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Hydraulic interference test between several doublets in the Dogger aquifer in Ile-de-France region (Val-de-Marne)

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The conception of this project supported by ADEME funds has emerged following the context of the renewal of geothermal exploitation in the Dogger aquifer. Indeed many new projects of doublets or rehabilitation of existing operations have been carried out or are currently under investigation. In particular in the west of the Val-de-Marne department where there is an increasing number of geothermal operations in a limited space. As a consequence of this fast development, there is a need to increase the reliability and to reduce uncertainties of the models used to predict the operation lifetime and the emergence of the "thermal breakthrough". One uncertainty of these models is the hydraulic interference between the different doublets.

The project includes two stages. The first stage consisted of the design and the achievement of the hydraulic test which was carried out in September 2013. The test included 5 geothermal doublets (Cachan 1 and 2, Chevilly-Larue, l'Haÿ-Les-Roses and Fresnes) located south-west of Paris in Val-de-Marne department. The test was conducted during approximately 4 days including a period of installation/uninstallation of the wells equipment and taking into account the constraints of operators. The hydraulic test was carried out as followed:

1. All the five doublets were stopped during a period of 36 hours for stabilizing pressure in the tested area.
2. L'Haÿ-Les-Roses doublet has produced (both producer and injector) for a period of 54 hours and pressure interferences were measured during this period at the other wells.
3. L'Haÿ-Les-Roses doublet has then been stopped for a period of 6 hours during which the recompression of the reservoir has been followed.

All the wells were equipped with pressure and temperature sensors at the well head. Three injector wells (Cachan 2, Chevilly-Larue and Fresnes) were also equipped with pressure and temperature sensors at the shoe of the well casing. The second stage under development consists of the interpretation of the interference test which will allow improving the local knowledge of the Dogger aquifer in the targeted area of the Val-de-Marne. This interpretation will include the transmissivity field between doublets and aquifer storage capacity. The program OUAIP developed at BRGM and dedicated to the interpretation and simulation of pumping tests will be used for this application. The interpreted data will be compared to the transmissivity field actually used in the models and based on geostatistical methods and local well transmissivity data (build-up pressure at production well). According to the results, these new data will be integrated into a numerical reservoir model that will be calibrated on pressure field in order to validate the field velocity and consequently heat transfer calculation. The calibrated model will allow increasing the reliability of the development of the "cold bubbles" in this sector densely exploited and helping decision makers for a sustainable development of the Dogger aquifer.

This project is a first of its kind on deep geothermal operations. Following the expected results, the hydraulic test could be replicated in other sectors with high geothermal development (e.g. Seine-Saint-Denis department).