

ENERGY

# The Lone Star Lithium Boom

An ingenious Texan's invention may soon bring extensive mining of the metal—vital for our increasingly battery-powered future—to the northeast corner of the state.



By Russell Gold

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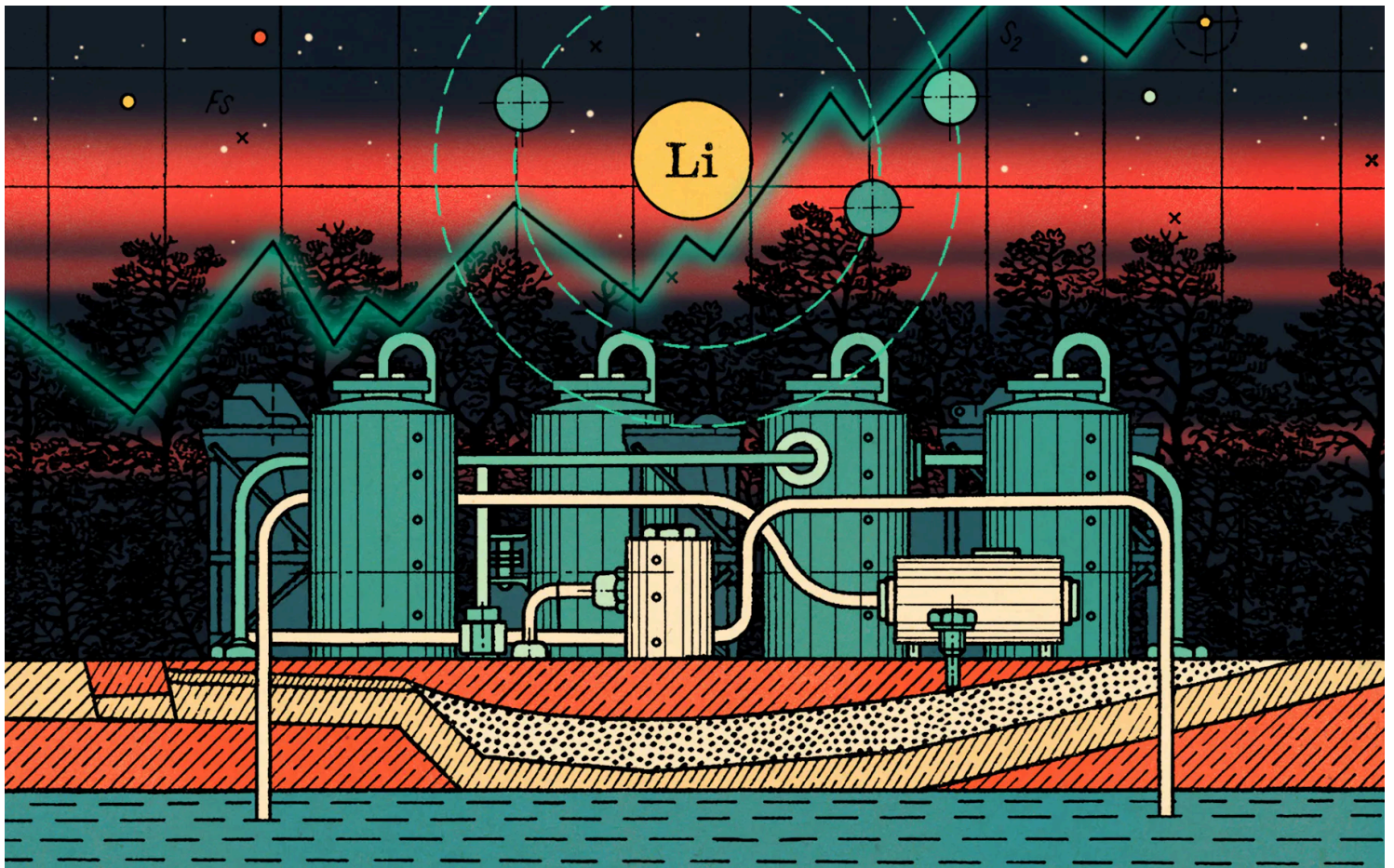


Illustration by Christian Gralingen

A lungful of hydrogen sulfide nearly killed John Burba a few months into his first job in the West Texas oil patch. He'd grown up in the region, where his

dad worked for Gulf Oil as a drilling superintendent. The encounter with the toxic gas left him with headaches for the better part of a year. Afterward, even though he'd previously been an uninspired student, he concluded, "Maybe it's not such a bad idea to go to college after all."

He headed to Waco, leaving Baylor University nine years later with a doctorate in chemistry and a nascent family. His new wife, Carol, who'd also studied chemistry at Baylor, was pregnant, so he dropped his plans for further studies and went to work for a global chemical company. Dozens of patents followed.

