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Electrical Resistivity Tomography (ERT) as a permanent monitoring tool to image the CO₂ migration at the Ketzin pilot site – Experiences from more than five years of operation

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At the Ketzin pilot site, Germany, electrical resistivity tomography (ERT) is part of a multidisciplinary geophysical monitoring concept, which was established in order to image CO₂ injection into a saline aquifer. For more than five years a vertical electrical resistivity array (VERA) is operating as a permanent reservoir monitoring tool at the three Ketzin wells Ktzi200, Ktzi201, and Ktzi202. The VERA system covers the depth range of 590-735 m and was at its time of inception the first and deepest ERT application in a real CO₂ injection project globally.

Based on the experience gained so far at the Ketzin pilot site, this contribution reports the essential technical and methodical elements of such a behind-casing electrode installation for tracking the CO₂ migration in the subsurface. First, the time-lapse resistivity images allow for valuable interpretations when they are integrated with process data, inverse petrophysical relations, and well logging data. Secondly, the permanent installation can be used for continuous crosshole measurements and periodic surface-downhole surveys (e.g. large-scale DC geoelectrics and controlled-source EM). Thirdly, the ERT array proved to deliver significant information about the presence of CO₂ in the well annulus. Forth, a properly calibrated and integrated ERT monitoring system allows for mapping of quantitative CO₂ saturation estimates.

Finally, with regard to the required long-term application in CO₂ storage projects, the Ketzin ERT concept will be critically evaluated concerning reliability and longevity of the deployed downhole components.