chance to be transported to EU economically (through Russia and TR)."

STRATEGIC APPROACHES TO UNCONVENTIONAL RESOURCES TO MEET THE TURKISH ENERGY DEMAND

by Necdet Karakurt and Oğuzhan Akyener

ABSTRACT

Increasing demand in energy makes the world revolve around it. Major oil companies have been researching all around the world as to increase reserve and production. What could we do to find more reserves? Thinking backwards is a way to discover new methodology and associated new technology. That is how unconventional methods stepped in to petroleum industry. As it is known, conventional methods are only able to extract oil from reservoirs with fair enough permeability. Unconventional methods focus on those reservoirs and or source rocks within the range from little down to micron level permeability.

What is challenging when we consider unconventional production? As known, associated technology depends on horizontally drilled wells and fracturing the rock to suck hydrocarbons out to surface. Once the horizontal wells are drilled, water is injected through by powerful pumps to crack the rock. Sand is a necessity to keep the cracks open and some chemical additives provides stability of the cracks to efficiently remove water and gas out, they also prevent bacteria growth. The amount of injected water, sand and additives play a key role since millions of tons of water and hundred thousands of tons of associated sand and additives are used in the hydraulic fracturing process. At this point two main concerns should be addressed. First, the wastewater that is pumped out during production requires high attention due to the chemicals it contains. The chemicals pose serious threats to human health and have to be handled carefully. It could be either recycled for usage in another fracking procedure or injected into a sealed reservoir to be sensitive to the environment. To define impermeable zones, which will trap re-injected wastewater, a thorough stratigraphic evaluation has to be achieved successfully. A leaking disposal formation is unwanted as it is certainly undesired to see those wastes pollute our environment. Second, it has been reported also that there has been an increase in the seismic events in those areas where unconventional technology is used. Tactfully, cracking the rock happens to affect natural balance and causes to stimulate more earthquakes. That information points out that location for unconventional wells have to be chosen far from active fault systems as fracturing might trigger earthquakes with higher magnitude.

As we elaborate Turkey's energy supplies, demands and politics regarding the subject, we might try to answer a couple of questions as follows: How much of unconventional potential Turkey has? Or, can Turkey double its proven reserves by this methodology? Answers are not complicated as one might think. Known facts about unconventional studies suggest that they require using a unique but expensive technology and raise important environmental concerns that might slightly change our lives. A few companies worldwide have the technology required for unconventional hydrocarbon production. Turkey has to pay for the expensive technology for its unconventional reserves. On the other hand, information regarding source rocks of Turkey is still questionable and poorly defined. Suitable source rocks need to be examined thoroughly as in thickness and areal extent before going too deep into unconventional business. As a result, Turkey has to carefully examine and properly define its unconventional resources before thinking that unconventional methods are the solution to ease high costs of energy import.

In this study, we share brief information from a technical window regarding global unconventional energy practices, how it affects the market, how it shapes Turkey's energy policies and further on if Turkey have enough reserves to cover its energy demands. Analysis of the technology used and its economic aspects will certainly point out how Turkey's unconventional future will change its energy supply

"Thinking backwards is a way to discover new methodology and associated new technology. That is how unconventional methods stepped in to petroleum industry."

and security chain.

INTRODUCTION

It was believed that the major oil fields had already been discovered and it was unlikely that petroleum companies would be able to succeed a reputable increase in their production. However, these companies had the urge to find another way to increase their production with the help of high oil prices, which allowed them to flexibly invest more money on the researchers. It has been known that only certain amount of hydrocarbon, produced by a source rock, is released through a porous and permeable reservoir rock. Total amount of hydrocarbon produced never equals the amount aggregated in a reservoir rock. This is due to some geological restrictions that affect migration of oil and gas out of source rock such as having micron level permeability, low overburden pressure, etc. At this point in the exploration history, researchers were aware that source rocks had great hydrocarbon potential but the question was: "How could they overcome the impermeability and suck all the oil out?".

