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Illustration by Hokyoung Kim for HuffPost

The Gassing Of Satartia

A CO2 pipeline in Mississippi ruptured last year, sickening dozens of people. What does it forecast for the massive proposed buildout of pipelines across the U.S.?

By Dan Zegart
August 26, 2021

It was just after 7 p.m. when residents of Satartia, Mississippi, started smelling rotten eggs. Then a greenish cloud rolled across Route 433 and settled into the valley surrounding the little town. Within minutes, people were inside the cloud, gasping for air, nauseated and dazed.

Some two dozen individuals were overcome within a few minutes, collapsing in their homes; at a fishing camp on the nearby Yazoo River; in their vehicles. Cars just shut off, since they need oxygen to burn fuel. Drivers scrambled out of their paralyzed vehicles, but were so disoriented that they just wandered around in the dark.

The first call to Yazoo County Emergency Management Agency came at 7:13 p.m. on February 22, 2020.

“CALLER ADVISED A FOUL SMELL AND GREEN FOG ACROSS THE HIGHWAY,” read the message that dispatchers sent to cell phones and radios of all county emergency personnel two minutes later.

First responders mobilized almost immediately, even though they still weren't sure

exactly what the emergency was. Maybe it was a leak from one of several nearby natural gas pipelines, or chlorine from the water tank.

The first thought, however, was not the carbon dioxide pipeline that runs through the hills above town, less than half a mile away. Denbury Inc, then known as Denbury Resources, operates a network of CO2 pipelines in the Gulf Coast area that inject the gas into oil fields to force out more petroleum. While ambient CO2 is odorless, colorless and heavier than air, the industrial CO2 in Denbury's pipeline has been compressed into a liquid, which is pumped through pipelines under high pressure. A rupture in this kind of pipeline sends CO2 gushing out in a dense, powdery white cloud that sinks to the ground and is cold enough to make steel so brittle it can be smashed with a sledgehammer.

Even Durward Pettis, a contract welder for Denbury and chief of the local Tri-Community Volunteer Fire Department, didn't figure out that the mystery fog was CO2 for a full 15 minutes. He'd directed first responders to set up three roadblocks to prevent traffic from entering the area. But it wasn't until 7:30 p.m. that word went out that they'd need self-contained breathing apparatus, or SCBA, to enter Satartia and evacuate the town's 42 residents, many of them elderly, and about 250 others who lived just outside town. By then, rescuers and residents were already in motion, fleeing the gas or evacuating others.

Even once Pettis figured it out, none of the sheriffs' deputies and volunteer firefighters had any emergency training in CO2 leaks. Neither did staff at two area hospitals, which had detrimental consequences for gas victims, according to interviews with many of the 49 who were hospitalized.

"It was bad enough that I thought my mama wouldn't make it, and she still has trouble breathing," said Army veteran Hugh Martin, who fled Satartia in a pickup truck with his 78-year-old mother as he struggled to remain conscious. "She never had asthma or COPD, now she's on inhalers full time."

Even months later, the town's residents reported mental fogginess, lung

dysfunction, chronic fatigue and stomach disorders. They said they have trouble sleeping, afraid it could happen again.

This story is the result of a 19-month HuffPost/[Climate Investigations Center](#) investigation into the Satartia pipeline rupture, and the safety of CO2 pipelines. It is based on interviews with more than 60 witnesses, victims, first responders, lawyers, medical and toxicological experts, pipeline and petroleum experts, and public health officials; and a review of medical records, police and fire reports, 911 recordings, emergency dispatch logs, internal documents from the Mississippi Emergency Management Agency and the state Department of Environmental Quality, as well as federal pipeline incident reports.

Meanwhile, the federal government is taking the first steps to vastly increase the size of the nation's carbon dioxide pipeline network as a way of fighting climate change. Our investigation reveals that such pipelines pose threats that few are aware of and even fewer know how to handle.

“We got lucky,” said Yazoo County Emergency Management Agency director Jack Willingham, who oversaw the rescue effort. “If the wind blew the other way, if it'd been later when people were sleeping, we would have had deaths.”

A Deadly Gas

Carbon dioxide has long been used to euthanize laboratory rodents and other small animals, a practice animal welfare organizations [now consider inhumane](#) due to the suffering the gas inflicts on the animals. Each year, CO2 accidents [kill about 100 workers](#) worldwide — often in basements of restaurants that use CO2-charged systems for their bar mixers — or in industrial accidents.

Carbon dioxide is an [asphyxiant](#) that displaces ambient oxygen, making it more difficult to breathe. Smaller exposures cause coughing, dizziness and a panicky

feeling called “air hunger.” As CO2 concentrations get higher and exposure times longer, the gas causes a range of effects from unconsciousness to coma to death. Even at lower levels, CO2 can act as an intoxicant, impairing cognitive performance and inducing a confused, drunken-like state.

Denbury’s entire business is built around piping carbon dioxide to oilfields and a few industrial users in two operational centers in the Gulf Coast and the Rockies. It owns or has an interest in 14 oil fields in Mississippi, Texas and Louisiana, which are connected by five CO2 pipelines spanning 925 miles. Among its properties is Tinsley Field, adjacent to Satartia, which became Mississippi’s first commercially successful oil field in 1939.

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Left: The Tinsley oil field in Tinsley, Mississippi, on July 23, 2021. Right: A CO2 gas pipeline remains active in Satartia, Mississippi, that same day.

