

CO₂ Fault Leakage of the Ladbroke Grove Gas Field: Establishing Potential Loss Rates for CO₂ Geological Storage Risk Assessment

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Achievability of long-term CO₂ containment can be assessed through risk and uncertainty analyses. These analyses would consider the occurrence and probability of possible containment loss mechanisms, such as leakage via a fault. Seepage rates from natural CO₂ accumulations with non-optimum fault seals are used to estimate potential leakage rates for risk and uncertainty analysis.

The Ladbroke Grove natural CO₂ accumulation in the Otway Basin, South Australia, demonstrates likely rates of natural fault leakage. The mineral marker laumontite indicates that the Ladbroke Grove CO₂ gas column was once nine metres thicker than present. Geomechanical modelling of the Ladbroke Grove Fault suggests a higher likelihood for fault reactivation along the NW-SE segment of the fault, resulting in a permeability pathway for gas to escape. Soil gas measurements at the surface suggest that the CO₂ has leaked up the NW-SE segment of the fault to surface, while the E-W segment of the fault has contained the CO₂. Flux data derived from this scenario and other examples throughout the world, suggests an estimated leakage range of 6 – 60 tonnes/yr should be applied to risk and uncertainty analyses for potential sites for CO₂ geological storage.