It is well known that conventional methods exercise on the reservoir rocks that have a variety of permeability ranges from low to high enough depending on the texture of the sand minerals in depositional environment. Those who are familiar with the exploration and production practices should know the terms "Oil in Place" and "Recoverable Oil". These terms state that how much of hydrocarbon there is in the reservoir and how much of it is producible. In general, the numbers for oil in place are generally calculated as billions of barrels but those for recoverable are lowered to millions of barrels depending on porosity and permeability distribution of the rock. Conventional reservoirs with lower permeability require more effort and time and higher investment costs than those with higher or high enough permeability. Technique used is based on fracturing the reservoir level to provide flow of hydrocarbon trapped in pores. There had been successful applications of horizontal drilling in conventional reservoirs. As the rock already has some fractures, it is easy to extend them or create new cracks. This same logic could be used in tight shales but more wells had to be drilled.

Having these already applied techniques "Fracturing" and "Horizontal Drilling" on hand, researchers stimulated the idea to a higher level. As if they drilled horizontal wells through an impermeable source rock and fractured it, they could suck most of that non-recoverable oil out to the surface. And that is what they exactly did and succeeded! The only handicap was the fact that they had to drill more horizontal wells to use the advantage of cracking procedure, which is now known as "Unconventional Methods".

United States of America (USA) has become the pioneer and practiced unconventional methods for over a decade now. Statistics indicate that USA is the major oil consuming country and the largest importer in the world. However, it now increased its production by 5 million barrels after American oil companies started to develop from unconventional reserves. An important outcome of these 5 million barrels of increase is the fact that small and mid-range companies have gone under a big change and they grew their assets and succeeded a steady growth. Seeing the unconventional potential and witnessing American glory, many countries now aims to find out if they have economic unconventional reserves. European companies seem to struggle with the legislations since they are having hard time to convince European Union that unconventional practices are safe enough for the people and the environment. Countries in the Middle East such as Saudi Arabia have been doing research to guestimate their unconventional resources. China and India, which seem to be largest oil importers in the future, also have important expectations and current activities on defining their unconventional potential. In near future, we might be seeing other countries joining the profitable unconventional club.

UNCONVENTIONAL METHODOLOGY

Unconventional practices depend mainly on

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"To be able to crack almost impermeable but oil rich rock that extends a few kilometer squares, more than a few horizontal wells need to penetrate through it. That is why designing a well grid for a successful recovery is a must."

hydraulic power, which oil industry has been utilizing for the conventional low permeable reservoirs. In general, the industry used hydraulic fracturing to crack the oil rich but low permeable reservoir rocks. That process has been mostly achieved in wells drilled vertical but has also been practiced in horizontal wells drilled through a reservoir. What makes unconventional approach different is that fracturing is applied in a grid of horizontal wells that are drilled in very low permeability shales that are known as source rocks. It is essential to understand that fracturing a rigid rock requires too much pressure and success is measured as a few meters penetration around the well bore. With the new technologic enhancement, it is now possible to fracture a few hundred meters but just one well never does the job. To be able to crack almost impermeable but oil rich rock that extends a few kilometer squares, more than a few horizontal wells need to penetrate through it. That is why designing a well grid for a successful recovery is a must. Upon defining the horizontal well grid, cracking starts by injecting highly pressured water through the hole.

"Hydraulic fracturing of Marcellus Shale in 2003 changed the assumptions regarding proven oil reserves in the world. Since American oil companies started 'use of multi-well pads and cluster drilling' in 2007, oil reserves increased dramatically as opposed to the idea that reserves would diminish day by day."

Water aims to create channels between oil/gas bearing lobes throughout the rock. These channels provide flow of oil/gas into the well bore. However, overburden pressure tends to close all the cracks, which is why a mechanism to keep the cracks open is necessary. The industry uses propping agents such as fine sand and ceramic beads mixed in water. Gelling agents are also added to the water mix to increase fluid viscosity that will help sand minerals travel along with water into the cracks and stay there. Having sand minerals inside the cracks prevents channels from closing and allows the desired flow of hydrocarbons. Stabilizing flow from cracks is essential and it requires other additives such as biocides, breakers, fluid-loss additives, anti-corrosives, friction reducers and acid. All these additives are intended to overcome certain problems associated with preventing bacteria growth, decreasing viscosity and leaking off of the fracturing fluid, protecting metallic elements, allowing high pressures and flow rates and cleaning the perforations, fractures and the well itself respectively.