Rory Doyle for HuffPost

In 2007, Denbury built its 31-mile Delta pipeline to connect Tinsley to the Jackson Dome, an extinct volcano under Jackson, Mississippi, whose 4.6 trillion cubic feet of naturally occurring CO₂ gas supplies all of the company's fields. Denbury extended the Delta line 77 miles to Louisiana's Delhi field in 2009.

Denbury uses the CO₂ for enhanced oil recovery, or EOR, which uses the gas to flush more oil out of wells. About 20% to 40% of the oil in a field can be recovered through conventional drilling and injecting water into the reservoir. Injecting CO₂ after that can increase the yield up to 60%.

CO₂ use in oil fields has resulted in accidents in several states and abroad. Tinsley itself suffered a sizeable CO₂ "blowout" — where injected CO₂ explodes out of the ground along with water, mud and drilling fluids — in 2011 that took 37 days to bring under control, sickened one worker, and killed deer, birds, fish and other animals.

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Denbury had already had two other blowouts in Mississippi, one requiring the evacuation of local homes in Amite County in 2007. Another underground CO₂ blowout at Delhi field in 2013 lasted for more than six weeks and contaminated the air with unsafe levels of both CO₂ and methane.

Denbury and other companies that do EOR are well versed in the dangers of CO₂. At Denbury's Heidelberg Field in eastern Mississippi, signs warn of a CO₂ hazard and say SCBA must be worn, and there are muster stations where workers gather if there is a release. The company also has safety pamphlets on its website — one for the public called "Pipeline Safety Is Everybody's Responsibility" and another for first

responders titled, “AWARE: Tactics for Responding to a CO2 Pipeline Leak.” None of the emergency workers interviewed for this story had seen either.

While the risks of CO2 exposure were well established, the Satartia gassing was the first known instance of an outdoor mass exposure to piped CO2 gas anywhere in the world, according to Marcelo Korc, chief of the World Health Organization’s Climate Change and Environmental Determinants of Health Unit, whose staff researched injuries from CO2 pipeline leaks in response to an inquiry from HuffPost.



The sun sets on the village of Satartia alongside the Yazoo River in July.
Rory Doyle for HuffPost

Korc's staff also found that CO₂ from the Jackson Dome is contaminated with hydrogen sulfide, a deadly gas that likely worsened residents' symptoms and also accounts for the gas cloud's odor and greenish color, since pure CO₂ is odorless and colorless.

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Denbury declined to answer specific questions for this story, sending only a statement:

On February 22, 2020, at approximately 7:00 p.m., Denbury Enterprises' Delta pipeline experienced a sudden rupture and release of CO₂ gas near Satartia, Mississippi. Before, during, and after the event, Denbury's main interest has been the health and safety of the residents in the vicinity of the release and the surrounding environment. Denbury and its personnel were quickly in the community, working directly with nearby leadership and any individual residents affected by the event to ensure that any needs arising from the event were met. We have continued to work closely with the community and have made significant contributions to local emergency response organizations to support the important role they play in keeping the community safe. Denbury has cooperated fully with all federal, state, and local agencies who responded to the incident. The federal agency charged with regulating the pipeline continues its review and investigation of the incident, and Denbury continues to cooperate

fully with their efforts.

Beyond the suffering of those who lived through it, the fact that the Biden administration is poised to commit unprecedented billions to carbon capture and sequestration (CCS) technology — putting CCS at the center of the country's strategy for reducing greenhouse gas emissions — further magnifies the importance of Satartia's CO2 accident.

The historic hike in federal support for CCS infrastructure includes taking the first steps toward the construction of a continent-spanning network of pipelines in order to move America's many millions of tons of CO2 to storage areas where, theoretically, the gas can be injected deep underground and sequestered indefinitely.

Some experts estimate this network will need to be as large as or even larger than the 2.6 million miles of existing petroleum pipelines. Meanwhile, there are only 5,000 miles of existing CO2 lines, meaning there is little experience with a wide range of operational — and safety — issues likely to arise from such a massive new system.

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Nevertheless, Biden's climate team; his Department of Energy and three of its former secretaries; most utilities; the coal industry and the governments of several coal states; ExxonMobil, the rest of Big Oil and other major industrial corporations; several climate NGOs; the AFL-CIO; and a bipartisan group that spans both houses of Congress all support CCS and the pipeline expansion in some form.

“We want to build more pipes,” DOE Secretary Jennifer Granholm told a reporter in June. “There’s a lot of jobs that are associated with decarbonizing ... and I think pipes are one of those opportunities.”

But the rush to build and operate an integrated CCS and pipeline system has so far taken place with little examination of the safety issue, as the people of Satartia learned.

Korc of the WHO worried that the basic science done long ago on many toxic chemicals, including petroleum products, has never been done for CO₂.

“The exposure studies simply don’t exist,” he said.

Satartia was, in effect, an unwitting case study for a monumental project.



Gas victim DeEmmeris Burns in July 2021, near the site where he was rescued in Satartia.
Rory Doyle for HuffPost

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“They Can’t Come Evacuate Y’all”

DeEmmeris Burns was returning to his mother's house in Satartia from a fishing trip with his brother Andrew Burns and cousin Victor Lewis when they heard an explosion and then a deafening roar, like a jet engine. The stench of rotten eggs filled the car.

DeEmmeris Burns immediately thought: pipeline explosion. He knew there was one nearby, but other than its approximate location, knew nothing else about it.

They were driving on Perry Creek Road, a gravel and dirt country lane that hugs its namesake waterway and passes close to but below the location of the pipe rupture. They were almost at his mother's house.

He called his mother's cellphone at 7:18 p.m. and told her there had been a gas explosion.

