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Upstream Petroleum Law and activities in Turkey

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HIGHLIGHTS

- New Turkish Petroleum Law has been introduced in 2013.
- Turkey has the highest drilling activity in Europe, considering rig counts in 2014.
- Turkey's third production peak may rise from unconventional resources or offshore.

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ABSTRACT

The new Turkish Petroleum Law has been introduced in 2013. The legislations and incentives regarding the new law are explained and the upstream petroleum sector of Turkey has been evaluated in all aspects, in this paper. The historical development of the industry together with the related law in Turkey is also discussed. The important points in the law about the investment guarantee, exploration license, production lease, royalty payment, foreign staff status, incentives and etc. are mentioned in detail. The overview, background and present condition of the Turkish upstream industry are analyzed with statistical data and with forecasts. The outlook of the drilling and production activities along with the geological and geophysical studies in Turkey is presented. The potential hydrocarbon areas in Turkey are mentioned beside the regulatory. It is expected that the exploration activities in Turkey will increase as the consequence of the new law. Remarkable discoveries are expected from offshore and/or unconventional activities.

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1. Introduction

The structure of this article is as follows: Section 2 reviews the remarkable points of the Petroleum law. Section 3 includes statistical information and details of exploration and production activities about the upstream petroleum sector of Turkey. The discussion of the results is the subject of Section 4. Finally, Section 5 concludes the subject and makes some suggestions for the future studies.

The petroleum industry is still keeping its popularity today. It is one of the most important and widely discussed topics in organizations worldwide. The petroleum sector is composed of three major divisions: upstream, midstream and downstream. The upstream sector is composed of the exploration, drilling and production activities differing from the midstream and downstream sectors that include the transportation, storage, processing, refinery and the marketing stages. The upstream oil sector has been very active during the last decade due to the rising oil prices and technological development.

The governments periodically publish new regulations to meet the needs of developing sector. A new law has been introduced by the Turkish government in 2013 to follow the trend of the sector, especially for shale oil & gas activities. The new law has been approved on 30/05/2013 by The Grand National Assembly of Turkey and has become effective as of the date of 11/06/2013 with the law number “6491” upon being published in the Official Gazette of Turkey. The implementing regulation of Turkish Petroleum Law has also been published on 22/01/2014 at the Official Gazette by the Ministry of Energy and Natural Resources of Turkey. The objective of this regulation is to regulate the procedures and principles related with the implementation of the Turkish Petroleum Law which includes 29 articles. The implementing regulation has 53 articles. The Turkish and English version of the law and implementing regulation can be accessed at the web site of The General Directorate of Petroleum Affairs (GDPA): www.pigm.gov.tr.

There is still very limited publication about the upstream oil sector of Turkey in the literature. Aydin and Acar (2011) have evaluated the effects of oil price on the Turkish economy and Turkish oil sector. They have concluded that the exploration activities may increase in the Black Sea and Mediterranean Region, despite the negative effects of high oil prices on Turkish economy.

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Aydin (2012) has given statistical information about Turkish upstream sector from an economical and the legal point of view. He has mentioned that the evolution of Turkish upstream sector depends on a new regime of fiscal incentives. For the overall purpose of this study, not only the information about upstream petroleum activities of Turkey is given, but also the summary of the new Turkish Petroleum Law has been discussed.

The old Turkish Petroleum Law, a liberal law of its enactment date, had been introduced in 1954. The law regulated the upstream, midstream and downstream petroleum activities, in general opening them to domestic and foreign private companies. Turkish Oil Corporation (TPAO) had been established and assigned for exploration & production activities on behalf of the State. Downstream activities handled separately in the Petroleum Law had been arranged within the Oil and Natural Gas Market Laws since 2001. As a result, old Petroleum Law, consisting of 139 articles, has lost its applicability and it contradicted to several existing regulations (fiscal regime, custom regime, tax etc.) due to changing conditions in time. It had been valid until 2013 with some minor changes.

Historical development of the old law had shown fluctuations. It had been affected by political winds during the legislation period. Sometimes, alterations had been issued as forced by nationalist winds like those in the period of 1974–1984 (when Cyprus war was followed by an embargo on Turkey's fuel imports). Sometimes, liberal changes had been underway due to the encouraging winds of 1950–1960 and 1980's.