Fracture water is of importance since it flows back to the surface after its injection to the well. This is called flow-back fluid or wastewater. Considering the amount of injected water might exceed one million gallons per well, the amount of flow-back fluid is as huge. Additionally, it should be handled carefully since it contains harmful chemicals and heavy metals that pose serious threats to fresh water sources and environment. There are a few ways to handle this wastewater that flows back to surface after cracking. It could be either recycled for usage in another fracking procedure or injected into a sealed reservoir to be sensitive to the environment. Recycling requires a number of techniques like distillation and it could be done in either onsite or offsite. Municipal wastewater treatment plant might come in handy if there is one nearby. Some companies dilute wastewater and re-inject it but dilution and reinjection of contaminated water might clog up the well. No matter how water treatment is made, the expenses increase up to such level that makes the project uneconomic. Many companies prefer disposal wells that might cost cheaper. Regulations state that disposal wells have to be deep and wastewater has to be injected between impermeable zones. A leaking disposal formation is unwanted as it is certainly undesired to see those wastes pollute our environment. For a successful disposal process, impermeable zones, which will trap injected wastewater, have to be defined by a thorough stratigraphic evaluation.

UNCONVENTIONAL RESERVES (VALUABLE OR NOT)

Hydraulic fracturing of Marcellus Shale in 2003 changed the assumptions regarding proven oil reserves in the world. Since American oil companies started 'use of multi-well pads and cluster drilling' in 2007, oil reserves increased dramatically as opposed to the idea that reserves would diminish day by day. In the beginning of the 21st century, USA was the largest oil importer in the world. After cracking the Marcellus Shale, USA turned the table around and reached over 5 million barrels production from the unconventional reserves. And now, USA seems to be cutting

on its oil imports. What this means is the fact that USA showed the world that having the science and coupling it with the high technology may change the conscience. As a result, each country might follow the lead, do the same and explore what is underneath their borders. However, USA did this when the oil prices capped $100. Notable information states that; a barrel of oil production from an unconventional well may cost around $60, depending on the geological difficulties and technical hardships. That means many countries have to find a cheaper way to succeed the horizontal well grid in their unconventional gold.

LOOKOUT AT TURKEY'S UNCONVENTIONAL POTENTIAL

Every country that has conventional hydrocarbon production should have unconventional hydrocarbon reserves. Turkey produces oil, gas and condensate from its reserves in the South-East Anatolia and Marmara Regions. Most of its Marmara reserves consist of natural gas, whereas oil reserves are mainly located in the South-East Anatolia. Both regions are considered as potential areas for unconventional explorations and exploitations. Other regions in Turkey have some hydrocarbon potential, too. It has been reported to the national oil company (Turkish Petroleum Corporation, TPAO) that there are lots of oil and gas leaks and spills all around the Anatolia. TPAO carefully examines all the reports and has yet to find valuable reserves in those reported areas but Marmara and South-East Anatolia. That is why areas other than those two should be evaluated in another category of unconventional hydrocarbon potential, for instance, bitumen shale or shale-oil. Concept of this study focuses on 'light tight oil and gas' as for unconventional sources definition and examines Turkey's known conventional hydrocarbon resource areas.

In the USA, there are a few known tight shales such as Bakken, Eagle Ford, etc. that led to famous unconventional discoveries. Almost all of these shales contributed to the production as millions of barrels per day. A certain fact that all these formations were mapped and modelled thoroughly before oil companies prepared their horizontal drilling grids to develop from unconventional reserves. American oil companies have been producing oil and gas from their conventional reservoirs for years. All the oil and gas they produced are known to be migrated from those shales (Bakken, Eagle Ford, etc.). What can be inferred from this fact is that hydrocarbons were formed within these shales and migrated to the conventional light tight oil and gas reservoirs. As it was mentioned earlier in the introduction part of this article, not all of the hydrocarbons that were formed in organic rich shales are migrated to the reservoir rocks. Most of the oil still remained in the shales due to some geological restrictions. The most important of all can be referred as very low permeability. Putting together the information above, it is certainly worth knowing the shape and the size of the light tight oil reserves and if they have formed the oil or yet to do so. If there is hydrocarbon trapped in conventional reservoirs, it means organic material rich rock certainly formed hydrocarbons and spilled it out. Then the source rock can be mapped directly and can be characterized for its oil potential.

