

Geothermal and Hydrocarbon Exploration in the Upper Rhine Graben – Competition and Cooperation

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ABSTRACT

The Upper Rhine Graben (URG) in Central Europe is known to be a cradle of hydrocarbon exploration and production since 1734. The development of deep drilling for hydrocarbons and electrical well logging started here. Due to the high geothermal gradient and the demand of renewable energy in the URG geothermal exploration and production is becoming more and more important in the last 20 years. Several target formations such as Muschelkalk, Buntsandstein or Rotliegend are subject of exploration for both industries and geothermal and hydrocarbon exploration licenses superimposing each other. However, major differences in exploration strategies exist and the cooperation between hydrocarbon and geothermal exploration can help to solve common geological, technical and stakeholder management challenges. Here we will show examples of pragmatic and fruitful cooperation between geothermal and hydrocarbon exploration which may serve as best practice between the industries. Exploration strategy Geothermal exploration is seeking high temperatures and very high flow rates. Therefore hydraulic conductive fault zones are typically addressed in hydrothermal projects. On the other hand, hydrocarbon plays in the Upper Rhine Graben are often related to fault-bounded dip closures where a working lateral fault seal is crucial to trap hydrocarbons. For both, access to 3D seismic data and a detailed understanding of the structural style, tectonic regimes, and present day stress fields are essential to differentiate between conductive and tight faults. Drilling and Well Design Successful drilling a well – regardless of its later use – is of vital importance for both industries. Therefore, we have carried out joint studies on clay mineralogy and geomechanical evaluation to mitigate wellbore instabilities and share drilling experiences. High flow rates and high thermal stresses have to be considered in well design of geothermal wells with hydrothermal use. Production is generally through casing. Subsequent geothermal use of unproductive oil/gas wells with small diameters need special completions. Stakeholder management Many project developments are affected by environmental and ground water protection policy or a wary public, and therefore sound and concerted public relation work is of greatest importance for both, geothermal and hydrocarbon exploration.