The new "Turkish Petroleum Law" which provides many incentives and implementations, has been introduced in 2013. The purpose of new law is to provide a competitive, transparent, equal, reliable and stable environment for investors. The General Directorate of Petroleum Affairs (GDPA) which is in charge of implementing the law is a sub-division of the Ministry of Energy and Natural Resources in Turkey. The Directorate has been established in 1954 to grant licenses, direct, supervise and audit in the upstream and downstream sectors as a government authority. After 2001, GDPA has become the responsible authority only for the upstream petroleum sector.

It is obvious that the Petroleum Law of each country is shaped to base on the hydrocarbon potential and geological structure of the country. Because Turkey has relatively low hydrocarbon potential and challenging geological conditions in the region, the new Petroleum Law has been formed as an incentive and attraction medium. As a result, the new law is believed to accelerate the upstream activities by attracting the domestic and foreign investors, international oil companies. The upstream petroleum activities of Turkey are mostly performed by the national oil company, Turkish Oil Corporation (TPAO), up to now since 1954.

2. Overview of the new Turkish Petroleum Law

In this section, main parts of the new Turkish Petroleum Law are reviewed. Regulations, incentives, restrictions and other issues regarding the law are briefly discussed.

2.1. Investment guarantee

The oil company has to pay some investment guarantee in accordance with the new law. This is 2% for onshore drillings and 1% for offshore drillings, of the portion of the turnover stated in the investment program of the drilling activity. By this practice it is aimed to overcome speculations caused by some third parties involved in the process just for license trade, so that the real entrepreneurs may take part in the sector and make more competitive investments. The amount of the investment guarantee for underexplored blocks or unconventional resources might be reduced by Ministry of Energy and Natural Resources depending on the investment program.

2.2. Exploration license

The borders and sizes of the territories covered in exploration licenses are designed according to international geographical grid system to provide suitable maintenance of records and well-organized upstream sector. License boundaries are based on map sizes. Maximum size is set for the 1/50,000 scaled sheet (average 56,000 hectares) and minimum size is set for the 1/25,000 scaled sheet (average 15,000 hectares). There are some other conditions. The 1/50,000 scaled sheet must cover onshore activities and territorial waters. For the offshore work in exclusive economic zone, maximum license boundaries of the area are extended by 1° both in latitude and longitude (to cover average 1 million hectares). The minimum size to be encountered in the license in such zones will fit a 1/100,000 scaled sheet on condition that the area stays within the limits of 1° extension (to cover 250,000 hectares in the average).

The schematic view of license application map can be seen in Fig. 1 (GDPA, 2015). Green squares and red squares on the map show the exploration application areas on the land and offshore areas, respectively. Blue lines indicate the exclusive economic zone in the Black Sea. There is an agreement between Turkey, Russia, Ukraine, Romania, Georgia and Bulgaria regarding the Black Sea borders.

There is still no consensus on the exclusive economic zones of the Mediterranean Sea between Turkey, Greece, Israel, Northern Cyprus, Southern Cyprus, Palestine, Egypt, Libya, Lebanon, Syria and of the Aegean Sea between Turkey and Greece. This fact also affects the exploration activities in these areas, especially in the Mediterranean Sea which is considered to include potential hydrocarbon deposits.

The black dots in the map shows the locations of wells drilled. It is clear in Fig. 1 that the drilling and production operations are concentrated on two regions of Turkey. The north-west part of Turkey, called Thrace Basin, hosts mostly natural gas activities; on the other hand, crude oil activities are mostly at the south-east part of Turkey (South Eastern Anatolian Basin).

The validity term of licenses has been set 5 years for onshore and 8 years for offshore cases in order to give sufficient time for exploration or drilling activities. Onshore license term can be extended twice each for duration of 2 years. Offshore license term can also be extended twice each for 3 years. In case of hydrocarbon discovery, licenses can be extended for another 2 years in order to provide for commercial evaluation.

2.3. Production lease

In case of an oil discovery within the scope of the exploration license, production lease is granted to the license holder. Production leases are granted for a 20-years period and can be extended twice, each for 10 years, depending on the productivity performance of the operation field. The border and size of the leases are similar to that of exploration licenses mentioned before.