Turkey claims that it has great unconventional reserves laid out in Trace and South-East Anatolia Basins. In fact, the whole basins are displayed as if source rocks extend throughout those basins. This logic is due to the assumption that known source rocks in those areas are widely sedimented in those basins. However, either oil and gas discoveries or drilled wells in mentioned areas prove that these source rocks appear not to be present within the whole basins. General findings of oil exploration in Turkey states that produced hydrocarbons are sourced to the rocks as Dadas of Silurian, Karabogaz, Karababa-A member and some to the calcispheres parts of Derdere Formations of Cretaceous age. Even though findings claim that Silurian shales are potential source rocks there is very little information about their presence in the South-East Anatolia Basin. Current unconventional practices try this formation but extent of it still requires more work as far as sedimentology and stratigraphy are considered. Additionally, Karabogaz Formation seem to be

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sedimented only in certain areas even though Karababa-A and Derdere Formations can be found almost everywhere in the South-East Anatolia Basin. Specific questions remain unanswered regarding the accountability of the named source rocks since many exploratory wells turned out to be dry in the region. Three major tectonic cycles during Cretaceous, Eocene and Miocene phases play a key role to shape today's geology in the South-East of Anatolia. The cycles are due to the Arabian and Anatolian plate interactions, which apparently mingles two crustal plates and interfere very badly with the geology. Wells that produce oil are the proof of source rocks but dry wells state that there is a catch to be noted. Many explorers think that main reason for oil not to be abundant could be the overburden pressure, which may be insufficient to start organic materials to switch to kerogen. Or the in-situ temperature of the rocks is low so no hydrogen and carbon molecules are able to make a bond. Another reason could be that not all of those source rocks are really a source rock. Perhaps, only those that sedimented in certain areas had the necessary temperature and pressure to achieve hydrocarbon bonds. To have the real answer, there should be more work done to accomplish as far as knowing the areal extents and thicknesses of formations that reserves light tight oil intact.

The wastewater might as well cause problems since there is a high possibility that it may contaminate the drinking water, pollute the air and the soil.

Unconventional production requires using horizontal drilling technology and coupling it with fracturing the oil-rich tight rock. Several companies worldwide have the technology or the companies with the technology seem to be abundant but Turkey has to build its own national drilling teams to lower down the high costs of fracturing. Of course, it is still possible to buy the technology and arrange the production efficiently. Flexibility for hiring foreign professionals would be more beneficial if Turkey had invested in its unconventional potential before the oil price had dropped.

Other concerns as far as the technology goes are that chemicals and water usage are the head actors in unconventional business. Chemical additives to keep the cracks open and prevent bacteria growth are of main concerns because these chemicals pose serious threats to the environment. Water amount used in the fracturing process is huge since it averages over millions of tons per well. Companies prefer to use fresh water supplies since it is cheaper in contrast to drilling water wells. Can Turkey favor its fresh water sources to be depleted by fracturing, moreover how economic will it be? Let us say Turkey has no problems with fresh water usage and it is economic, it still has to pay close attention to contaminated water because it comes out back to surface and some gasses released to the atmosphere after production starts in an unconventional well. The wastewater might as well cause problems since there is a high possibility that it may contaminate the drinking water, pollute the air and the soil. Oil companies, in most cases, handle the wastewater carefully as some of them recycle and reuse it in another fracturing process and some prefer pumping it in disposal wells underground. Yet, there are reports that some of them are not that careful and do not dispose the water accordingly. Some disposal wells might be inappropriate due to leaky faults as there are a lot of them in the areas that are exampled to have Turkey's unconventional potential. To decide if a fault is leaking or not might be difficult since it is impossible to go underground and see it. Using available geophysical, geological and engineering data is a must and testing the disposal formation should be able to guide the companies to the right direction. However, regulations have to be in order to keep the control over the companies and the clean environment.

