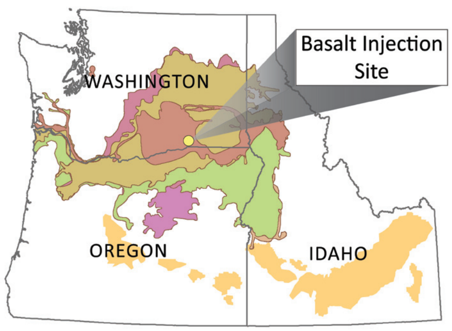
Project Overview

The Big Sky Carbon Sequestration Partnership is collaborating with Battelle, Boise Inc. and others, to test the feasibility of permanently storing carbon dioxide (CO_2) in deep basalt formations. CO_2 is a gas contributing to climate change and research is ongoing worldwide to look for options to reduce these emissions.



This project will take promising laboratory results for capturing and permanently storing CO_2 to the next step – a field test in southeastern Washington state, which will represent the first of its kind in the United States. The efforts consist of collecting and analyzing large amounts of environmental and subsurface data. Scientists will inject 1,000 tons of CO_2 (the amount a typical coal-fired power plant emits in a few hours) about 2,700 feet underground and monitor it for 14 months. The project has been permitted by the Washington Department of Ecology and funded by the U.S. Department of Energy and other private companies.

Project Goals

The primary goal is to demonstrate CO_2 can safely be stored in basalt, resulting in no leakage and eventual mineralization of the CO_2. The team is committed to involving stakeholders in the community to make them aware of the project and to solicit their feedback. State regulators have also been engaged to ensure that regulatory procedures are followed through the permitting process.

Why are Basalt Rocks a Good Target to Store CO_2?

For many years scientists at Battelle and elsewhere have been researching basalt formations to determine if they would be a good geology for CO_2 storage. They discovered basalts have great potential to store CO_2 because of the way the rocks were formed and their unique chemical properties.

Millions of years ago, basalts formed as volcanic lava flows cooled and solidified into layers. The cooling process created stacks of many individual flows tens to hundreds of layers thick, similar to a stack of pancakes. Variations during the solidification of the lava caused the fast-cooling tops of flows to be full of cracks and holes, while the slower-cooled interior of flows formed dense, impermeable barriers. The porous tops of the flows are well suited to store CO_2, while the dense interiors function to trap the CO_2. Additionally, laboratory experiments have shown basalt rocks can rapidly convert injected CO_2 to solid carbonate minerals, thereby permanently trapping and securing the CO_2.

Quick Facts

Location: Wallula, WA, on Boise Inc. property

Amount of CO_2: 1,000 tons

Injection Depth: ~2,700′

Project Cost: ~$12 million

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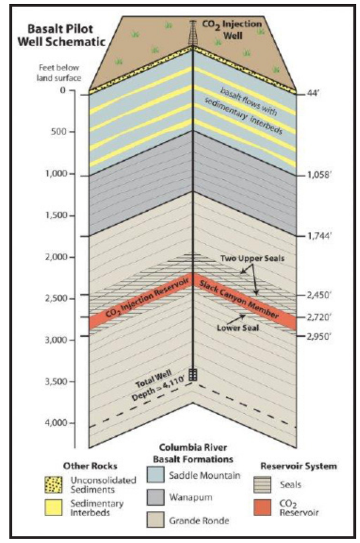
SEQUESTRATION PARTNERSHIP

Carbon Storage

Characterization



The team has a characterization well on Boise's property in Wallula. Scientists have used the well, conducted extensive tests, and performed in-depth evaluation assessments to ensure the site is suitable for a long-term field demonstration study. To be certain, additional characterization activities were performed between September and December 2012. With this added confirmation and with all permitting requirements by the Washington Department of Ecology met, injection of the CO_2 is scheduled to commence this summer.

What is the significance of the research?

Continental flood basalts represent one of the largest geologic features on the planet and exist in the U.S. and around the globe. Worldwide CO_2 generation comes from a multitude of sources, with the combustion of fossil fuels in power plants being the largest. Efficiency measures are essential, but other options are needed to reduce CO_2 emissions. Some parts of Asia also have extensive flood basalts and could rely on this technology once proven as a means to permanently store CO_2 emissions, a potentially key mechanism for addressing the threat of climate change.

What is the potential storage capacity of the underground basalt formation?

According to recent estimates released by the Department of Energy, the United States and portions of Canada have enough potential capacity in geologic formations to store as much as 5,700 years of CO_2. If the Wallula demonstration is successful, basalt flows in many parts of the world may serve as storage locations to sequester CO_2 emissions from a variety of industrial facilities.

Monitoring after injection underground

Laboratory studies show that within a matter of months, the CO_2 should chemically react with minerals in the basalt to begin forming calcium carbonate crystals. This chemical conversion is an indication that the CO_2 is turning into a solid, thereby forever eliminating the risk of it being released to the atmosphere.

Who is sponsoring this research?

This joint research is conducted under the Big Sky Carbon Sequestration Partnership, which is funded by DOE's Office of Fossil Energy under Financial Assistance Agreement DE-FC26-05NT42587 with the National Energy Technology Laboratory (NETL). It is one of seven regional partnerships throughout the United States aimed at finding safe and economical ways to reduce the nation's greenhouse gas emissions.

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