WHAT DO UNCONVENTIONAL RESOURCES MEAN FOR TURKEY: ENERGY INDEPENDENCE OR LESS DEPENDENCE ON IMPORTS?

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What are the unconventional resources? Is Turkey rich enough in terms of them? And is Turkey doing enough actually for understanding and exploring for these resources? What should we do for these resources in Turkey? Can Turkey become an energy independent country, or is it all about being less dependent on the energy resources imported? These are all the questions that I tried to explain in this study.

The Shale Revolution began in North America in the early 2000's, which changed the position of US in its world energy policy and resulted in a huge interest for these resources all over the countries in the world such as China, Argentina, England, France, Poland and Turkey should be among those countries. The main reason why Turkey should be keen on exploring unconventional resources is that there have been researches and studies done by institutions like U.S. Energy Information Administration (EIA) and international companies such as Transatlantic and Valeura Energy, for the promising probability of these resources being in Turkey. Even though there have been studies going on by Turkish Petroleum for these resources, I think that their effort is valuable but not quite well enough and I think few people in the country do understand the importance of these resources for Turkey but cannot or do not do much about it.

UNCONVENTIONAL RESOURCES

I think the term "unconventional" might not have been known well enough in Turkey. From a fluid type point of view, unconventional resources are the same as oil and gas that we produce conventionally from rocks known as reservoirs. In fact, the term unconventional refers to all resources that are different than the conventional resources in terms of many aspects such as formation of hydrocarbons, extraction method, rock properties and so on. Although it is not well described, these unconventional resources generally are said to be composed of Shale gas, Shale oil, Tight gas, Tight oil, Gas hydrates and Coal bed methane. In Turkish press or other publications in Turkey, you may have seen that the term "Rock Gas or Oil" have been used. In this research, I only talked about shale gas and shale oil in Turkey.

Conventional oil and gas are produced from certain type of rocks where porosity and permeability are high enough. In other words, such rocks are referred to as reservoirs and they are capable to transmit oil and gas without any stimulation such as hydraulic fracturing. In such reservoirs, fluids exist from top to bottom as gas, oil and water. On the other hand, the unconventional shale oil and gas are

hydrocarbons that are sourced and produced from the same petroleum system with conventionals, but from a different rock type which can be seen through Fig.1. These rocks are referred to as shales. If a shale is rich enough in organic matter, it is referred to as Source Rock. Despite of conventional reservoirs, it is very difficult to extract oil and gas due to their very low permeability, porosity and transmissibility of fluids. Besides, the fluids exist from top to bottom as water, oil and gas which is just the opposite of a conventional system. To have economic flow rates, extended horizontal drilling and multi stage hydraulic fracturing may be strongly needed dependent on the resource properties.

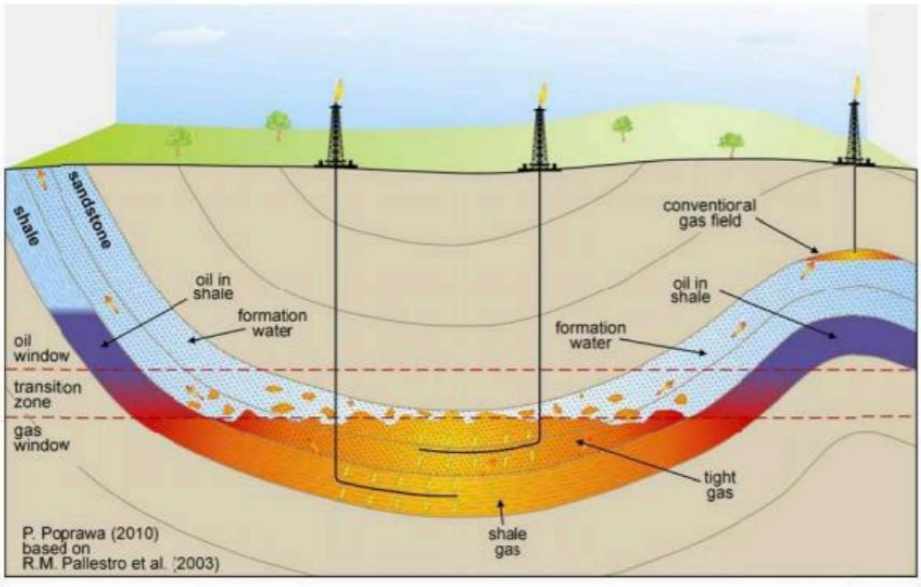

Figure 1: Conventional and Unconventional Resources in a Petroleum System. The distinction is made by the presence of free water. (Derman, 2017)