At last, a point that might be considered as a mild situation and needs attention is the small earthquakes caused by hydraulic fracturing. Pumping high pressured water into a solid rock surely creates cracks. Each crack stimulates a small quake as it is measured by seismometers. Thinking that many cracks are achieved during hydraulic fracturing, the number of quakes recorded increases rapidly in the areas where unconventional work is practiced. Are these quakes dangerous? Probably no, because they are very small in sizes but the point is if there is an active fault that has been drifting by huge energy load, it might, as well, be triggered by those little quakes. This is not to say that big earthquakes

are triggered by fracturing. It only is to point out what seismology states and that is a fact: 'Little forces might trigger huge earthquakes!'. Possibility of this seismological fact is that Arabian Plate is still pushing towards Anatolian Plate, which is why three tectonic stages took place in geological time frame. The interaction is known to be continued and the North and South Anatolian Faults are still active. Geological studies in the area note that some of the faults cuts through Quaternary fluvial sediments. Indeed some of the faults in that area might have had some energy load and that fracturing might fasten the energy load over a fault and might near a potential big earthquake.

STRATEGIC STEPS TO BE CONSIDERED

Each country wants to increase their oil production - reserves since hydrocarbons are the most preferred source used to cover their energy demand. Hydrocarbon usage in Turkey's energy sector is over 700,000 barrels of oil per day (bopd) and Turkey's production only covers 10-15% of the total consumption. Latest news states that USA will become an oil exporter in near future because it started utilizing its unconventional sources. This brings up the question: 'Why not Turkey should do the same?' So it is about the right time to start the challenge. TPAO, as the national oil company, had already signed an agreement with Shell and begun unconventional exploration activities in the South-East Anatolia and Marmara Regions. Even a few wells were drilled in Dadas Fm. The results are hidden at the moment but if there were good news TPAO would definitely share it with public. It looks like new strategies should be considered before going head-down into unconventional reserves of Turkey. At this point, this study aims to pinpoint the needs of a successful start or successful beginning for the unconventional.

According to technical sources or studies, Turkey has a lot of unconventional hydrocarbon potential. A few formations all around Turkey are pointed as having high to very high source rock parameters like total organic carbon (TOC) and hydrogen index (HI) values. Mezardere and Hamitabat from Thrace basin, Dadas, Karabogaz and Karababa-A member from South-East Anatolia basin, Caglayan from Blacksea Region, Karapınaryaylası from Mid-Anatolia, and Akkuyu and Ziyarettepe Formations from the South Anatolia Region are reported to have high TOC and HI values. Those formations with high source rock potential means Turkey has plenty of unconventional oil and gas waiting to be discovered. However, only two of the regions have proven oil reserves or oil has been produced. The other regions have yet to be claimed to have conventional oil reserves since there is no oil discovery. An important step should be to define the source rocks first. A rock might have high TOC or HI values but the question: 'Has it produced hydrocarbon, yet?' has to be answered. If a rock has yielded any hydrocarbon, some of that hydrocarbon would definitely migrate to a nearby reservoir. That knowledge is certain for Thrace and South-East Anatolia Basins. That might be the reason for TPAO, Shell and private companies to consider those basins for unconventional practices. A second question might come in handy since knowing the areal extent and the thickness distribution of the named formations. Have oil companies studied and mapped these formations thoroughly? It was informed that some work has been accomplished in the south east for Dadas Fm. but it was only local and probably not enough to characterize the formation. The knowledge for the proposed potential formations is skeptical because extents of those formations require more seismic work since the information only comes from the well cuttings. As a result, the first step into the unconventional adventure should start at stratigraphic and structural definition of each proposed source rock.

