Exploring and ensuring geothermal resources for district heating: the PGE project (Bordeaux, France)

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Plaine de Garonne Energies is a joint venture between COFELY and STORENGY in charge of the construction of a large district heating network, mainly supplied by renewable energies, in Bordeaux (France). Geothermal is a major solution planned to provide the new Plaine de Garonne district with heat, on the right bank of the Garonne river. In the early eighties, few geothermal wells have been drilled to the ~900 m deep Cretaceous formation, to supply with heat small networks in the city of Bordeaux, without any reinjection of cold water. These wells confirmed the Cretaceous aquifer as a valuable resource. Even fewer wells reached deeper targets like the Jurassic formations. In 2015, the Bordeaux Metropole called for realizing this new project with the ambition to explore deeper formations for even hotter resource, namely the Jurassic expected at a depth of ~1600 m. Storengy proposed its expertise in geosciences and its experience in exploration and drilling to the project. Through the subsurface studies, Storengy geoscientists and well engineers were able to propose an innovative design of a doublet, in agreement with the project constraints, local regulation and the heat demand. A geological model (including structural and petrophysical information) has been built according to the current regional knowledge of the northern Aquitanian Basin and to the local data publicly available on the surrounding wells, including the geothermal ones. Unlike the Cretaceous formations, the Jurassic layers are poorly documented and the petrophysical information were chosen locally as productive as the Dogger formation of the Paris Basin, regarding their similar facies, to size up a productive doublet in this formation thanks to a reservoir model. The reservoir modeling was performed to set up the location of the reinjection well (while the producer location was set up quite early in the project). Both the geological and reservoir models were used, to assess the spacing between wells and the distance to the main faults (according that fault trajectories are uncertain due to the urban context precluding for past investigations through seismic campaigns). The project consisting in exploring and characterizing the Jurassic layers, and then potentially exploit the Jurassic aquifer, is a challenge both technically and in project management because of exploration risks, budget constraints, and the upper stringent objective of delivering heat to the district network. To comply with all these objectives, the engineering department designed the production well with an innovative technical solution consisting first in pre-testing the Cretaceous formation, to confirm this reservoir as it is a proven one today, then continuing drilling to the Jurassic target. After testing the Jurassic and if the Jurassic aquifer does not present the required performances in flow rate and/or temperature to satisfy technical and economic criteria of the project, a fallback to the proven Cretaceous aquifer is planned. Actually, the drilling strategy for the productive well will allow exploration of the deeper Jurassic formation and also the production of the Jurassic or Cretaceous reservoir without sidetracking.