POTENTIAL OF TURKEY IN TERMS OF SHALE OIL/GAS

There are number of geological basins in Turkey that have been considered to be potential for shale oil/gas exploration as seen through the Fig. 2. Of these basins, Southeast Anatolian basin and Thrace basin are thought to be promising based on the geological, reservoir and production data obtained due to conventional oil/gas production that has been taking place years in those basins. Because of limited data with regards to Salt Lake and Sivas basins, it can only be said that these two basins may have some shale resources but need exploration wells, more geological and geophysical understanding. Therefore, in this study, I focused more on the Southeast Anatolian basin and Thrace basin for potential shale resources.

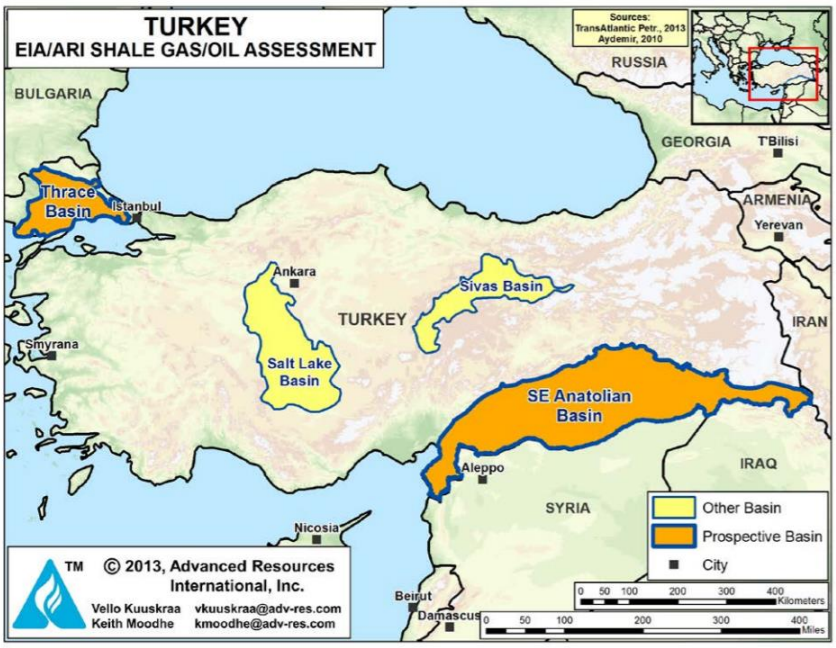

Figure 2: Major Shale Basins in Turkey. (EIA, 2015)

In a report done by U.S. Energy Information Administration in 2015, it is said that Dadas Shale in the SE Anatolian Basin and the Hamitabat Shale in the Thrace Basin preserve 24 Tcf technically recoverable shale gas resource out of 163 Tcf shale gas in place. Furthermore, it is also estimated by the same agency that these two basins have 4.7 billion barrels considered as technically recoverable shale oil resource out of 94 billion barrels of shale oil in-place.

Additionally, the SE Anatolian Basin, which covers a large, 32,100-mi^2 area in South-eastern Turkey, composes of the Silurian Dadas Shale located in the central basin portion of the basin as shown by the Fig. 3 (EIA, 2015). The SE Anatolian Basin is fundamentally an active oil prone basin with approximately 100 oil fields from which 40^o to 50^o API gravity oil have been produced (EIA, 2015). There have been many oil/gas exploration activities run by TPAO and some international companies such as Anatolia Energy and TransAtlantic Petroleum explained by the Fig 4.

TPAO, the Turkish National Oil Company, and Shell drilled the Saribugday-1 well in South Anatolian basin in order to test the Dadas Shale. After completing operations in this basin, Shell wanted to exit the project due to many reasons such as the low flow rates, low oil prices and new government regulations (Derman, 2017). Furthermore, Anatolia Energy drilled their first Dadas Shale evaluation well that was Caliktepe-2 on their Bismil lease area in early January, 2012 (EIA, 2015). It was reported by TransAtlantic Petroleum that flowing gas and light oil from their two Dadas Shale test wells were recorded, Goksu-1 and Bahir-1 (EIA, 2015). TPAO also said that their Oiksor well produced 152 barrels of 60^o API gravity oil during a three-hour test in the Dadas Shale (EIA, 2015).

