Further guidance relating to the clean development mechanism

- carbon dioxide capture and storage technologies -

FCCC/KP/CMP/2006/L.8:
INFORMATION ADDRESSING THE FOLLOWING ISSUE

(c) Long-term responsibility for monitoring the reservoir and any remediation measures that may be necessary after the end of the crediting period

Submitted by Greenpeace

Stored CO_2 in the geological underground will need to be monitored to verify that there is no leakage and to provide confidence in predictions about its future behaviour over the long term. The big question is, who will take the long-term responsibility for monitoring the reservoir and any remediation measures if necessary? Regarding CDM another issue is of relevance – CDM crediting periods are much shorter than the lietime of a storage project. What will happen at the end of the crediting period with e.g. a coal power plant that had been equipped with a capture facility, a pipeline system and a storage site, i.e. a CCS project? Will the storage site be closed and the power plant again emit CO_2 or will the CCS project continue to run outside the CDM? It could also be that the storage site will be used for a new CDM project in which CO_2 from another power plant will be captured and stored. Such constellations make decisions on long-term responsibilites for monitoring and remediation measures more difficult.

Geological storage sites must be selected and operated to avoid leakage. What is needed is a comprehensive site characterisation (including baseline surveys), risk assessments (appropriate environmental impact assessments), monitoring programmes and remediation contingency plans. A number of remediation options exist for different leakage scenarios, e.g. from the IPCC Special report on carbon dioxide capture and storage[1], Zhang[2].

Monitoring starts from the very beginning of injection.Subsequent monitoring continues over the project lifetime, and the stored mass of CO_2 will need to be verified at regular intervals during injection. On completion of injection, monitoring must continue for a period of time. The frequency of monitoring activity is likely to decrease as confidence increases that the CO_2 plume is behaving as predicted. The timeframe of post-closure monitoring is case-by-case dependent and can not be defined ahead of the project. Monitoring continues until site performance is confirmed by an independent expert entity. Post-closure here is defined as the timeframe after the end of injection and sealing of wells until an expert entitiy confirms quasi stable conditions in the reservoir.

Monitoring is not a cheap exercise. Remediation will cost even more and may happen long after operation has ended. Estimated costs for monitoring geologic storage over the full life-cycle of a project (assumed to be 30 years operation and 50 years post-operation) can range from \$0.05 to \$0.10 per tonne of stored CO_2. This is small in comparison to the cost of capture, it nevertheless may represent up to \$50 to \$80 per tonne CO_2 over the life cycle of a typical project[3]. However, these costs increase if a longer post-closure timeframe is taken into account. No experiences with large-scale storage sites and the behaviour of CO_2 in the underground in the long-term exist today. A 50 year slot can therefore only be seen as an approximation. While the frequency of monitoring will propably be reduced over time, the area that need to be monitored will increase. A CO_2 plume will occupy an increasing area enhancing the risk of undetected fractures and faults that could serve as escaping routes for CO_2 (and/or saline waters from the storage formation). Estimations for costs of remediation are not available. How will financial resources set aside, reserved and made available for monitoring and remediation?

While a company / field operator undertaking a storage project will be responsible during operation and closure of the project, long-term responsibilities may go in the hands of governments. Authority must be given to oversee the results of the monitoring programs and to verify monitoring programs if needed. While suboptimal site selection will increase leakage risk, so too will decisions regarding the monitoring and aftercare of a site. Major environmental incidents often result from installations considered to be safe if checks are put in place; the problems arise when these are not. Who takes such a decision that a storage site is suitable and who sets the time on which no more monitoring is needed is of importance, ie. where the burden of proof lies.
Authority should be given to an independent international entity. This would guaranteee that the safety issue is the major criteria and not cost or other reasons in the long-term. This entity should hold the security responsibility (decision on type and timeframe of monitoring and remediation, approval of reports) whereas the countries that have gained credits from CCS projects hold the financial responsibility (undertaking monitoring, remediation, and reporting).

References:

[1] IPCC (2005): Special report on carbon dioxide capture and storage. *p252-253*
[2] Zhang Y., Oldenburg C., Benson S. (2004): Vadose zone remediation of CO_2 leakage from geological CO_2 storage sites. *submitted to Vadose Zone Journal special section on TOUGH2 applications*
[3] Benson S., Hoversten M., Gasperikova E., Haines M. (2005): Monitoring protocols and life-cycle costs for geological storage of carbon dioxide.