"You got to get out. We're close, we're coming to get you," Burns shouted over the roar of escaping gas.

On the other end of the call, 65-year-old Thelma Brown was trying to figure out why her son sounded so strange. He was hollering, breathing heavily, not making sense. She knew the pipeline he was talking about; it runs about half a mile from her house. But she hadn't smelled anything. She heard her son frantically repeating, "Cut the air! Cut everything off! Cut the air!" And then, silence.

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She tried calling him back. No answer. She rang the other two men's cell phones,

but got nothing.

Inside the car, the three men rolled up the windows to keep out whatever it was they were driving through. Then the engine died.

“Hunh,” Burns said. “Car shut off.”

Minutes later, Thelma’s sister, Linda Garrett, who lived just down the road, smelled the gas and called too. Thelma repeated what her sons had told her before their call dropped.

Garrett hung up with Thelma and called 911, but the dispatcher didn’t seem to know about a gas leak.

“Do I need to be getting out of here?” Garrett asked. The 911 operator said she’d call her back and let her know.

“She can’t breathe. She’s on the floor right now”

-3:43

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Garrett noticed her own breathing was becoming labored. Then her daughter Lynett

Garrett and 14-year-old granddaughter, Makaylan Burns, who had been out picking up a pizza for dinner, staggered in the door.

Makaylan seemed to be in full-blown respiratory distress, and Lynett was unable to talk. She pounded on the dining room table and panted.

“What is it? What’s wrong? What is it?” Garrett shouted.

Makaylan dropped to the floor, unconscious.

Garrett tried 911 again. This time the operator acknowledged that there was a gas leak.

“They have shut the highway down because of it. They’re not letting anyone in, they can’t come evacuate y’all,” she said.

Garrett was afraid if they left the house, all three of them would pass out. She insisted on an ambulance. The dispatcher said one would meet them outside of town.



Gas victims Linda Garrett (right) and her granddaughter, Makaylan Burns, in Garrett's kitchen in Satartia in July.
Rory Doyle for HuffPost

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Garrett and Lynett carried Makaylan out to the car. Garrett had a bad back and both adults were having trouble breathing, but they managed to get the teenager into the back seat, still unconscious.

Lynett drove and Garrett stayed on the phone with 911 as the operator told them the best route out of town. But after a few minutes, Garrett's breath "just cut out." "We ain't going to make it," she said, before she blacked out. Lynett drove to where they were supposed to meet the ambulance, but it didn't show up, and she had to drive to the hospital.

Back at her house, Thelma Brown ran outside to round up her 8- and 3-year-old grandchildren. She brought them into her bedroom, along with her 2-month-old grandson. The oldest, who has asthma but hadn't suffered an attack for some time, was having trouble breathing, so she gave him his albuterol inhaler. She gave some to the 3-year-old too, since she had been outside. Brown closed the windows and blocked air from coming in under the door with a wet towel.

Other relatives called, urging her to get out. But her pickup had a flat, and she was alone with three children. Her daughter was supposed to come get the kids after work, but called and told Brown that all the roads into the area were blocked off. Garrett told Brown what 911 had told her: that emergency workers were not coming into town to evacuate victims.

"I talked to the Lord. I said, 'Lord, me and these kids going to bed,'" recalled Brown. "And I said, 'We're going to stay here until somebody comes and gets us out of here.'"

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She waited for her son and the others to show up. She fell asleep.



Gas victim Thelma Brown in July, near the site where two of her sons and one of her nephews were rescued in Satartia.

Rory Doyle for HuffPost

At the same time, a group of friends were cooking crayfish and sipping beer at a fishing camp along the Yazoo River. It was getting dark when Hugh Martin noticed the rotten egg smell. Soon they were all wheezing and breathing hard. Martin's friend, Casey Sanders, collapsed onto the ground, then quickly came to.

Coughing and choking, everyone somehow made it to their vehicles. Martin jumped into his white pickup truck and drove up onto the levee that separates the town from the river. The glare of his headlights illuminated a green, misty fog. The suffocating feeling was nearly intolerable. "Only thing I been through worse than

this was the gas chamber when I was in the Army training for Desert Storm,” he said. “And that was CS gas.” CS gas is a type of tear gas.

He called his elderly mother, Marguerite Vinson, who told him she was feeling dizzy.

“Got your shoes on, mama?” he asked, trying to keep the anxiety out of his voice. He told her to meet him in the carport of their home, not far from the fishing camp. After stopping once to throw up out of the truck window, he made it home.

“I saw mama standing there, holding her phone, and she was weak at the knees. And I just grabbed her and throwed her in the truck,” said Martin. “Then I just took off and headed for the highway.”

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At the stop sign at Route 3 was a checkpoint, but he blew by it, heading north to the hospital in Yazoo City. His mother lay motionless on the passenger’s seat: Her eyes were open, but she stared blankly ahead when he spoke to her.

At the hospital, he found others from the crayfish cook, including Casey Sanders, and learned that her teenage son, Nathan Weston Sanders, and his girlfriend were missing, after leaving the fishing camp minutes before the explosion.

The girlfriend had called in a panic — their pickup was dead, and Nathan Weston Sanders had collapsed. She couldn’t revive him and didn’t know where they were. Now, Sanders’ father and another man from the crayfish gathering were driving back into the fog to look for them.

An Improvised Response

Sheriff's Officer Terry Gann was at a grocery store, taking a break from a long day working a double homicide when he received an EMS alert about a motorist who had a seizure due to a "green fog" crossing Route 433 east of the town.

