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Monitoring Challenges for CO_2 storage

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A wide range of tools and methods are potentially useful for monitoring CO_2 storage sites. Geophysical, geochemical, well-based, surface-based and even airborne and satellite monitoring systems have been successfully demonstrated at a number of CO_2 injection sites. The challenge for industrial-scale storage is to select which tool combinations together provide a cost-effective and technically robust site monitoring system. The key element of an integrated monitoring system is likely to be deep-focussed, aiming to demonstrate that processes in the storage reservoir are proceeding as predicted and to give early warning of encroachment of the CO_2 plume into areas of containment risk. Shallow–focussed systems, possibly concentred around identified containment risks (such as old wells), aim to aim to demonstrate ultimate site integrity and satisfactory emissions performance. In the event that leakage to surface did occur, shallow monitoring would be required to identify potentially hazardous buildups of gas and enable suitable remediation to be undertaken. Suitable monitoring systems are highly site dependent, but key deep-focussed methods are likely to include surface 3D time-lapse seismic and downhole pressure/temperature monitoring. In their different ways, these tools are integrative, providing diagnostic responses from the 3D volume of the storage system. Key shallow-focussed methods may include shallow geochemical sampling, complemented by atmospheric measurements and possibly remote sensing.