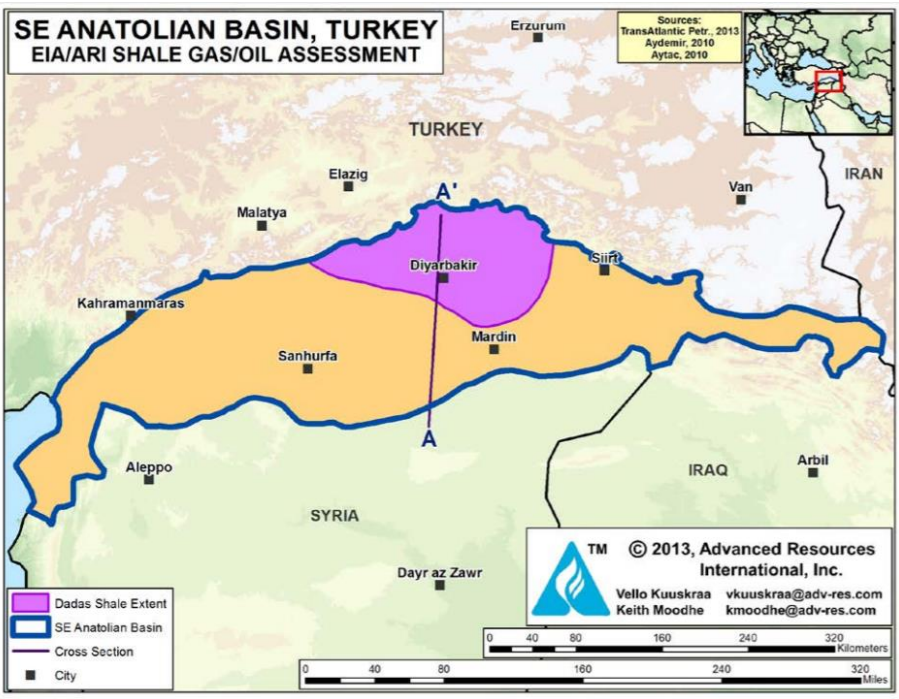

Figure 3: Geological Assessment of Southeast Anatolian Basin in Turkey. (EIA, 2015)

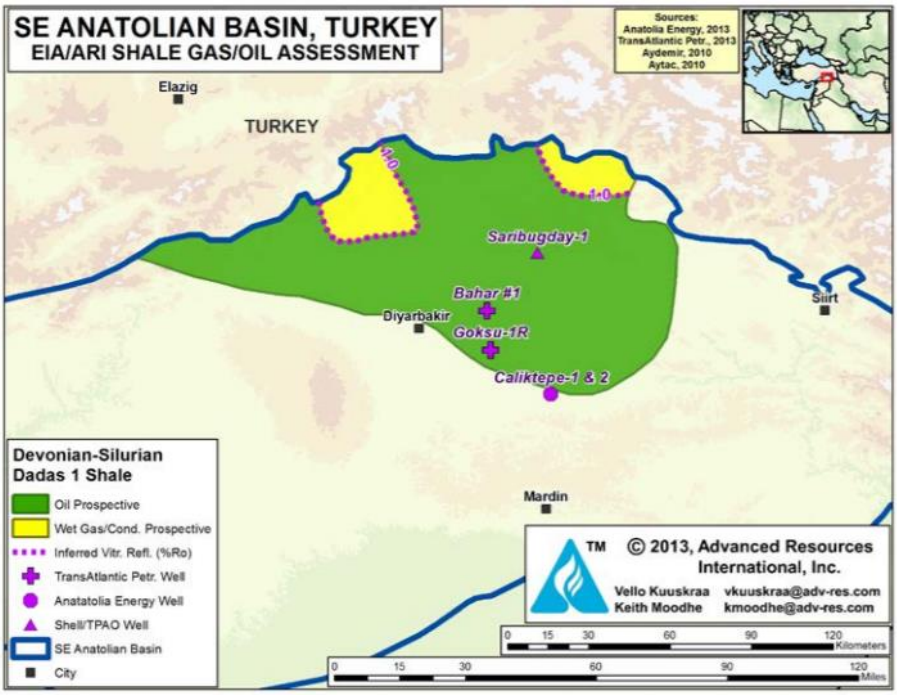

Figure 4: Shale Oil/Gas Activities in Southeast Anatolian Basin in Turkey. (EIA, 2015)

Moreover, the Thrace Basin, which covers a 6,500-mi2 area in the European portion of Turkey as can be seen by the Fig. 5, has approximately 350 wells drilled in thirteen gas fields and three oil fields, which makes the Thrace Basin essentially a tight sand gas play, fed by adjoining and deeper shales

(EIA, 2015). Much of the activity in the Thrace Basin is for tight gas, particularly by TPAO and some international companies such as TransAtlantic Petroleum and Valeura energy. However, there are recent activities targeting the potential of shale oil/gas resources in Thrace Basin.

