Structural Models:
Getting the most out of the Pillar Grid

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The pillar grid is the cornerstone to constructing structural models which are commonly used to represent sedimentological configurations, volume calculation and reservoir simulation. Generally, it forms a highly flexible method for representing most structural and stratigraphic aspects of our reservoirs. However, there are limitations, which if understood, we can avoid issues and at the same time maximise the benefits of the 3D pillar grid. The main constraint of the pillar grid is cell orthogonality, which is sometimes ignored by modern-day geo-modellers. This often results in both excessive run-times and unknown calculation errors in reservoir simulations. The main use of pillar grids is for running reservoir simulations; therefore, cell orthogonality is important for both simulation speed and accuracy. Although volume calculations are equally important, they are less dependent upon grid orthogonality vs accuracy issue.

By far the most effective input to constructing a high-quality and efficient pillar grid is to use a structurally consistent interpretation. This can be defined as faults and horizons which have been interpreted together, where the fault planes as near planar, the horizons are relatively noise-free, faults are interpreted first, fault branch-lines are actually interpreted, and the horizons are mapped up to the faults (stopping at a well-defined fault cut-off line). Starting with a consistent structural interpretation means that the model building phase has minimal adjustment of the faults and horizons. Not only does the model represent, as closely as possible, the seismic image, the structural model is of the highest quality and the structural modeller avoids significant time-sinks.

Any constructed pillar grid needs to use pillars that do not cross within the reservoir zone and any changes to between adjacent pillar vectors are minimal. Providing this has been achieved, a pillar grid will maximise cell orthogonality. However, this principle can often create conflicts with the structural interpretation, especially when adjacent faults have opposing dip directions. Several methods are available to help these situations, which will be discussed in the presentation: large boundary faults can be modelled as truncation surfaces rather than a discrete fault, Y faults can be handled either as stair-step faults, verticalized faults, as a transmissibility effect only or in the worst case, omitted altogether. Planning and forethought are highly beneficial when constructing a structural grid.