

Definition of a method for risk analysis of CCS combining long-term and short-term issues - Application to the different life stages of CCS in a saline aquifer.

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ABSTRACT

It is necessary to undertake a systemic approach in order to assess the risks of CCS, and to consider all kinds of risks. In a national research programme, INERIS is developing a specific method, adapted to CCS, based on pre-existing material, including FEPs and risk analysis for nuclear waste. Due to its history and skills, INERIS combined its knowledge of underground storage operations, industrial safety, environmental and health risks, in a multidisciplinary approach.

A risk analysis was performed, first leading to identify the relevant risk scenarios, and in this analysis we took into account the possible high content of impurities, and therefore the different exposure routes for man and for the soil/water environment. In a second step, the criticality of risk scenarios is estimated with an innovative 4-criteria analysis. The two main criteria that are usually considered in Risk Analysis are i) Probability of occurrence and ii) Severity of effects (or Gravity). Here we suggest an to add two criteria, focusing on :
iii) Time scale. Indeed the probability of occurrence of events depends on the time scale, since an event that is very unlikely during injection phase (e.g a seism) can become very likely in the longer term.
iv) Uncertainty. Estimating the uncertainty is highly desirable in order to manage the risk, especially in the CCS context where lack of knowledge is rather high and learning from experience is rather poor.

A practical application of the method to the injection phase and in the longer-term in a saline aquifer will be presented. It will include a classification of the main possible events and the exposure scenarios, specific fault trees, resulting criticality. It will end with the illustration of the differences between the risks encountered in the successive life stages of the CCS chain - in particular, due to the different time-scales and the kind of equipment involved, both surface and underground.

Keywords: CCS, Risk analysis, fault tree, criticality, saline aquifer.

Proposed Topic: Large Scale Demonstration Projects and Impact of the Quality of CO₂