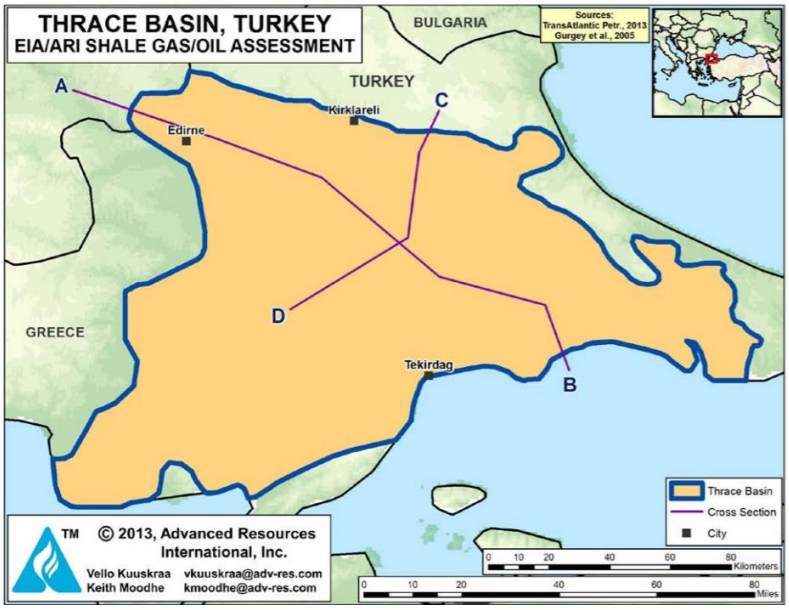

Figure 5: Geological Assessment of Thrace Basin in Turkey. (EIA, 2015)

WHAT TO DO NEXT IN TURKEY FOR SHALE OIL/GAS

There are number of operations that should take place in the oil and gas industry. As it is known that Turkey imports approximately 97% of its natural gas consumption and 90% of its oil consumption. In addition to this, Turkey have been having a trade deficit of approximately 50 billion dollars until 2017 and had about 30 billion dollars of trade deficit in 2018. Oil and gas imports account for most of this trade deficit. This shows that Turkey must pay most of its attention in order to decrease this deficit. Unfortunately, in my opinion, Turkey has not done it yet. As an example of this, up to date, there have been over 40000 wells drilled in the state of Texas, USA while Turkey has approximately 8000 wells drilled in the history of the country. As far as this issue is considered, Turkey has not put enough effort in exploring oil and gas fields including both conventional and unconventional resources in order to decide whether Turkey is an oil/gas country or not. We need to drill more and work with people that are knowledgeable in this field.

For the unconventional resources, we also need hydraulic fracturing operations provided by only international companies that could result in bills worth billions of dollars that Turkey might have to

pay. What I understand from this is that Turkey should have its national oil company, TPAO, working on developing itself for its own hydraulic fracturing operation unit. Unless we do these operations ourselves, it will not help us make a lot of profit from the resources that may be have found in Turkey. With this, I would like Turkey to have the following decisions made in order to have a sustainable and realistic energy policy;

- Form a national oil and gas institute that is composed of knowledgeable people from national local companies, universities and oil and gas related non-governmental organizations
- This national oil and gas institute must not be only formed and supported by the Ministry of Energy and Finance but also supported by the presidential office essentially
- This institute must also work to assess the unconventional resources such as shale oil/gas and methane hydrates on land in Turkey as well as offshore coasts, especially Mediterranean and black seas where Egypt, South Cyprus, Israel and Lebanon have found massive reserves of natural gas
- As we obtain more knowledge, the institute should organize national conferences in order to share ideas and developments

This list can be extended as a result of more thoughts and discussions. To sum up, Turkey is doing nothing enough in exploring oil/gas conventional and unconventional resources itself. The answer the question in the title which was what do unconventional resources mean for Turkey: energy independence or less dependence on imports? is I do not know, because there are a lot to learn, discover and to do before even thinking to make a statement about that question. This country, unfortunately, did not do much in its history with regards to oil/gas exploration.

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