2.4. Royalty

1/8 (12.50%) royalty is to be redeemed, based on monthly oil and natural gas production. The royalty calculation basis is the 'market price' for crude oil and 'wholesale price' for natural gas. However, royalty does not cover the hydrocarbon quantity used for exploration and production activities of the oil company (e.g. enhanced oil recovery application or power generation at the field site).

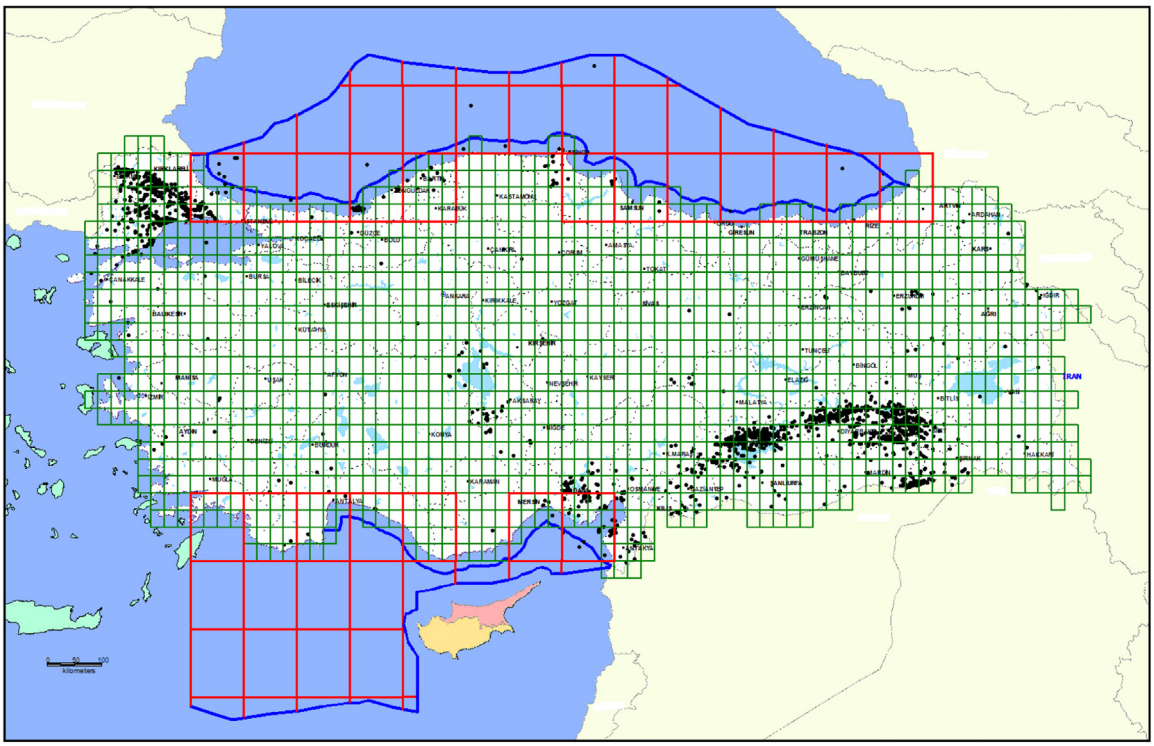

Fig. 1. Petroleum license application map for Turkey. (For interpretation of the references to color in this figure, the reader is referred to the web version of this article.)

2.5. Foreign staff

In the new law, there are also incentives for the working permit of foreign personnel. Employment of foreign personnel will be exempted from the procedures of the Ministry of Labor and Social Security in case the foreign staff is staying only for 6 months or a shorter period. This permission is issued by the Ministry of Energy and Natural Resources. For the staying durations extending 6 months, the oil company has to apply to the Ministry of Labor and Social Security for the working permission of its foreign personnel.

2.6. Incentives

There are tax reductions in the customs on goods to be utilized in the petroleum industry, as an incentive. The imports of casing, drilling rig, drilling pipe and equipment, seismic equipment, drilling bits, vehicles and chemicals used in the exploration operations are all exempted from VAT (value added tax); however, they all include VAT if they are used for the production operations. Service contracts are exempted from stamp taxes for both exploration and production operations.

