

Sequence stratigraphic study and play fairway analysis of the Lower Goru/Sembar Formations of Mubarak Block, Pakistan

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The Mubarak Block is situated in the Middle Indus basin, about 300 km to the northeast of Karachi, Pakistan (Fig. 1). The main objective for exploration in this block is the Lower Goru/Sembar Formations of Cretaceous age. Sequence stratigraphy approach was used to better understand the depositional history of the Lower Goru/Sembar Formations and subdivide them into sequences and was subsequently used to model the possible play fairway. The study is based on well data, associated biostratigraphy, core reports, well completion report and about 3,000 line-km 2D seismic data of new vintages acquired in 1999, reprocessed and old data over the block area.

After the widespread deposition of the Chiltan Formation platform carbonate in the area, a deepwater basin was developed to the east of the block into which the Sembar Formation and Lower Goru Formation were deposited (Fig. 2). This progressive in-filling of the basin from the east resulted in sedimentary packages that show oblique and sigmoidal clinoform geometries on seismic. Well data corroborates this interpretation of basin in-fill where wells to the east of the block show gross intervals of about 1,000 m whereas the same interval is not seen in well Kandra-1 to the west of the block. In its place the zone is interpreted to be replaced by a thin condensed marine shale. It is then interpreted that sands encased in marine shale encountered in the deeper part of the basin was deposited as part of lowstand fan system and their

correlative shallow-marine/non-marine facies was deposited to the east. Subsequent in-filling of the basin from the east to west deposited the majority of the Lower Goru sand in a narrow shallow-marine shelf setting.

Gross Depositional Environment maps were generated. This together with a geological model was used to predict lithofacies and lithologies. From these, a Common Risk Segment map, highlighting areas of common risks was generated. Play Fairway maps can then be constructed from a series of risk maps to show areas or corridors of low risk (Fig. 3).

Some general conclusions that could be reached are: (1) play fairways are relatively narrow and do not always stack vertically, (2) a number of stratigraphic prospects have been identified for different reservoir levels within the block and (3) there are no independent roll-overs in the block so all structural traps requires a minimum of three seals to be successful.