Underground Injection Control
Carbon Sequestration
Class VI Permit Application

STIMULATION PROGRAM
40 CFR 146.82(a)(9)]
Section 12.0

NexGen Carbon Oklahoma, LLC
Vanguard CCS Hub

June 2025

12. STIMULATION PROGRAM

Vanguard CCS Hub

INSTRUCTIONS

This template provides a suggested outline and recommendations for the stimulation program.

In this template, instructions or suggestions appear in ***blue text***. These are provided to assist with site- and project-specific plan development. These are recommendations and are not required elements of the federal Class VI Rule.

Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns). Appropriate figures, references, etc. should also be included to support the text of the plan.

For more information, see EPA's Class VI guidance documents at https://www.epa.gov/uic/class-vi-guidance-documents.

Facility Information

Facility name: Vanguard CCS Hub
Vanguard I-1
Vanguard I-2
Vanguard I-3
Vanguard I-4
Vanguard I-5
Vanguard I-6
Vanguard I-8
Vanguard I-9
Vanguard I-10
Vanguard I-12

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Well locations: Osage County, Oklahoma

Vanguard I-1: Lat 36.633288°N, Lon -96.571029°W (NAD 83)
Vanguard I-2: Lat 36.660083°N, Lon -96.534652°W (NAD 83)
Vanguard I-3: Lat 36.664329°N, Lon -96.586951°W (NAD 83)

Vanguard I-4: Lat 36.710244°N, Lon -96.542370°W (NAD 83)
Vanguard I-5: Lat 36.744047°N, Lon -96.533843°W (NAD 83)
Vanguard I-6: Lat 36.724157°N, Lon -96.489526°W (NAD 83)
Vanguard I-8: Lat 36.823356°N, Lon -96.620496°W (NAD 83)
Vanguard I-9: Lat 36.849167°N, Lon -96.592912°W (NAD 83)
Vanguard I-10: Lat 36.893849°N, Lon -96.578026°W (NAD 83)
Vanguard I-12: Lat 36.785641°N, Lon -96.594085°W (NAD 83)

12.0 STIMULATION PROGRAM [40 CFR 146.82(a)(9)]

Stimulation to enhance the injectivity potential of the injection zone may be necessary. Stimulation may involve but is not limited to flowing fluids into or out of the well, increasing or connecting pore spaces in the injection formation, or other activities that are intended to allow the injectate to move more readily into the injection formation. Advance notice of all proposed stimulation activities must be provided to the Director, as detailed below, prior to conducting the stimulation. The permittee must describe any fluids to be utilized for stimulation activities and the permittee must demonstrate that the stimulation will not interfere with containment. The permittee must submit proposed procedures for all stimulation activities to the Director in writing at least 30 days in advance, per 40 CFR 146.91(d)(2). Within the 30-day notice period, EPA may: deny the stimulation; approve the stimulation as proposed; or approve the stimulation with conditions. The permittee must carry out the stimulation procedures, including any conditions, as approved or set forth by EPA.

12.1 Introduction/Purpose

After drilling of the open hole section of the injection wells is complete, an acid job will be performed using mud acid. Mud acid has the ability to dissolve silicates and other components commonly used in drilling muds. The dissolution process creates channels and pathways, enhancing the permeability of the rock formation, allowing for the injection to be more efficient.

12.2 Stimulation Fluids

The mud acid will consist of a mixture of Hydrochloric Acid and Hydrofluoric Acid. KCL water will be the primary fluid used to displace the mud acid and flush the open hole interval at the end of the job. This job will consist of 2,000 to 2,500 gallons of mud acid, and 800 to 1,000 barrels of KCL water.

12.3 Additives

The following additives may be used during the stimulation process, and the volumes will be determined at the time of treatment:

Friction reducer: Lowers the pumping pressure.

Biocide: Kills any bacteria in the fluid.

Acid retarder: Allows acid to travel deeper into reservoir before completely spending.

Iron control: Prevents precipitation of iron compounds during acid stimulation.

Corrosion inhibitor: Decreases the rate of corrosion in metal when pumping acid.

12.4 Diverters

Rock salt will be used throughout the job to help aid in diversion of the pumped fluids. 2,500 lbs. total of rock salt will be dropped throughout the job in intervals of 100 lbs., up to 500 lbs.

12.5 Stimulation Procedures

The following procedure will be performed after the well is drilled to total depth, and the drilling equipment is moved of off location. The stimulation procedure will utilize a smaller workover rig using a working string of 2 7/8" tubing.

1. MIRU workover rig.
2. Run in 2 7/8" tubing to TD and spot 150 gal. mud acid.
3. Pull tubing up 100', and spot 150 gal. mud acid.
4. Repeat step 3 until entire open hole section has been covered.
5. Pull 2 7/8" tubing out of well.
6. Hook up to 7" production casing, load hole, and establish rate at 30 BPM.
7. Run 100 bbl KCL water pad.
8. Pump 500 gal. mud acid, followed by 100 bbl. KCL water
9. Repeat step 8 two (2) more times.
10. Flush with 200 bbls. KCL water.
11. Shut in well and prepare to run tubing and packer.