Baker Hughes geomechanics experts use our proprietary GMI•ModelBuilder™, GMI•SFIB™, and GMI•FaultSeal™ software to build 3D models of fault reactivation potential based on accurate knowledge of pore pressure, and in-situ stress orientations and magnitudes. These models can be used to predict the risk for reactivation due to injection or production and hydrocarbon column heights.

Avoid risks that compromise the reservoir and production
Producing or injecting in a reservoir can lead to changes in the local stresses and reservoir pressure, causing formerly “dead” faults to become active, and thus hydraulically conductive. Locally induced fault activation in the reservoir or in the surrounding rock can lead to shearing of wells that cross the fault, channeling of injected and produced fluids along or across the fault, loss of sweep efficiency, and environmental risks of surface eruptions of hydrocarbons, aquifer contamination, and induced seismicity.

Features and benefits
- Fault map of leakage potential
  - Identify areas where leaks are likely
  - Avoid drilling active portions of faults
- Fault map of critical pore pressure
  - Determine safe injection pressures
  - Avoid induced seismicity

Develop 3D workflows for fault reactivation
Baker Hughes geomechanics experts derive initial reservoir stress and strength information from seismic data and offset wells, which are then resolved on 3D and/or 2D seismically mapped fault surfaces to determine the proximity of the faults to shear failure. We provide the slip potential of each fault, in addition to calculating the maximum pressure change required to reactivate any portion of a fault. The output can be provided digitally to plot attributes on the fault planes in a 3D viewer. When providing our fault leakage analysis, our experts work closely with you to ensure the integration of our analysis with more traditional fault-seal methods that use shale-gouge ratio, juxtaposition, and/or membrane sealing to assess the fault’s sealing potential.

Breakthrough of the injected and produced fluids can occur at pressures significantly lower than the least principal stress. Baker Hughes geomechanics experts can predict these events by understanding both the initial stress and reservoir conditions, as well as any changes in stress and pore pressure around the faults due to production or injection. Our results make it possible to design production strategies that minimize the risks of unwanted events, while at the same time maximizing the value of the asset under production.
Predict hydrocarbon column height

By building the geomechanical model, our experts can assess the reactivation potential of reservoir-bounding faults. The maximum hydrocarbon column that can be maintained by a fault is dependent on the position along the fault where the reservoir intersects the fault surface, the water phase pore pressure in the reservoir, the orientation of the fault, and the stresses resolved on the fault surface. Faults that are well-oriented to slip in the present-day stress field with reservoirs that have high water-phase pore pressures are likely to leak and therefore are more likely to have smaller or nonexistent hydrocarbon columns. Faults that are poorly oriented to slip and have lower water-phase pore pressures are more likely to have significant accumulations of hydrocarbon. These faults are also more likely to be capable of withstanding significant drawdown and depletion pressure changes, and less likely to present drilling problems when drilled through.

Ensure accurate decisions

Our geomechanics experts conduct a quantitative risk analysis (QRA) of uncertainties associated with determinations of stress magnitudes and orientations, pore pressure, and fault orientations. Based on uncertainties in the input geomechanical model, the QRA provides realistic estimates of uncertainties in predictions. This knowledge allows our geomechanics experts to recommend appropriate measurements and analyses that will most efficiently reduce the uncertainties to manageable levels.

To find out how our geomechanical modeling for fault reactivation can reduce environmental risks and protect your reservoir, contact your Baker Hughes representative or visit us online at www.bakerhughes.com/geomechanics-consulting