Multiple petroleum systems starting from Paleozoic through Triassic, Jurassic, Cretaceous and Tertiary exist in Kuwait contributing to its huge oil and gas reserves. Of these, only Jurassic and Cretaceous petroleum systems are contributing to production and large areas and stratigraphic sections are underexplored. With the aim to work out total petroleum system of Kuwait and to quantify the type and amount of hydrocarbons expelled from the effective source rocks, 3D compositional model with migration was run considering all possible source rock from Paleozoic to Mesozoic section.

Major effective source rocks are Qusaiba, Jilh, Sargelu, Najmah and Makhul while minor source rocks are Upper Qusaiba, Khuff, Sudair, Kra Al-Maru, Minjur, Marrat, Hith and Ratawi Shale. The Silurian source rock (Qusaiab) is not penetrated by drilling in Kuwait but it’s likely to be preserved in Western Kuwait and Offshore. It is modeled to have expelled all its potential since 175 and it is over matured in the present. The Triassic source rock Sudair, Kra Al-Maru, Jilh and Minjur) are expected to have expelled 90% of their potential since 135 MA. Presently these are in the wet-dry gas window. The Jurassic source rock (Sargelu, Najmah and Hith) have expelled 80% of their moveable hydrocarbon potential since 60 MA. They are in the light oil and condensate window presently. Cretaceous source rock (Ratawi Shale) has expelled 70% of its potential since 53 MA and it is still in the oil window.

The 3D compositional modeling was carried out for minimum, most likely and maximum scenarios for total organic content (TOC) and source thickness based on available geothermal data and kerogen type –II. The Total hydrocarbons are derived from 3D compositional basin model and 6 kinetics classes (C1, C2-C6, C6-C14+, C14+ Sat, C6+Aro and NSO). Thus each of the source rocks was subjected to six expulsion scenarios in million Tons. The volumes in million tons were converted to BBL and TCF taking into consideration the reservoir properties of each petroleum system. The migration efficiency was applied to the these volume to estimate the Original Oil In Place (OOIP).

The study has provided leads for Yet To Find volumes available and impetus for increased exploration efforts of the deeper reservoirs. The model is suggestive of a high potential for gas discoveries from Jurassic and deeper plays.