Executive Certificate in Carbon Capture and Storage

Monitoring

Monitoring is a critical component of Carbon Capture and Storage (CCS) projects, ensuring the safe and efficient storage of carbon dioxide (CO2) in geological formations. This explanation will cover key terms and vocabulary related to monitoring in the context of CCS, with a focus on delivering detailed, comprehensive, and learner-friendly content.

1. Carbon Capture and Storage (CCS): A technology that captures CO2 emissions from large point sources, such as power plants, and stores it in geological formations, reducing the overall greenhouse gas emissions.
2. Monitoring: The continuous tracking and measurement of various parameters related to CCS projects, including the injection, migration, and storage of CO2.
3. Geological storage: The long-term storage of CO2 in geological formations, such as depleted oil and gas fields, deep saline aquifers, and unmineable coal seams.
4. Injection: The process of injecting CO2 into geological formations for long-term storage.
5. Migration: The movement of CO2 within geological formations after injection.
6. Trapping mechanisms: The processes that keep CO2 in place after injection, including structural trapping, residual trapping, solubility trapping, and mineral trapping.
7. Baseline monitoring: The initial monitoring of geological formations before CO2 injection to establish a reference for future comparison.
8. Continuous monitoring: The ongoing measurement and tracking of various parameters related to CCS projects, including CO2 injection, migration, and storage.
9. Verification and accounting (V&A): The process of confirming that the amount of CO2 injected into geological formations matches the amount reported and accounted for.
10. Leakage detection: The identification and measurement of any CO2 that escapes from geological formations.
11. Passive monitoring: The use of natural processes, such as seismic activity, to monitor CCS projects.
12. Active monitoring: The use of artificial means, such as sensors and measurement devices, to monitor CCS projects.
13. Seismic monitoring: The use of seismic waves to monitor the movement and storage of CO2 in geological formations.
14. Electromagnetic monitoring: The use of electromagnetic signals to monitor the movement and storage of CO2 in geological formations.
15. Gravity monitoring: The use of changes in gravity to monitor the movement and storage of CO2 in geological formations.
16. Pressure monitoring: The measurement of pressure changes in geological formations to monitor the injection and storage of CO2.
17. Temperature monitoring: The measurement of temperature changes in geological formations to monitor

the injection and storage of CO2.
18. Fluid sampling: The collection and analysis of fluids, such as water and CO2, from geological formations to monitor the injection and storage of CO2.
19. Well integrity: The maintenance of the structural and functional integrity of wells used for CO2 injection and monitoring.
20. Risk assessment: The evaluation of potential risks associated with CCS projects, including the risk of CO2 leakage and the potential impact on the environment and human health.
21. Contingency planning: The development and implementation of plans to address potential risks and challenges associated with CCS projects.

Monitoring is a critical component of CCS projects, ensuring the safe and efficient storage of CO2 in geological formations. Baseline monitoring establishes a reference for future comparison, while continuous monitoring tracks and measures various parameters related to CCS projects. Verification and accounting confirm that the amount of CO2 injected matches the amount reported and accounted for, while leakage detection identifies and measures any CO2 that escapes from geological formations.

Passive monitoring uses natural processes, while active monitoring uses artificial means, such as sensors and measurement devices. Seismic, electromagnetic, gravity, pressure, temperature, and fluid sampling are all methods used to monitor CCS projects. Well integrity is crucial to maintain the structural and functional integrity of wells used for CO2 injection and monitoring. Risk assessment and contingency planning evaluate and address potential risks and challenges associated with CCS projects.

In conclusion, monitoring in CCS projects involves a range of terms and vocabulary related to the injection, migration, and storage of CO2 in geological formations. Understanding these terms and concepts is essential for the safe and efficient implementation of CCS projects, and for reducing overall greenhouse gas emissions. By continuously monitoring and measuring various parameters, CCS projects can ensure the safe and efficient storage of CO2, reducing the risk of leakage and the potential impact on the environment and human health.