Abstract

One notable project in the Oltenia region is related to the development of the Turceni Energy Complex. The GETICA project aimed to retrofit some of the existing coal-fired units with CCS technology to capture and store carbon dioxide emissions. The objective is to make these units more environmentally friendly and align with European Union climate goals. Oltenia is an important industrial area in Romania, particularly known for its coal-fired power plants. The implementation of CCS in this region is part of broader efforts to reduce carbon emissions and transition to cleaner energy sources. Two zones: Zone 1 and Zone 5; have been selected out of an initial list of seven as presenting the best potential for future underground CO2 storage. Between these two candidates, Zone 5 seems to have higher performance indicators (in terms of capacity and injectivity), but this initial consideration has to be considered with caution, as very high uncertainties are attached to the figures currently calculated. After a review of the preliminary performance and risk assessments performed on the two zones, preliminary development scenarios and an appraisal strategy are proposed. A significant safety margin was applied within the model.

The parameters for run the dynamic simulations are presented below:

• analytical or numerical simulation of an aquifer;

• the daily injection flow was established based on Turceni CO2 emissions, accepting a daily mean value (Qinj = 2.07*106Sm3/day);

• The water mineralization value was taken from the existing data at a well situated on the Balteni structure (720 – 1150 Kg/car);

• the relative permeability curves for water and CO2;

• the reservoir temperature was established based on the geothermal gradient of the area Gt=3°C/100m (for temperature variation we take into account the depths 600 m and 4000 m with 28deg C respectively, 130 deg C).

The CO2 injection process (zone 1) was simulated in eight wells and nine wells (in this last case were developed additional scenarios with different distances between the wells – approx. 10000 m, 5000 m and 2500 m) and one case with two pseudo production wells.

The reasons behind choosing these specific simulations/development scenarios were:

a). the need to analyse the reservoir response and the behaviour of CO2 depending on the number of injection wells;

b). the gradual increase of the injectors number was determined to arrive the target of CO2 injection daily rate;

c). in the scenarios proposed the distance between the wells was established so that the interference phenomenon would be avoided, in the same time the entire area of interest would be covered and also the wells to be far away from the fault. Observing the evolution of the CO2 plume after 5 years of injection, at the end of injection period and after 300 years from the start of injection, it can be seen that CO2 tends to accumulate at the top layers of the reservoir and begins to extend significantly on horizontal after 300 years. From the injection scenarios developed for Zone 5, the best scenario was selected CO2_INJ_5_AREA_V. Within this scenario the injection target is achieved with 5 injectors.

The conclusions are the same for both zones:

•the CO2 injection pressure increases when the distance between the wells decreases;

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•the field pressure is not influenced by the distance between the wells;

•the CO2 injection rate presents some variations with the distance, which can be considered insignificant;

The presence of the pseudo production wells doesn't influence the parameters of the wells (rates and pressures) and the reservoir pressure.

Keywords: CO2 storage, CO2 injection, reservoir, deposits