The tax reduction is also applied for the fuels (such as gasoline, fuel oil, natural gas and etc) used in the petroleum activities including geological and geophysical surveys, drilling and production activities and etc. The petroleum companies have exemption for the value added tax (VAT) and the private consumption tax (PCT) for the fuel consumed in drilling operations. These taxes compose almost 60% of the fuel price in Turkey. For production operations however, petroleum companies have exemption for only the PCT which makes about 45% of the fuel price.

2.7. Other issues

Besides the aforementioned topics regarding the new Petroleum Law, there are also other regulations in the law. Depleted underground crude oil and natural gas reservoirs can be used as storage facilities by the petroleum right holders for the downstream sector under the permission of the Ministry.

In the new law, the competition offer method is also introduced in article-6. The open blocks with high hydrocarbon potential can be closed to routine licensing system and these areas will be announced to the public by the Ministry for free competition. Conditions of these applications are set in specifications in advance. The applicant that has submitted the most satisfying work and investment program will be the winner of the tender.

The new law has also changes that cover rising local and global environmental concerns in article-22. Petroleum right holders have to take required measures regarding protection of environment and cultural properties. These measures should take into account all their operation path to follow the disposal water flow from well to surface, from surface to well or from one formation to the other which might also change the reservoir dynamics.

Moreover, petroleum right holders should inform local people on all aspects of their operation as introduced in the implementing regulation of the law. Petroleum right holders are obliged to reshape the land to its previous form upon completing their operations. They have to compensate for the damage that they have given to third persons as the consequence of their operation. Down payment is compulsory for the companies in order to meet damages that might have occurred. It is 1/10,000 of the registration dues per hectare of the survey permit, 1/1000 of the registration dues per hectare of the exploration license and 5/1000 of the registration dues per hectare of the production lease. Dues are determined annually by the Ministry of Finance.

Certain fines are issued in cases of prohibited actions, violation of registration rules and missing commitments. Exploration license and production lease could as well have been canceled for 1 and/or 2 years.

3. Overview of the upstream petroleum activities in Turkey

More than 250 oil companies have performed operations in Turkey from 1954 until today. 77% of these are foreign companies

(GDPA, 2015). However, about 70% of the drilling activities, 75% of the productions, 70% of the geological surveys, 68% of seismic studies and 95% of the gravity & magnetic surveys have been performed by TPAO up to now. Until now, about 4500 wells have been drilled in Turkey which is quite low as compared to that of other countries. 42% of these wells are exploration wells, 40% are production and 18% are extension wells. Total depth is more than 8.2 million meters and average drilling length per well is about 1850 meters. More than 350,000 km 2D and 18,000 km^2 3D seismic data have been acquired from the beginning until now. About half of the seismic activities have been carried out on offshore and the other half on onshore. Based on these studies, crude oil and natural gas has been discovered in 203 fields (129 crude oil and 74 natural gas fields) till now. The production statistics about Turkish upstream sector are given in Table 1, Figs. 2 and 3 (GDPA, 2015). The crude oil production meets 7% of Turkey's crude oil consumption and the natural gas production meets only 2% of the natural gas consumption (WEC, 2013). However, the shale gas exploration activities in the Thrace Basin region of Turkey and the shale oil exploration activities in the southeastern region may alter this situation in the long term. Moreover, the rising offshore activities in the Black Sea and the Mediterranean Sea may make contribution to the production in future. These shale potential formations and offshore block areas are virgin zones geologically in Turkey and have indications of good potential. There are only six deep (one by TPAO and others by joint ventures) water drilling operations performed in the Turkish continental shelf of the Black Sea up to now that have been realized during the last decade. Exploration activities have been conducted by TPAO in a joint venture with other companies; British Petroleum (BP), Chevron Corporation, Exxon-Mobil, Petrobras and Shell at five different wells. The total cost of these six wells have been more than 1.4 billion US dollars that have resulted in some evidence of crude oil and natural gas but with no commercial value. The shallow offshore drilling activities at the west part of the Black Sea have resulted in natural gas discovery and production afterwards. Few drilling operations in the Turkish continental shelf of the Mediterranean Sea have been performed on shallow waters to result in no discoveries of importance.