"My friend, she's laying on the ground, she's shaking, she's drooling out of the mouth"

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-2:51

Yazoo is Mississippi's biggest county at 923 square miles, but it's an economically disadvantaged one, with just 11 sheriff's officers who get called in for everything from tornadoes and floods to industrial accidents. Even though he is the county's only criminal investigator, Gann works the disasters too. At 7:32 p.m., he headed toward Satartia in his truck.

EMS advised responders that self-contained breathing apparatus was required to enter the "hot zone" inside the roadblocks, where the gas had settled. Gann didn't have SCBA with him, but he went in anyway.

At the command post south of Satartia on Route 3, a man told Gann his daughter had gone missing in the gas plume, not far from the ruptured pipe. The cloud was moving slowly northwest, so first Gann took the road over the levee to enter the village from the south to evacuate any remaining residents.



Terry Gann, chief investigator for the Yazoo County Sheriff's Department, with the truck he used to rescue gas victims in Satartia.

Rory Doyle for HuffPost

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He did a round of checks on houses, banging on doors and peering through windows, but found no one. Around him he saw — and felt — the cloud. “It’s like I just ran a mile as fast as I could. My ears were popping. My face was burning like a sunburn.”

His pickup also started to choke on the fumes. He raced back over the Yazoo River, out of the cloud, to catch his breath and get the vehicle running, then returned to check more houses. Just outside of town, he found a young man and woman pacing the middle of an intersection.

“It was almost like something you’d see in a zombie movie. They were just walking in circles,” he said. “I kept telling ’em, ‘Y’all get in the truck.’ And they would just look at me with this blank look on their face. And the girl was holding a phone up to her head but she wasn’t saying nothing. ... Finally I just yelled at ’em, I said, ‘Get in the truck or you’re gonna die!’”

Gann shoved the dazed teenagers into the back seat, not knowing it was Nathan Weston Sanders and his girlfriend.

After picking up a woman he found unresponsive in a stalled car, his engine began sputtering again, so he returned to the command post to meet the ambulance. By the time they got there, Gann himself could barely breathe and had to be given oxygen.

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He did one last search of Satartia, then messaged dispatch, “Everyone evacuated” at 9 p.m. He radioed that he was heading for Perry Creek Road, which hadn’t yet been searched.

That worried Jack Willingham, director of Yazoo County Emergency Management Agency, since Gann had been breathing high levels of CO₂ for nearly two hours and was panting audibly over the radio. His speech was often slurred and when it wasn’t, it didn’t always make sense. Willingham ordered Gann to leave the “hot zone” immediately and get medical attention.

But Gann, disoriented by the lack of oxygen, got lost and never made it to Perry Creek. With radio guidance, he met an ambulance that took him to a hospital in Yazoo City. After two hours of oxygen treatments, he went home, utterly spent.

Finally I just yelled at 'em, I said, 'Get in the truck or you're gonna die!'

By then, however, a three-man team of Vicksburg firefighters was on its way to Perry Creek Road.

They were driving a UTV, or utility task vehicle, a small ATV-like two-seater with an open cargo bed in back that held spare air bottles and tools. Jerry Briggs, fire coordinator for Warren County, squatted in the cargo area with Warren County 911

director Shane Garrard, while Lamar Frederick, a Vicksburg fire chief, drove. Each wore 60 pounds of fire protective clothing and gear, including SCBA.

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After making their own fruitless search of the village, they decided that rather than return empty handed, they would enter the blast area via Perry Creek Road. The roar of the ruptured pipeline was deafening as they approached.

A half mile up Perry Creek Road, they saw a car with its lights on and windows up just as the UTV began stalling.

“We got victims,” Frederick yelled above the roar.

Inside the small red Cadillac sedan were three men: DeEmmeris and Andrew Burns, and Victor Lewis. DeEmmeris Burns lay across the backseat in the fetal position. The other two were slumped against the windows, white foam coming out of their noses and mouths, their clothes stained with urine and excrement. The firemen thought they were too late.

The doors were stuck, so Briggs smashed the right rear window. The three were still breathing, though just barely. The rescuers shook them and tried sternum rubs, but got no reaction.



Warren County firefighter Jerry Briggs in July with the utility task vehicle he used during the February 2020 gas leak in Satartia.
Rory Doyle for HuffPost

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Panting in exhaustion and sweating under all their gear, they managed to get all three out and cram them into the UTV.

They headed toward the south command post. After a few minutes of fresh air, the victims began to stir. Then they tried to stand up. They seemed about to fall off when a truck full of county deputies met up with the UTV, and one of the deputies bear-hugged the men into place until they met the ambulance.

The firemen had just a few minutes to breath fresh air and chug water before Willingham sent them to evacuate a group of mostly elderly residents just across the river. Willingham and the National Weather Service office in Jackson were tracking the plume as it headed northwest, and Willingham was determined to get ahead of it.

By now, six Denbury officials had arrived on the scene along with Denbury's air monitoring contractor, the Center for Toxicology and Environmental Health; the environmental remediation firm E3; an investigator for the federal Pipeline Hazardous Materials Safety Administration (PHMSA); and officials from the Mississippi's Emergency Management Agency and Department of Environmental

Quality.

At 11:06 p.m., the Denbury team “observed no product coming from the failure location,” according Denbury’s report to PHMSA. The leak was officially declared over.

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A Massive Buildout

Once the province of a few policy wonks and coal companies, shipping carbon dioxide and storing it underground has gotten much more mainstream attention in recent years amid a tsunami of conferences, draft legislation and interest groups.