Turkey's drilling technology unsuits the multi well horizontal drilling and high pressured hydraulic fracturing process. Choices for Turkey are either to take the baby steps and learn from scratch as building high pressured pumps and rigs to go with that or to hire service companies to do the job. Another choice might be to find a partner with technology such as Shell and share the profit. TPAO seems to be doing this as it cooperates with

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Shell in south east and with TransAtlantic in Thrace. Hiring service companies seems to be reasonable and will provide more profit as opposed to collaborating with other companies but that will also reduce the profit because production expenses per barrel will increase dramatically. Taking the baby steps should be the main purpose of the national oil company or other private companies operating in Turkey. Waiting for the staff to gain the necessary skills and expertise means a long and painful journey. Designing and building the rigs and the high pressure pumps is never a bad idea. It will open up new frontiers for the Turkish investors and help with economy as well. If Turkish companies acquire the necessary technology and the experienced staff, they might provide services to other companies worldwide, which might drive the economy to a higher level in the long run.

Water supplies are of another concern. Turkey seems to have enough fresh water sources. It may be unfair to criticize losing its water supplies but if the wastewater from unconventional production pollutes the surface water, there might be huge concerns expected to be aroused. Legal authorities need address known allegations and prepare associated laws and regulations to prevent the unconventional pollution to the environment. Laws and regulations need to cover disposal wells, water treatment facilities and specific solutions for air pollutant gasses.

Turkey is located on Anatolian Plate, where too many seismic activities are recorded on a daily basis. Some major earthquakes happen in the strike-slip fault zones. It is possible to come across lots of faults of different geological type (Strike-Slip, Normal, and Reverse Faults) in Anatolia. High pressure hydraulic fracturing may not cause big seismic activities; however, seismology states that one small push might move big mountains. That is why active strike-slip fault zones and faults that might be triggered by these fault zones should be carefully examined.

"Unconventional discoveries succeeded in US points out that the countries with low hydrocarbon potential such as Turkey should evaluate and utilize their unconventional resources."

CONCLUSION

Unconventional discoveries succeeded in US points out that the countries with low hydrocarbon potential such as Turkey should evaluate and utilize their unconventional resources. It is well known that pioneers in any industry always struggle with the pitfalls. In this unconventional case, the process might be easier for those countries because they have the upper-hand of minimizing the risks and mistakes done in US. Any country that considers investing on their unconventional resources should assess the pros and cons to stay on the safe line for the country and the environment. Economic aspects of the hydrocracking technique should meet the expectations whereas the environment should be kept clean.

As for Turkey with very limited known conventional reserves, it makes sense to examine its unconventional potential to secure its energy supply in the future. However, as mentioned earlier, Turkey should start with considering certain facts and taking a few steps into unconventionals as listed below:

- Unconventional resources have to be studied geologically to assess their economic value. If there is no economic reserve, there is no need to invest. As of today, Turkey's hydrocarbon bearing basins and related source rocks are yet to be mapped thoroughly. To be able to define the basins and reserves, coherent analysis must be designed both structurally and stratigraphically (new seismic and wells) and such source formations should be mapped correctly at each basin.
- Comparison of unconventional production cost in US, averaging about $60 bopd, to about $ 40 bopd for conventional oil production cost in Turkey states that unconventional reserves to be found in the country have to be in great amounts to be a hope for the future. It is obvious that hydrocracking technique is a fairly new technology that Turkey has to pay for. That is why; developing the unconventional resources will never be any cheaper than the rate succeeded in US. Since the technology is expensive, the commercial risks will draw the private companies out of the picture but the governmental support such as awarding

unconventional exploration and development projects in certain potential areas might bring them back in. These awards may also include easy & long term bank loans, tax reductions, etc.