The digital copy of all underground data regarding upstream activities is kept at GDPA. There are more than 30,000 well & field data and more than 3000 cuttings and core samples present in the GDPA, which can be reached by the petroleum companies upon payment of related costs. These archives can provide valuable information for the petroleum companies willing to make investment in Turkey.

The historical crude oil and natural gas production curve of Turkey is presented in Figs. 2 and 3. It can be seen that there are two production peaks in the Fig. 2. The first peak is in 1969 mostly due to the discovery of Batı Raman crude oil field in 1961 and Şelmo in 1964 and some other fields. The Batı Raman field is the biggest crude oil field of Turkey and is also known as an important one in the literature. The field has 18° API degree heavy crude oil. The discovered recoverable reserve is 185 million barrels and the field is still in production. The second production peak is in 1991 as a result of the discovery of Karakuş, Güney Karakuş and Kuzey Karakuş crude oil-fields during 1988–1990. It has a total of 130 million barrels of recoverable reserves. Both of the fields are located in the southeast part of Turkey. It is also evident that the productions make peaks after some years following the discovery since the development of the hydrocarbon fields takes some time. In the light of all aforementioned, this is the question to be answered: is the crude oil production curve of Turkey showing the Hubbert curve behavior (Hubbert, 1956) or will the Turkish petroleum sector be able to see the third production peak? The third peak may rise as the result of the unconventional petroleum resources or offshore productions, because the discovery of new and giant conventional crude oil onshore fields is not expected any more by experts.

Table 1
Proven petroleum reserve data of Turkey (GDPA, 2015).

Petroleum type	Total reserve	Recoverable reserve	Produced amount	Remaining recoverable reserve
Crude oil	8000	1350	1010	315.3
Natural gas	883.1	706.3	529.7	176.6

Reserve data units for crude oil and natural gas are in terms of million barrel and billion cubic feet, respectively.

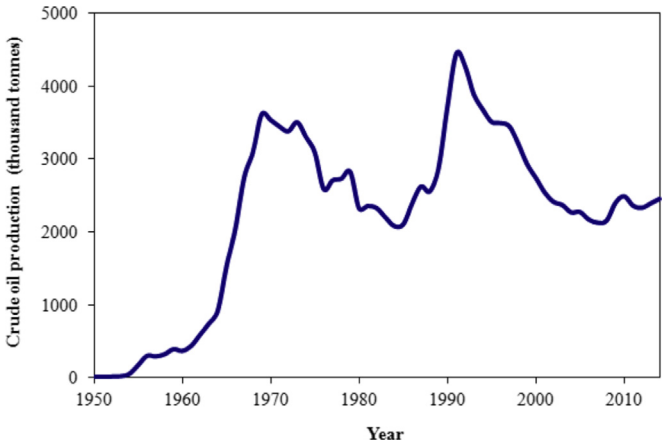

Fig. 2. Historical crude oil production of Turkey between 1950–2014.

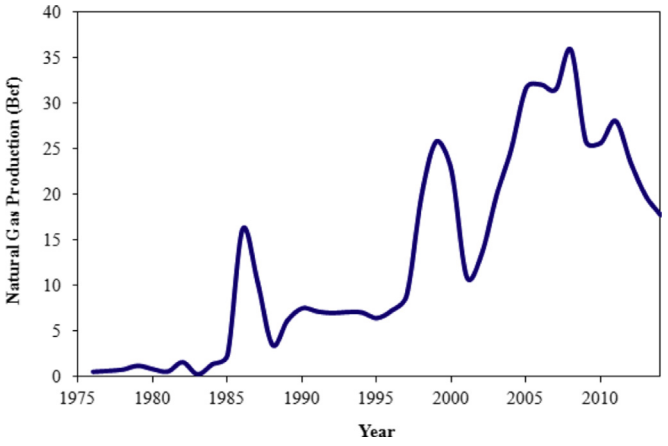

Fig. 3. Historical natural gas production of Turkey between 1975–2014.

The crude oil production in Turkey is actively performed at more than 1300 oil wells and daily production is about 46,400 barrels from 129 oil fields currently (GDPA, 2015). The quality of produced crude oil is determined by its API (American Petroleum Institute) gravity which is inversely proportional to specific gravity. Generally, API gravity values range from 10 to 70. As API gravity increases, the quality of crude oil increases. In Fig. 4, the API distribution of Turkish crude oils is given. Turkish crude oils rank generally in the medium quality range (GDPA, 2015). The natural gas production in Turkey is performed at more than 230 gas wells and daily production is about 1.5 million m^3 from 70 gas fields, at present.

