Production and Economic Characteristics of a portion of the Cleveland Sand horizontal play in southern Ochiltree County, Texas

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This talk discusses the production and economic characteristics of a portion of the Cleveland Sand horizontal play in the Texas Panhandle based on the statistical evaluation of horizontal wells drilled between late 2007 and the end of 2010 in a 100+ square mile study area in the southern part of Ochiltree County, Texas.

Statistical evaluation methods are becoming common place in evaluating "resource plays". While geology remains an important consideration to resource plays, statistical evaluations have become a useful tool to help predict the economics of a play when geologic variability makes it difficult to accurately predict reservoir properties. The Cleveland reservoir is a upper Pennsylvanian (Missourian) age fine grain, fluvial-deltaic sand derived from the Cimmaron Arch & Amarillo uplift to the west & south of the Study Area. The primary direction of deposition is from the the west of the Study area into basinal deposits to the east. The sands occur from 7000' TVD on the western side of the Study Area to 8000' TVD on the eastern side. Porosity ranges from <5% -15% and permeability is generally less than 1md with net pay thickness of 10' to 40'.

Monthly production was analyzed for 73 horizontal wells that were drilled between late 2007 and the end of 2010. Decline curves and normalized monthly production plots were prepared on all of these wells. A type well/average well within the Study Area will come on at an average rate of 250-275 BOEPD (based on peak monthly production & peak normalized production) and will have an EUR of 130-155 MBOE for an average well in the Study Area. A statistical evaluation of the production data from all of the wells indicates that there is a 90% probability that a well in the Study Area will produce at least 60 MBOE and a 10% probability that a well will produce more than 275 MBOE.

The average well will produce 130 MBOE and the mean well will have a 40% probability of making 155 MBOE. However, when comparing various drilling and completion attributes to EUR it becomes clear that the newest wells are making better wells, even though the earliest wells appear to have been drilled in areas having better sand quality based on net sand maps. Each year lateral lengths have increased, as has the amount of frac sand pumped per foot of lateral and the number of frac stages. While it is difficult to see a direct correlation between anyone of these attributes it is clear that peak production rates as well as EUR's have increased with time. Wells completed in the last year of the study have a peak production rate of almost 280 BOEPD (versus -195 BOEPD in the 1" year) and have an average EUR of almost 160 MBOE (versus 140 MBOE for wells completed in the 1" year). Also, production rates at 6 months and one year are significantly higher in the newer wells than in the initial wells.

It appears that, with the exception of the potential of additional improvement associated with frac techniques, we are probably approaching a state of diminishing returns associated with increasing the length of the lateral, as well as the number of frac stages. Also, there are ;'0 apparent indications of new drilling techniques that may provide substantial cost savings associated with the drilling of these wells. Based primarily on a statistical evaluation of the play. and assuming the use of drilling and completion techniques utilized in most of the wells completed in 2010; it

appears that there is a 90% probability of completing a future well in the Study Area that will make at least 64 MBOE (which should correlate to a 15%-20% rate of return) and that there is a 25% probability of drilling a well that will make more than 200 MBOE. The average future well drilled in the study area should recover 137 MBOE from depths of less than 8000'TVD.