The fossil fuel industry has gotten behind CCS as a technology that, it hopes, would allow continued production so long as the emissions are buried underground. But the immense network of pipelines needed to transport carbon dioxide to locations where it would be stored deep below ground weren’t discussed publicly until

recently, nor was how such a rapid, unprecedented pipeline buildout could be done.

A much-touted December 2020 Princeton University [study](#) — funded in part by the oil industry — calls for a 65,000-mile system by 2050, which means adding 60,000 miles to the current 5,000 miles of CO₂ pipeline. The new system would be organized into a spider web of continent-spanning trunk lines as large as 4' in diameter — twice the size of the Satartia pipeline — fed by a system of smaller spur lines.

**2050 totals: 21,000 km trunk lines + 85,000 km spur lines
(equivalent to ~22% of US natural gas transmission pipeline total)**



E+ scenario

929 million tCO₂/y
106,000 km pipelines
Capital in service: \$170B

CO₂ point source type

- CO₂ point sources
- BECCS - power and fuels
- Cement w/ CCS
- Natural gas power CCS oxyfuel

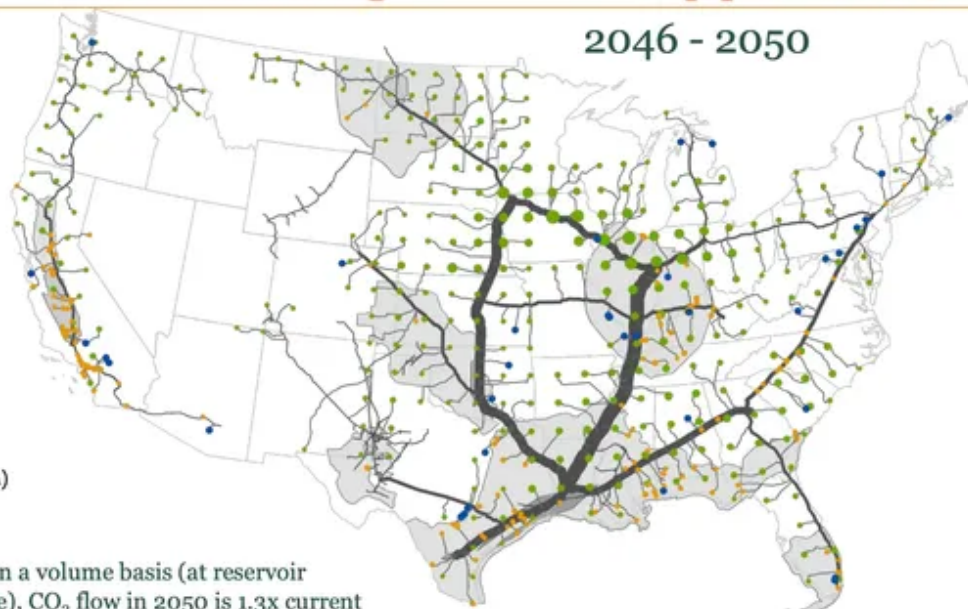
CO₂ captured (MMTPA)

- 0.0006449
- 7.9144
- 15.8282
- 23.7419

Trunk lines (capacity in MMTPA)

- 5
- 166.667
- 328.333
- 490

Note: On a volume basis (at reservoir pressure), CO₂ flow in 2050 is 1.3x current U.S. oil production and ¼ of current oil + gas production.



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Princeton Net-Zero America Report

But even 65,000 miles of pipeline could only move 15% of current U.S. greenhouse gas emissions. To have any effect on climate change “would entail CO₂ pipeline capacity larger than the existing petroleum pipeline system,” which totals 2.6 million

miles, according to a 2020 [study](#) in Biophysical Economics and Sustainability.

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Beginning with the Bush administration, the U.S. government has spent [over \\$8 billion](#) to promote carbon capture and storage (CCS). But almost all of the CO2 in current pipelines is [used for](#) enhanced oil recovery rather than being injected deep into the earth for secure geologic storage, and enhanced oil recovery produces more emissions than it sequesters. Almost none of today's CO2 is manmade, but comes from natural sources like the Jackson Dome.

Proposals like Princeton's would likely require extending CO2 pipelines into heavily populated areas, across mountains and other natural barriers. The cost of such an enormous system is driving some to suggest simply repurposing existing natural gas pipelines to move CO2.

But because CO2 is corrosive and will eat through the carbon steel used in petroleum pipelines if contaminated with even small amounts of water, CO2 pipelines have to be [manufactured](#) to a higher standard and the purity of the gas carefully monitored. And research shows that CO2 from a commonly used carbon capture technique is [particularly likely](#) to have water in it. CO2 pipelines also run at significantly [higher pressures](#) than natural gas pipelines, which in turn requires more energy-gobbling compressor stations along the line to keep the CO2 in a liquid state.

That's why a 2019 National Petroleum Council [report](#) warned against using existing natural gas pipelines to move CO2. The American Petroleum Institute has also

highlighted the risks.

Yet an influential [white paper](#) produced jointly by the [Energy Futures Initiative](#), headed by former U.S. Energy Secretary Ernest Moniz, and the AFL-CIO proposes doing just that. “Repurposing the expansive U.S. network of existing oil and gas pipelines presents a ripe opportunity to lower costs for CO2 transport,” said the report.