There are only 10 crude oil fields having grade “B” or higher among the 129 crude oil fields in Turkey, based on the classification of Ivanhoe and Leckie (1993). The information about these

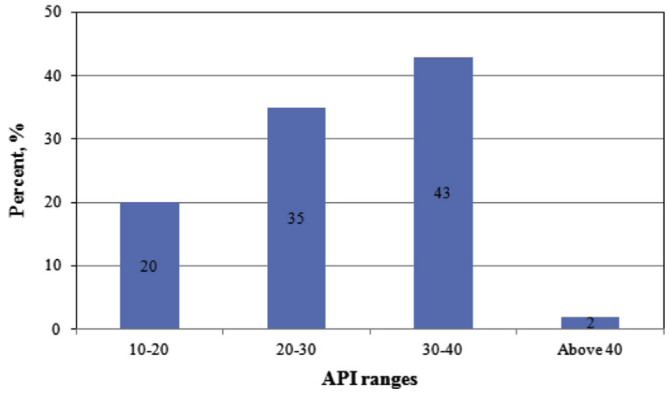

Fig. 4. The distribution of crude oil fields in terms of API gravity in Turkey.

crude fields is given in Table 2 (Ediger, 2000). The number of small-tiny fields are so numerous and scattered throughout the southeast region of Turkey as the result of the collision of the Anatolian plate and the Arabic plate caused by the tectonic movements. The notable oil fields of Turkey are presented in Table 3 (GDPA, 2015). They are mature fields producing for a long time. Some of them have been in production longer than a half-century period, some more than a quarter century.

The number and reserve levels of natural gas fields in Turkey are very low. The average recovery rate for crude oil fields in Turkey is about 20% (GDPA, 2015). It is 80% for natural gas fields. The low recovery rate for oil fields is mainly due to viscous and low gravity crude oils and poor reservoir pressure support mechanisms. Although water injection is performed at all fields, the recovery rate is still low. In some fields, some enhanced oil recovery projects are being implemented. In the Batı Raman oil-field, CO_2 injection is being performed. Chemical/polymer flooding is being performed in several other fields. Recently, steam injection has also been performed in the Batı Raman oil field. However, the profitability of the project is questionable; instead, it is mostly viewed as a research project.

4. Results and discussions

4.1. Drilling activities

Despite poor reservoir/geological conditions of Turkey mentioned in Section 3, the drilling activities in Turkey in 2014 has formed 1% of the world total reported in the annual rig count report of Baker Hughes oil field service company (Baker Hughes, 2014). Turkey has the highest drilling activity in terms of rig counts across the European Countries (excluding Russia). Turkey has about 40 active drilling rigs during each month of the year. In Table 4, the detailed information about the active rig counts of European countries and worldwide information is presented (Baker Hughes, 2014). Drilling activities in Europe have formed 4% of the world total, with Turkey having 30% share in the drilling activities among the European countries, in 2014.

Table 2
Classification of oil fields discovered in Turkey based on Ivanhoe and Leckie's technique (Ediger, 2000).

Field grade	Recoverable reserve (MMbbl)	Field name	Turkey total
AAAAA	> 50,000	Megagiant	–
AAAA	5000–50,000	Supergiant	–
AAA	500–5000	Giant	–
AA	100–500	Major	2
A	50–100	Large	5
B	25–50	Medium	3
Others	< 25	Small-Tiny	119
Total			**129**

Table 3
Information about the notable oil fields of Turkey (GDPA, 2015).

Oil field	Discovery year	Reserve (MMbbl)	API gravity
Raman	1945	100–500	18
Batı Raman	1961	100–500	13
Kurkan	1963	50–100	31
Bayı Kayaköy	1964	50–100	34
Beykan	1964	50–100	33
Şelmo	1964	50–100	34
Karakuş	1988	50–100	30
Garzan	1951	25–50	24
Kayaköy	1961	25–50	38
Kuzey Karakuş	1990	25–50	29

Table 4
Average of rig counts in Europe and worldwide in 2014 (Baker Hughes, 2014).

