How Do the Class VI Requirements Protect Against a Sudden Release of CO_2?

A main source of CO_2 is the burning of fossil fuels; however, CO_2 also is created deep in the earth by natural processes, and it may make its way to the surface over millions of years. It can be released by volcanoes or in areas with volcanic activity. Infrequently, a large, sudden release of natural CO_2 occurs that may be dangerous to people and animals. Natural releases of CO_2 have occurred in stratified lakes such as Lake Nyos in Cameroon (see the box to the right). CO_2 can also seep up through the soil at active volcanoes, such as Mammoth Mountain in eastern California, or through faults or fractures.

However, geologic sequestration (GS) projects will not cause these types of releases because the locations for GS sites are chosen specifically to avoid high-risk sites and to prevent the escape of CO_2 into ground water or the atmosphere.

GS will not lead to catastrophic releases of CO_2

GS involves the injection of CO_2 thousands of feet underground where it is trapped within the pore spaces of solid rock. EPA requires that sequestration sites have confining zones, or layers of impermeable rock, to keep CO_2 from escaping into overlying geologic layers, ground water, or the surface (40 CFR 146.83(a)(2)) .

The Lake Nyos disaster was caused by an event at the surface that triggered a stratified lake overturn and a release of CO_2. Surface events such as landslides cannot affect CO_2 that is trapped thousands of feet underground in geologic formations.

The rigorous process for selecting a GS site helps to ensure that GS projects will be safe

Under the GS Rule, EPA requires that potential GS sites be thoroughly studied to ensure the safety and security of the project. GS is not allowed in unsuitable geologic areas, such as where injected CO_2 could potentially reach USDWs or the surface. In addition, GS is not allowed in areas where there is risk from earthquakes or other seismic activity, or where faults or fractures connect the injection zone to USDWs or the surface (40 CFR 146.82(a)(3)).

Lake Nyos

The most well-known natural release of CO_2 occurred in 1986 at Lake Nyos, in the Northwest Province of Cameroon in Africa.

Lake Nyos is a deep, stratified lake located in the crater of an extinct volcano in a volcanic rift valley. In most lakes, seasonally changing temperatures and densities cause water to circulate throughout the lake.

However, in some lakes, this circulation does not always occur throughout the entire water column. In Lake Nyos, CO_2 from a volcanic source naturally built up in the deepest, densest layer of the lake.

In 1986, a trigger event (probably a landslide) disrupted the layers in the stratified lake and caused the CO_2 to rush to the surface in a process called rapid lake overturn or "limnic eruption." Many people were suffocated by this release.

Today, CO_2 at the bottom of Lake Nyos is vented to the surface in a safe, controlled process called degassing. The slow degassing will reduce CO_2 buildups and prevent future catastrophes.

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Photo of Lake Nyos degassing fountain courtesy of Michel Halbwachs.