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[Moniz](#) was Biden’s energy adviser in his 2020 presidential campaign, and oversaw billions in spending on CCS in his time at the Department of Energy. He and his team are considered leading experts on both natural gas and carbon dioxide infrastructure. Yet the petroleum industry’s own longstanding warnings about mixing gas technology with carbon dioxide are nowhere to be found in a 79-page report or its 299 footnotes.

“So much of it is about cost cutting, finding ways to do things cheaper and where can you make compromises,” said Carroll Muffett, president of the Center for International Environmental Law and co-author of a highly critical report on CCS and pipelines.

Muffett noted that CO2 behaves differently from natural gas inside a pipeline — in ways that make a CO2 rupture uniquely dangerous.

“Because of the intense pressures involved, explosive decompression of a CO2 pipeline releases more gas, more quickly, than an equivalent explosion in a gas

pipeline,” noted a [report](#) by CIEL and the Environmental Working Group, and “even a modest rupture can spread freezing CO2 over a wide area within seconds.”

A complicating factor in the Satartia accident was the presence of hydrogen sulfide. A Mississippi Emergency Management Agency email from the night of the accident said the leak contained an “unknown amount of pressurized CO2 with H2S.” CO2 is often contaminated with hydrogen sulfide, and Muffett points out that not only does H2S increase the corrosiveness of CO2, but it has serious [health effects](#) that can [include](#) damage to the nervous system, lungs, liver and heart.

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Even CO2 by itself, however, can be quite lethal. On a summer day in 1986, a thick plume of CO2 from a volcanic lake in Cameroon [killed](#) 1,746 people. Birds dropped out of the sky and whole families died together in minutes.

Short of death, however, there is a [wide range](#) of CO2 inhalation effects, which include dizziness, headache, nausea, shortness of breath, increased heart rate, memory disturbances, lack of concentration, disorientation, convulsions, and unconsciousness — symptoms that closely track those of Satartia’s gassing victims.

Unfortunately, few emergency rooms are familiar with the range of its effects.

A Scramble At The Hospital

When DeEmmeris Burns woke up, he was sitting in a chair near a nurse’s station. He had no idea how he got to the hospital.

An IV was running down his arm, and his brother and cousin were in adjoining chairs. His lungs burned and his head ached. He was still in his soiled clothes.

“They didn’t put us in rooms. I mean, it was just all bad,” he remembered. “The nurses weren’t prepared for this.”

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The hospitals told HuffPost that they responded appropriately under standard protocols for a mass toxic incident, but would not comment on specific cases.

At around 12:30 a.m., Sarah Belk, who had grown up with the Burns brothers, found the three sitting in chairs, wrapped in a single blanket. Belk had brought her own mother and daughter to the ER after they escaped from Sataria.

“I felt that they were not realizing the extent of what was going on with these people,” she said.

Sarah Belk

Andrew Burns asked where they were, and she told them they were at the hospital in Vicksburg, that their car stalled in the cloud of gas, and they’d been found unconscious. They were shivering “like they were in shock,” Belk said.

She saw their stained clothes and the dried foam on their faces. All three were thirsty. No one was attending to them, and the nurses seemed dismissive and rude, Belk said.

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“I felt that they were not realizing the extent of what was going on with these people,” she said.

Belk’s 16-year-old daughter, Ellie, had thrown up, and was still red-faced from the lack of air during her escape from Satartia. Belk’s 57-year-old mother, who has COPD, was also struggling to breathe, and after more than an hour of gas exposure, her complexion “was gray.” But Belk said she still struggled to get them oxygen or basic attention. The hospital seemed overwhelmed.

Belk let the three men borrow her phone to call their families.

“I’m like, ‘What’s going on?’” Berneva Lewis, Victor Lewis’ mother, remembered. “‘We’re at the hospital.’ That’s all they could tell me on the phone. I’m like, ‘What happened?’ They’re like, ‘They said we were in gas.’”

Given how disoriented they were, Lewis was startled to get a call at 2 a.m. saying the men were being released. “It was ridiculous. They were out before I could even get to the hospital,” she said.

Another relative picked them up at the hospital and drove them to Victor Lewis’ father’s home in Vicksburg. They were still in the same clothes they’d worn upon

arrival.

Of some 49 gassing victims who went to the hospital, almost all were treated at Merit Health River Region in Vicksburg or Baptist Memorial Hospital in Yazoo City. But the victims say neither facility seemed prepared for how to deal with this kind of disaster. In response to questions from HuffPost, both hospitals acknowledged they based treatment on standard toxic event protocols, which included setting up unheated outdoor decontamination tents to undress and wash victims — despite temperatures in the low 40s that day.

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Neither hospital said they'd received any special training in handling a CO2 pipeline incident. Medical records for four gassing victims treated at Baptist Memorial — and for six of those from Merit River Region, including the Burns brothers and Lewis — seem to reflect confusion about what they were exposed to.

“Asphyxiation by environmental toxic gas, accidental or unintentional initial encounter. CO2, H2S, chlorine gas exposure from ruptured gas line,” reads the report for all four of the Baptist patients. Later the records cite “natural gas exposure.”

“They [were] nowhere near ready for something like that to happen,” Hugh Martin said. “They were understaffed, but they also didn't know what the hell they were dealing with.”

For Denbury, An “Incident” Without Consequences

Denbury knew about the accident before anyone. At 7:07 p.m., a low pressure alarm at its Texas headquarters alerted the company that the pipeline was leaking, and the company closed the main operating valves for the Sartaria section of the line at 7:15 p.m., according to Denbury’s incident report to the federal Pipeline and Hazardous Materials Safety Administration (PHMSA).