Nearly five decades later, the 73-year-old Burba has amassed the trappings of a successful life. He and Carol live on two hundred acres in East Texas with a donkey, three horses, five cows, and a one-ton bull named Max. But Dr. Burba—everyone calls him doctor, likely because of his professorial demeanor—isn't ready to slow down. One of his inventions looks poised to become as critical to the twenty-first century as the rotary drilling rig was to the twentieth.

To understand the burgeoning need his innovation is serving, just peek inside Burba's garage. He owns a Porsche Taycan powered by a lithium-ion battery, the same kind that keeps all electric vehicles running, not to mention iPhones and chainsaws and military drones and pacemakers and so on. Demand for batteries is growing exponentially. By 2040 nearly three quarters of new passenger vehicles bought globally are expected to rely on them. The revenue from the lithium-ion battery industry is projected to quintuple by the beginning of the next decade, to more than \$400 billion a year.

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John Burba and his wife, Carol, on their East Texas ranch.

Courtesy of John Burba

That won't be possible without the mining of hundreds of thousands of tons of lithium. The Porsche's battery alone contains about twenty pounds of the soft silvery metal. The element is devilishly hard to get your hands on because it's often found in extremely low concentrations, buried deep in briny underground reservoirs. Few places on earth offer large deposits of it.

One exception is Western Australia, where hydraulic excavators gouge enormous craters to get at the lithium-rich mineral spodumene. Elsewhere—particularly in the high desert where Argentina, Bolivia, and Chile converge—salt water is pumped out of the earth and left to evaporate, in pools that can be a half-mile long and a third of a mile wide, so enormous that

they're visible from space. It's a slow and environmentally damaging process that leaves behind a lithium-rich aqueous mixture.

Burba developed a third way, called direct lithium extraction, in 1995. In DLE, brine is pumped through cylinders made of a fiber-reinforced polymer and filled with crystalline granules slightly larger than grains of sand. Lithium ions get stuck, much like contaminants in an ordinary water filter, but the granules release the prized metal when the cylinder is flushed with fresh water. The process takes less than an hour to extract lithium that would otherwise take months or years to mine or to concentrate through evaporation, and it doesn't ruin large stretches of land or pollute millions of gallons of water.

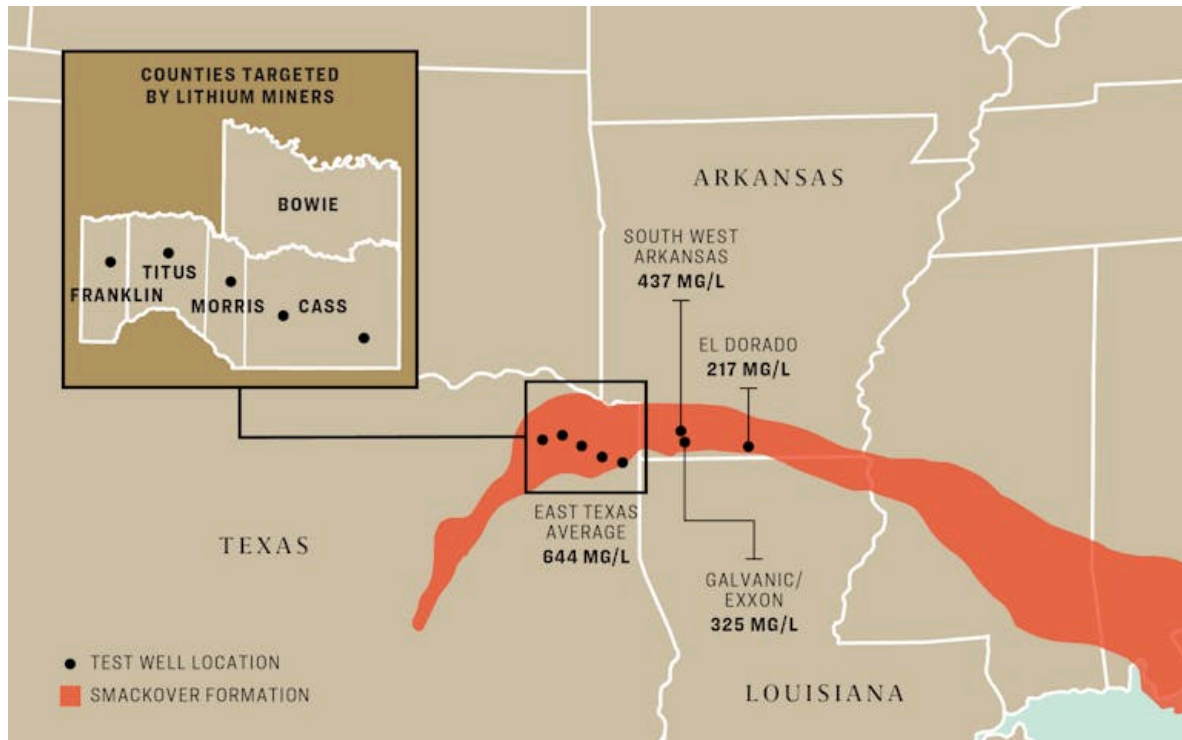
In the nineties, Burba designed and built the first DLE plant, in a place ominously called Hombre Muerto, in Argentina. The plant remains in operation today, although DLE didn't immediately take off because global lithium demand at the time was satisfied by existing mines and evaporation ponds. But as the need for batteries has soared, so has interest in new lithium sources. Last year the financial giant Goldman Sachs called DLE "a potential game changing technology."