Country	Avg. active rig counts
Albania	6
Austria	3
Crotia	2
Czech Republic	2
Denmark	2
France	3
Germany	4
Hungary	2
Italy	5
Lithuania	2
Netherlands	9
Norway	17
Poland	5
Romania	12
Turkey	41
United Kingdom	16
Europe–others	14
Europe – Total	145
World	**3578**

The state-based upstream petroleum activities constitute the majority of the oil business in Turkey. Moreover, the joint projects of TPAO and Shell Company on shale oil explorations (mainly by horizontal drilling and hydraulic fracturing) in the southeastern part of Turkey and deep offshore drilling operation in the west part of Black Sea are the latest developments in the Turkish upstream petroleum sector.

4.2. International organizations

The introduction of the new law has started to render good outcomes. For example, 23rd World Energy Congress will take place in Istanbul in 2017. This big organization takes place in every 3 years with more than 5000 delegates. 6th World Forum on Energy Regulation has taken place in Istanbul in 2015. This event also takes place in every 3 years. In 2014, American Association of Petroleum Geologists (AAPG) had arranged International Conference & Exhibition in Istanbul with the participation of hundreds of delegates. To host energy related conferences & activities (as called the Energy Olympics) in this decade will bring a good reputation for Turkey in the energy & petroleum sector. New collaborations between Turkish oil companies and foreign oil companies are likely to occur in the future.

4.3. International activities of TPAO

Beside the activities for the advertisement of the new Petroleum Law and Turkish petroleum sector, it must also be declared that the 60-year upstream activity of TPAO, the state based oil company has provided many benefits for the company and country (TPAO, 2014). International activities have made TPAO an important actor in the region since the early 1990's. TPAO conducts its international activities especially in the Caspian Region (Azerbaijan, Kazakhstan), North Africa (Libya) and Iraq. TPAO has been continuing to negotiate for business opportunities in other hydrocarbon rich regions such as South America, Russia and the Middle East. TPAO is currently a participant of two exploration, development and production projects which are Azeri–Chirag–Guneshli (with 6.75% share) and Shah Deniz (with 19% share) in Azerbaijan. Most of the international production is from Azeri–Chirag–Guneshli Project located in offshore Azerbaijan. In addition to the Azerbaijan projects, some of the TPAO's production in that region had been supplied from Kazakhstan fields. TPAO had used to conduct its activities in Kazakhstan by a joint venture with the company KazakhTurkMunai (KTM) Ltd. in which TPAO holds a 49% share and KazMunaiGas has 51%. In 2014, TPAO has transferred its shares to Kazakhstan part and left the project. Additionally, in 2014 TPAO has acquired 49% share in Hungarian oil company MOL's production field in Baituganskoye, Russia.

Within the scope of international projects, TPAO had also taken place in hydrocarbon exploration and production projects in Libya from 2000 to 2011. Because of the Libyan Crisis that has occurred in 2011, TPAO has left the projects in this country. On the other hand, since 1994, TPAO has been working closely with the Iraqi Ministry of Oil for exploration, development and production opportunities in Iraq. TPAO has signed Development and Production Service Agreement for several crude oil and natural gas fields in Iraq in 2011. Besides, TPIC (Turkish Petroleum International Company), Subsidiary of TPAO, has its exploration and drilling activities in the Gonzalez and Maria Conchita Blocks in Colombia.

In addition to upstream activities, TPAO is also active in the other parts of the oil sector. It has 6.53% share in the Baku–Tbilisi–Ceyhan (BTC) international crude oil pipeline. The 1768 kilometers long pipeline starts at the Sangachal Terminal near Baku in Azerbaijan, crosses Georgia and terminates at the Ceyhan Marine Terminal (Haydar Aliyev Terminal) on the south-eastern Mediterranean coast of Turkey. The pipeline is supplied by oil from Azerbaijan's Azeri–Chirag–Guneshli oil field in the Caspian Sea. The pipeline is managed by BP. TPAO is also a shareholder in the South Caucasus Pipeline (also known as: Baku–Tbilisi–Erzurum Pipeline, BTE pipeline) with 19% share. The 692 kilometers pipeline is a natural gas pipeline from the Shah Deniz gas field in the Azerbaijan sector of the Caspian Sea to Turkey. It runs parallel to the Baku–Tbilisi–Ceyhan pipeline. The operators are BP and State Oil Company of Azerbaijan (SOCAR).