The report claimed that the company promptly notified local emergency responders, but both Fire Chief Durward Pettis and county Emergency Management Director Jack Willingham said nobody called them.

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Denbury had no contact with them until Pettis called the company at about 7:45 p.m., according to the Yazoo County emergency dispatch log, and even then provided no guidance on the response or how to treat CO2 inhalation victims.

Without that guidance, 911 operators told callers there had been a natural gas pipeline rupture. But natural gas and CO2 are quite different. Natural gas is lighter than air, travels straight up, and is highly flammable. Exposure to CO2 mixed with hydrogen sulfide, on the other hand, can cause death from asphyxiation as well as lung damage. Residents of Sartaria were given no information about how to respond to such a mixture.

In the weeks that followed, Denbury also appears not to have disclosed the extent

of the pipeline breach to investors.

“The affected pipeline segment was [isolated] within minutes of detection,” Denbury’s Senior Vice President of Operations David Sheppard said during a Feb. 25 quarterly earnings call. “And as a precaution, the area surrounding the leak site was evacuated, including residents of the small nearby town of Satartia. No injuries to local residents, our employees, our contractors were reported in association with the leak.”



LEFT: The CO2 pipeline rupture. RIGHT: Vehicles pass over the pipeline explosion site in Satartia in July.

Yazoo County Emergency Management Agency/Rory Doyle for HuffPost

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To date, that is Denbury's most detailed public statement on the CO2 pipeline leak. Its filings with the Securities and Exchange Commission make no mention of a pipeline accident or leak, the evacuation, the injuries to residents, or any other details. Its 2021 annual [report](#) made two oblique references to the explosion, noting an oil production decline in 2020 at its Delhi, Louisiana, oil field "due to the lack of CO2 purchases between late-February and late-October 2020 as a result of the Delta-Tinsley CO2 pipeline being down for repair during that period" and "\$4.3 million of costs associated with the Delta-Tinsley CO2 pipeline repair."

Denbury did disclose a total of 46 hospitalizations and 200 evacuees — the latter a little lower than the number reported by other sources — in its incident report to PHMSA.

Denbury also did not disclose that on Oct. 7, 2020, there was another accident while reconnecting the damaged pipeline section. While workers did a "controlled blow-down" to remove any remaining CO2 from the section, a valve "froze in the open position due to internal ice formation" and gas poured out, according to Denbury's report to the state Department of Environmental Quality. Multiple attempts to close it failed, and some residents had to be evacuated that night on short notice. But the second incident lasted longer — almost an entire day— and released 41,000 barrels of CO2, according to Denbury, while the Feb. 22 incident lasted four hours and released 31,407 barrels.

Why the pipeline initially ruptured also has yet to be determined. A PHMSA spokesman declined to comment on when its official report on the incident might be released.

Meanwhile, Denbury sent a section of the pipeline to a metallurgical lab for testing. Based on those findings and its contention that the pipeline was "code compliant," it theorized in its report to PHMSA that soil movement caused by persistent heavy rains "induced axial stresses" that caused a rupture.

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Berneva Lewis plays a video of an October 2020 gas leak in Satartia.
Rory Doyle for HuffPost.

Heavy rains beginning in late January 2020 did cause widespread flooding and evacuations along the Yazoo and Mississippi rivers. But Chad Jones, a plaintiff's lawyer representing gassing victims who is also a geologist, said flooding is

common in the Delta, and should have been anticipated when the pipeline was built in 2007. Jones noted several other factors that should have been taken into account during construction as well: the soil in the area, called [loess](#), is unstable and prone to shifting and mudslides, and building a pipeline through such soil requires special techniques because any rupture in that area would send the gas downhill into Satartia.

“They might claim an act of God,” said Jones, “but I mean, we can prove that it wasn’t.”

Denbury Resources filed for bankruptcy five months after the incident, citing the pandemic crash in oil prices. It emerged from Chapter 11 in September 2020 after shedding \$2.1 billion in debt and its old name. In March 2021, the newly restructured Denbury Inc. gave a [presentation](#) at the 26th Annual Credit Suisse Energy Summit recounting highlights of 2020, including “record levels of safety performance for the fourth consecutive year.”

Among the new capital investments for 2021 that Denbury CEO Chris Kendall and other officials unveiled was a \$7 million plan boosting CO₂-based drilling operations in the Tinsley field — using the same pipeline that ruptured in 2020.

The Next Day

Officer Terry Gann got three hours of sleep before heading back to Satartia.

Abandoned vehicles were everywhere — doors ajar, many with their windows smashed from the rescue efforts. Gann had the keys to several, and rescuers set up a kind of lost and found on the side of the road.

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Gann helped Denbury personnel, including technicians with gas measuring equipment, escort villagers back to their homes. The rotten egg odor was still heavy in the air.

As soon as Linda Garrett and her family walked in her kitchen door, the technician's gas meter hit the red zone, and they had to leave until levels went down.

That evening, Satartia Mayor Kathy Nesbit, Pettis and several Denbury representatives presided over a standing-room-only meeting at First Baptist Church. Bruce Augustine, Denbury's operations manager, told the crowd that the company

Gassing Satartia: Carbon Dioxide Pipeline Linked To Mass Poisoning

Denbury officials said they would be stationed at the town hall to deal with any problems or complaints, and that residents would be promptly reimbursed for medical bills. While there was some discussion of safety measures to prevent a repeat disaster, nothing definite was promised.

Nesbit, an intensive care nurse who had been working at River Region hospital the night before, tried to dispel fears of long-term health effects. "It is a natural chemical in our bodies," she said. "So it's not a poison that's going to infiltrate you and eventually kill you."