Over the years, to test his invention, Burba has evaluated brine samples from fifty locations around the world. "Most are crap," he says, relaxing in jeans and black alligator boots in a large house with vaulted ceilings outside Atlanta, a small town a thirty-minute drive south of Texarkana. The brine containing the most lithium he's found in North America, rivaling the best in the world, lies beneath a one-hundred-mile swath of northeast Texas and southern Arkansas. It's a mostly rural area of soaring pines and muddy bayous. Burba's home, where he and Carol moved in 2021 to be nearer her aging parents, sits smack in the middle of it.

The race is on to turn this area—home to a subterranean limestone formation known as **the Smackover**, once a productive oil field—into a globally significant lithium producer.

# A Lithium Mother Lode

The briny water found within the Smackover formation contains relatively high concentrations of lithium. Amounts of the metal—measured in milligrams per liter—rise going westward from southern Arkansas into northeast Texas.



Source: Cameron Manche (Texas A&M University) and lithium companies

Fueled by several cups of coffee, an effusive Burba spoke nearly uninterrupted for three straight hours when I visited him in mid-July. The day before, the company he founded, Houston-based International Battery Metals, had announced the first commercial DLE lithium mine in the United States, in Utah, was operational. It had beaten a dozen companies—some, such as ExxonMobil, quite a bit larger—to this milestone.

Burba's successful launch followed years of struggle to get a sustained DLE operation up and running in North America. In 2012, after just fifteen days of retirement, he got bored and joined an attempt to extract lithium from the scalding water that fed a geothermal power plant in California. Four years later he looked into the prospect of building a large DLE facility in the

Canadian province of Alberta, but the plan sputtered because the costs involved were too high.

That setback led him to puzzle out a modular extraction system that could be transported on skids and assembled at the mining site. Daniel Layton, a longtime Houston energy investor, backed him, and the first such plant was built in Lake Charles, Louisiana, in 2022.

By then, drillers were looking for lithium in the Smackover. **Galvanic Energy**, an Oklahoma City company, acquired 120,000 acres of leases in Arkansas. Its CEO **publicly worried**: Could the lithium “be brought to market without destroying the pristine landscape of this beautiful, forested land?” To demonstrate that it could get to the metal with minimal disruption to the environment, Galvanic teamed with Burba in 2022. It was an opportunity to showcase his modular technology.

“Obviously, the first time you run anything through it, you’re a little nervous,” Layton told me. “I never doubted for one minute it was going to work. I just wasn’t one hundred percent sure how well it was going to work.” The results exceeded everyone’s expectations. An independent test later showed that Burba’s system recovered 97 percent of the lithium from the brine.

Exxon acquired mineral leases to Galvanic’s 120,000 acres for about \$100 million, and **Reuters has reported** that the oil giant is considering using Burba’s DLE at the heart of its operations. (Burba’s company plans to provide its extraction technology to miners.) Houston-based SLB is looking to **get into lithium extraction**, as are Saudi Arabia’s **Aramco and the Abu Dhabi National Oil Company**. A half dozen lithium-mining outfits are leasing land in northeast Texas’s Bowie, Cass, Franklin, Morris, and Titus counties.

While the brine in south-central Arkansas contains between 200 and 250 milligrams of lithium per liter, testing suggests that concentrations rise to the west and reach much higher levels in the Texas portion of the Smackover. In March 2023, Standard Lithium, a Canadian company, **announced** it had

drilled a well that tested at 634 milligrams per liter, reportedly in Cass County. Overnight, leasing activity in the area exploded.

**Cass County** has welcomed the new industry—albeit warily. The resistance isn't to extractive industries, which have long provided jobs and economic opportunities. It's not uncommon to see a flatbed truck piled high with recently cut trees rumbling past on county roads, and oil drilling has been ticking up in recent years. But Craig Bohuslav, a local petroleum landman, told me that in 2022 he began receiving calls from concerned neighbors who were getting solicited to sign brine leases.