- Ensuring the safe environment should be a must for the government since the development of unconventional resources poses danger to the environment. Chemical additives used in the development process are dangerous to human health and the nature as they pollute the fresh water sources, soil and air. In USA, certain regulations were ordered by the US Senate and some other rules are waiting to be discussed. Turkey should start working on the known cases of environmental hazards caused by pollutants and rule out the terms and procedures in the process of development of unconventional sources. It will be much easier to regulate the oil companies on their work once the environmental legislation system is settled.
- Being in the center of oil and gas related global energy politics and running its industry by the most consumable energy sources as oil and gas, Turkey has to remain firm as far as having energy as the most important item in its political agenda. In the last decade, Ministry of Energy and Natural Resources (MENA) attempts to make Turkey an energy hub between oil producers and exporters. However, being a transit route alone is never enough to control or build the pipelines. In addition to all the efforts for making Turkey a transit route, MENA should be determined to establish a steadfast growth in exploration activities so that oil and gas reaches a desired importance in Turkey's political agenda. If national oil company is unable to lead the industry, MENA should encourage private companies by providing solid investment opportunities and economic support on oil and gas market especially in exploration activities.
- Current statistics regarding Turkish Petroleum Corporation (TPAO) states TPAO's financial situation, experience and technology are insufficient to handle such an uptrend in unconventional exploration and production. MENA should affirm national and international investors to carry the flagship in unconventionals.
- In the case of successful unconventional reservoir discoveries, more service companies for drilling and well completion will be necessary. MENA should clarify any allegations that such companies might encounter under current laws while entering the country.
- An important part of unconventionals is the utilization of fresh water. MENA should regulate plans for fresh water usage and handling the wastewater produced during unconventional development stage.
- Micro earthquakes are of another important concern since Turkey lays on active fault systems. Securing Turkey's future before starting the fracturing shale reserves should be definitely considered. MENA should define a safe tremor scale for fracturing especially nearby active fault systems.
- At last, the oil price is the key element for unconventional investments to be able to continue or stop.

Two scenarios can be derived depending on whether or not the above items are applied:

THE WORST CASE SCENARIO: (AS THE ITEMS IN THE LIST ABOVE ARE NEGLECTED)

National oil company, TPAO will be the main and only actor investing on unconventionals, which means investment capacity is limited to TPAO's own resources. Considering TPAO's current investments and financial situation being very negative, and current low oil prices, it is unlikely that TPAO will favor great investment to the unconventional activities. Being inflexible to invest more TPAO might double its current production number from conventional reserves by adding unconventional resources, which will be estimated as about 0,5 bcma of unconventional gas production and about 30000 bopd of unconventional oil in 2035's.

"If national oil company is unable to lead the industry, MENA should encourage private companies by providing solid investment opportunities and economic support on oil and gas market especially in exploration activities."

THE BEST CASE SCENARIO: (AS THE ITEMS IN THE LIST ABOVE ARE APPLIED)

If MENA succeeds the above list items, there will be more company involvement for investing on unconventional resources. More investment will provide better exploration results and draw the success rate to a higher level as it happened in US. Too many companies (small-mid-large scale) utilized different unconventional basins in US. The production increased 10 times higher than the conventional production. Supposing Turkish government applied the list items presented above, production rates will definitely increase 10 times higher than the current production rates. Estimations will be 5 bcma for unconventional gas and 350,000 bopd for unconventional oil in 2035.

Assuming oil prices will be at again $100 levels after 2020 (if not happens earlier), Turkey's unconventional investment portfolio should be as follows:

BETWEEN 2015 AND 2020:

- Unconventional resources should be defined properly. Each basin and reservoirs should be mapped structurally and stratigraphically.
- Rules and regulations should be written and ready until 2020.
- Economic models should be prepared for the potential reservoirs.

BETWEEN 2020 AND 2025:

- 2020 should be the start for the investments since the oil price will be high enough to extract the unconventional oil and gas.
- MENA should call for the national and international investors.

BETWEEN 2025 AND 2035:

- This interval will be the time to develop the market and adjust rules and regulations as the market grows.
- New laws should be mandated as necessary.

In conclusion, minimum 20 years needed to define the possible resources. An additional 30 years needed to organize a suitable investment environment, which will help investors to develop the resources and turn into production. As it is clear, unconventionals have to be a long term strategy to be followed and the benefits will be rewarding after the first 20 years of 50 years in total.

"In conclusion, minimum 20 years needed to define the possible resources. An additional 30 years needed to organize a suitable investment environment, which will help investors to develop the resources and turn into production."

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TURKEY'S ENERGY STRATEGIES AND POLITICS RESEARCH CENTER (TESPAM)

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