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That was cold comfort to many survivors, some of whom noted pointedly that Nesbit hadn't been in town that night and didn't experience being inside the plume.

When it was over, Thelma Brown and Berneva Lewis thanked Vicksburg firefighters Jerry Briggs and Shane Garrard for saving their sons. "That was when they actually told us about the condition that the guys were in and how they were very near death and foaming at the mouth," Brown said.



Warren County firefighters Shane Garrard (left) and Lamar Frederick in Vicksburg, Mississippi, in July. They're next to the utility task vehicle they used during the February 2020 gas leak in Satartia.

Rory Doyle for HuffPost.

DeEmmeris and Andrew Burns and Victor Lewis were still in no shape to go to any meetings. After a sleepless night, more vomiting and severe headaches, they spent early Sunday on oxygen, being monitored and having bloodwork done at the University of Mississippi Medical Center in Jackson, the state's flagship teaching hospital. Even after that, Lewis told his mother, who is a nurse, that he still felt terrible.

She took all three to another doctor the next day, and tests revealed that their blood CO2 levels were still alarmingly high. The doctor said they would need to remain on oxygen until the numbers came down, and sent them to a pulmonologist.

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Denbury called victims to ask whether they needed anything and reimbursed medical bills quickly. Residents were asked to drop by Town Hall to discuss compensation for other losses, like pain and suffering. Those who accepted were paid on the spot, but waived their right to sue or discuss the settlement.

But many victims, some of whom say they are still sick, anxious and unable to fully return to their previous lives, weren't interested in a deal and decided to sue. The Burns brothers and Lewis hired Robert Gibbs, a well known lawyer from Jackson. Their suit will claim Denbury failed to properly maintain the pipeline or take necessary safety precautions to prevent exposure to hazardous gas, Gibbs said.

Another who decided to sue was Martin, whose occasional breathing difficulties from mild COPD have required much more frequent use of his inhaler since the February 2020 incident.

Medical records also show that months after the incident, his 78-year-old mother, who had no previous history of breathing difficulties, was using albuterol constantly, getting oxygen treatments, and had to be hospitalized for a week in March 2020 after he found her lying unresponsive in bed and having trouble breathing.

Marguerite Vinson was frustrated that not only was she not recovering, she seemed to be getting sicker.

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“I can’t think half-right! And I just wear out. Anything I try to do, it’s hard to do if it requires exertion,” she said.

Linda Garrett said Denbury asked to meet with her three weeks after the incident and offered her a package deal — \$5,000 each for her, her daughter and granddaughter, which she refused. She said she heard one neighbor, who is white, had been offered \$10,000, and that another white neighbor had been given \$18,000 compensation for cows that miscarried after the incident.

“They value a cow more than they do a human,” Garrett said.

Gibbs’ three clients, however, did get some extra attention from Denbury.

Not long after the gassing, DeEmmeris Burns’ phone rang. According to Burns, the voice on the other end identified himself as Denbury CEO Chris Kendall.

“He asked me ‘How’s everything going?’” said Burns. “I just told him I’ve got someone talking for me now.”

“You Should’ve Told Us.”

Over a year and a half after the gassing incident, the Burns brothers and Lewis still have not returned to work. They were under a doctor’s care until February 2021, when they were taken off oxygen, said Gibbs. DeEmmeris Burns moved out of his mother’s house because, he said, it’s too painful for him to drive up Perry Creek Road.

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Gibbs said his and some nine other law firms representing the Satartia CO2 plaintiffs have joined forces as the Denbury Litigation Group. While Gibbs represents only the three Perry Creek Road victims, some lawyers have as many as 60 or 70 clients. None has yet filed suit, awaiting the long-delayed Pipeline and Hazardous Materials Safety Administration report on the reasons for the accident.

Martin said he hopes a lawsuit will pry out all the facts about what happened that night and why.

“If there’s this many malfunctions in that one section of pipeline, somebody was at fault, or they were passing inspections they shouldn’t have passed,” said Martin. “That’s what we need to find out.”

Nevertheless, opinions differ as to how or even whether Denbury should be held accountable. One reason may be an inherent reluctance to criticize the oil and gas industry, a source of scarce well-paid jobs as well as a statewide political power.

Some are willing to consider the pipeline rupture “an act of God,” though gassing victims point out that many who believe that were not in town the night of the disaster.



The sun sets on the village of Satartia alongside the Yazoo River in July.
Rory Doyle for HuffPost

Interestingly, only a few of the residents interviewed for this article had heard of carbon capture and sequestration — and none knew about plans for a greatly

expanded CO2 pipeline network.

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“That doesn’t make any sense,” said Martin. “Not when they can’t control what they’ve already got. I think there’s real basic questions that need to be answered first.”

Linda Garrett said she still struggles with back pain from carrying Makaylan to the car that day. Makaylan’s asthma, which had been in remission, is worse than ever, and both her daughter and granddaughter remain traumatized. She wants the company punished.

Denbury, she said, should have warned the town before there was an emergency.

“If you cared about us, you and the pipeline, you should have let us know,” Garrett said. “But you didn’t let us know nothing. You just telling us now. That doesn’t seem right to me. Sometimes we have to be held accountable for the things that happen.”

CORRECTIONS: *An earlier version of this article misidentified a person affected as Lynett Burns. The woman’s name is Lynett Garrett. An earlier version of this article also misquoted Hugh Martin as saying his Army training for Desert Storm included “cyanide gas,” rather than “CS gas.”*

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