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Otway CO2 sequestration pilot project: end of phase I monitoring program

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The first phase of CO2CRC Otway Pilot project involved the injection of 66,000 tonnes of CO2/CH4 gas mixture (80% of carbon dioxide and 20% of methane), onshore, into a deep depleted gas reservoir. Such case is particularly challenging for geophysical monitoring. However the initial results of the time lapse seismic are quite encouraging. The first time lapse anomaly was detected after only 33,000 t of CO2 were injected into Waarre C reservoir at depth of 2050 m. The final time lapse TL3D survey is recorded in January 2010, five months after injection was completed.

In this study we describe and discuss the strategy we adopted for the design of TL3D seismic program. The main aim was to achieve high sensitivity of the measurements while maximising the repeatability of successful seismic measurements. The specifics of the site such as typically excessive wind, power lines, electric fences, farm animals and strict environmental restrictions made this task particularly challenging. Furthermore we used underpowered sources, with respect to the depth of the target to reduce the footprint. To achieve satisfactory signal to noise ratio, high repeatability and high resolution we designed high density, high fold 3D survey grid.

Careful planning of 3D surveys allowed us to achieve excellent repeatability which is, at the reservoir level represented by normalised RMS difference values of about 20%. Single time-lapse anomaly at the reservoir level was observed, its location and amplitude agrees with the position of CO2 plume predicted by reservoir simulations and amplitude variations predicted by seismic modelling. Post injection 3D data are currently analysed.