The Pre-Khuff section of Qatar is composed of a thick sequence of siliciclastic sediments, which are estimated to be approximately 7500 feet in thickness. Six wells to date have penetrated the Pre-Unayzah (Hercynian) Unconformity in Qatar, with three of these being localized on the Dukhan structure. The most recent well, Jasseseyah-1, tested gas from the Unayzah and Jauf and has validated a working Pre-Khuff hydrocarbon system in Qatar.

The three deepest Pre-Khuff penetrations in Qatar reached total depths in the Qasim Formation, and demonstrate a stratigraphic succession and hydrocarbon system comparable to the prolific Paleozoic Hydrocarbon System of Saudi Arabia. The main source rock of the system is the Early Silurian Qusaiba Shale, which is expected to underlay the entire Qatar Area. The Qusaiba Shale averages about 750 feet in thickness, with a well-developed “hot shale” at its base.

The two primary Pre-Khuff reservoir targets are sandstones of the Early Permian-Late Carboniferous Unayzah Formation and the Early Devonian Jauf Formation. Both reservoir units are very well developed in Qatar, with the Unayzah having up to 300 feet of net reservoir thickness and the Jauf up to 200 feet of net reservoir. Both sandstone units contain characteristic illite/chlorite grain coatings, which have effectively inhibited quartz cementation at higher burial depths.

Potential top seals for the Pre-Khuff include the Lower Khuff shales and anhydritic dolomites for the Unayzah and the transgressive “D3B” shale for the Jauf. Additionally, locally developed internal seals within the Unayzah may provide effective seals. Traps include basement-involved culminations along the Qatar Arch as well as salt-induced structures to the east and west of the Qatar Arch.

The main risks to the play are considered to be top seal development and integrity, structural timing, and trap definition due to poor seismic imaging of the Pre-Khuff section.