These early proposals were lousy: \$10 to \$25 an acre for a onetime signing bonus and none of the royalty payments typical for fossil fuel exploration. (Oil leases regularly fetch \$300 an acre, plus a 20 percent royalty.) He counseled his neighbors to wait, and the offers have since improved markedly. "I'm not against leasing," Bohuslav said. "All I'm trying to do is get a fair deal."

The county's highest elected official likewise is taking a wait-and-see approach. "We had an oil boom in the thirties—that's what brought my grandfather here," said Travis Ransom, the boyish-looking county judge. "Immense wealth was generated, but it didn't stay here. This is an opportunity, and I want to make sure we don't squander it."

Driving through town in Ransom's red Chevy Avalanche with 152,000 miles on the odometer, we passed a line of sixty cars extending out onto the street from the parking lot of a Methodist church. They were waiting their turns to accept boxes of fresh produce from a once-a-month food pantry. "We're not a wealthy county," Ransom said. "We have a lot of generational poverty."

He likes that DLE doesn't require tearing up the earth as the lignite coal mines in nearby Harrison County once did. And he's proud that it could facilitate domestic production of an element vital to the U.S. economy, at a time when congressional leaders have expressed concerns about China's

potential dominance in global lithium supplies. Extracting the metal, he figures, could make Cass County relevant in the twenty-first century. “The future is batteries and bandwidth.”

Our lunch of hamburgers at the Rabbit Patch, a popular local restaurant, was regularly interrupted by friends of Ransom’s coming over to say hello, including a loan officer from the local bank. He told us his parents and two of their neighbors had recently signed brine-mining leases. The bonus payments were more than \$250 an acre, and they were to receive 10 percent royalties. Ransom seemed pleased.



An aerial view of International Battery’s modular DLE system in Lake Charles, Louisiana. Courtesy of International Battery Metals

**Burba may have** invented DLE, but others have developed their own forms of the technology—using proprietary resins or other absorbent materials to filter the brine. Some of these competitors boast deep pockets. Houston-based oil giant Occidental Petroleum, for instance, owns a subsidiary with a patented DLE system and plans to demonstrate its technology at a California facility.



Further along is Standard Lithium. A ninety-minute drive east of Atlanta—south of El Dorado, Arkansas—the company announced in March that it had started mining. Its eight-foot cylinder hangs from a metal structure painted bright blue and yellow, like an IKEA erector set. Up to ninety gallons of salt water per minute run through the cylinder, which is full of a resin, developed by a subsidiary of Koch Industries, that resembles sesame seeds. “It is very quiet, very contained, highly automated,” said Chad Martin, Standard’s vice president of U.S. operations.

Standard plans to build a \$1.3 billion facility in Arkansas, called the South West Arkansas Project, and is aggressively leasing in East Texas. In May, Norwegian oil giant Equinor agreed to invest up to \$160 million in these efforts. The El Dorado pilot could have been the first commercial DLE facility in the U.S., but until Arkansas finalizes rules on lithium-mining royalties, the lithium is being extracted, separated, and then put back into salt water that’s pumped back into the ground. Martin shrugged in a “what can you do” manner when I asked him about it. “We’re just proving the technology,” he said.

That opened the door for Burba and International Battery to be the first to commercially mine lithium in North America using DLE. The company disassembled its modular plant in Louisiana, and shipped it on trucks to Skull Valley, Utah, where it was reassembled at a facility owned by U.S. Magnesium that has been producing magnesium from the Great Salt Lake for more than fifty years and has large ponds of leftover salts. Burba struck a deal to strip the lithium out of that waste. International Battery says it should initially produce 4,500 tons of lithium per year there, enough for more than 10,000 Tesla Model S batteries. The Utah opportunity simply came together faster than any of the potential plays in Texas.

“I would have preferred the Smackover,” Burba said, over barbecue beef sandwiches that Carol had prepared. Texas has many advantages, he noted: higher concentrations of lithium, proximity to battery factories in Mississippi and Tennessee, and easy access to drilling rigs. International

Battery is ready to assist as soon as some client company in Texas needs its services.

Burba finished his lunch and scratched the ear of Ruger, an 85-pound Jack Russell and schnauzer mix. East Texas has long been known for its cotton, timber, and oil output. Next could be lithium. It could rival South America's so-called Lithium Triangle. "I believe it will," Burba said. "I believe it absolutely will."

*This article originally appeared in the October 2024 issue of Texas Monthly with the headline "The Lone Star Lithium Boom." **Subscribe today.***

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