The upstream and midstream activities of the state based petroleum company of Turkey in the region have attracted the international companies for possible collaborations in Turkey. The company also opens ways for the introduction of the Turkish petroleum sector abroad with its exploration & production activities.

The upstream activities of the state based petroleum company of Turkey in the region have attracted the international companies for possible collaborations in Turkey. The company also opens ways for the introduction of the Turkish petroleum sector abroad with its exploration & production activities.

5. Conclusions and policy implications

This study focuses on the new Turkish Petroleum Law and Turkish upstream petroleum sector. The upstream petroleum statistics regarding rig counts in Turkey shows that new Turkish Petroleum Law has an increasing effect on the activities. The advertisement of new law in the international congresses, symposiums, and etc by Turkish bureaucrats will predictably make some contributions to the Turkish Upstream sector in the long term. This may lead to some new agreements between the national oil company, Turkish Oil Corporation (that has already signed some with British Petroleum, Chevron Corporation, Exxon-Mobil, Petrobras and Shell) and the international oil companies in the exploration activities in the region.

Throughout the 60 years of upstream petroleum history of Turkey, a number of local, international and national oil companies have operated and more than one billion barrel of crude oil and more than five hundred billion cubic feet of natural gas have been produced. The crude oil activities have focused mostly on the southeast part of Turkey whereas natural gas activities mostly on the northeast part of Turkey. Between the years 1954–2013, the old Petroleum Law had experienced several changes because of the fluctuations in the political winds. The discoveries of important crude oil fields have lead to production peaks in two different times. However, the production tends to fall year by year because of the maturity of producing in the oil fields in Turkey. On the other hand the third production peak may as well occur due to the future upstream activities.

It is expected that the exploration activities in Turkey will increase by time in the next decade due to increasing global petroleum demand, increasing oil prices despite some fluctuations, increasing exploration investments. The process also will hopefully be helped by the new law. Remarkable discoveries are expected from offshore and/or unconventional activities owing to the geological conditions and geological history of Turkey that has made conventional reserves ruptured and scattered. The third production peak may result after ongoing exploration activities. Turkish upstream sector has already reached the highest drilling activity level among all the European Countries.

Global technological improvement and economical requirements during the last decade make upstream sector very profitable. This trend will likely keep its stability due to rising energy consumption worldwide. Depleting conventional reserves push petroleum companies search for unconventional resources. Apart from shale gas/oil or tight gas/oil resources, the other unconventional resources in Turkey such as oil shale at the western and central Anatolian region, gas hydrates at the Black Sea, coal bed methane at the northern Anatolian region and asphaltites at the southeast part of Anatolian region are important alternative fossil fuels. They can be utilized for hydrocarbon production in the coming future.

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References

Aydin, L., Acar, M., 2011. Economic impact of oil price shocks on the Turkish economy in the coming decades: a dynamic CGE analysis. Energy Policy 39, 1722–1731.

Aydin, L., 2012. The economic impact of petroleum royalty reform on Turkey's upstream oil and gas industry. Energy Policy 43, 166–172.

Baker Hughes, 2014. Worldwide Rig Count Report.

Ediger, V.Ş., 2000. Probable developments in the twenty first-century petroleum industry and possibilities for Turkey. TAPG Bull. 12 (1), 1–17.

GDPA (General Directorate of Petroleum Affairs), 2015. Ministry of Energy and Natural Resources. ⟨www.pigm.gov.tr⟩.
Hubbert, M.K., 1956. Nuclear energy and the fossil fuels 'Drilling and Production Practice'. Spring Meeting of the Southern District. Division of Production, American Petroleum Institute. Shell Development Company, San Antonio, TX. pp. 22–27.
Ivanhoe, L.F., Leckie, G.G., 1993. Global oil, gas fields, sizes tallied, analyzed. Oil Gas. J. 91 (7), 8–91.
Turkish Oil Corporation (TPAO), 2014. Petroleum Sector Report.
World Energy Council – Turkish National Committee, 2013. Energy Report.