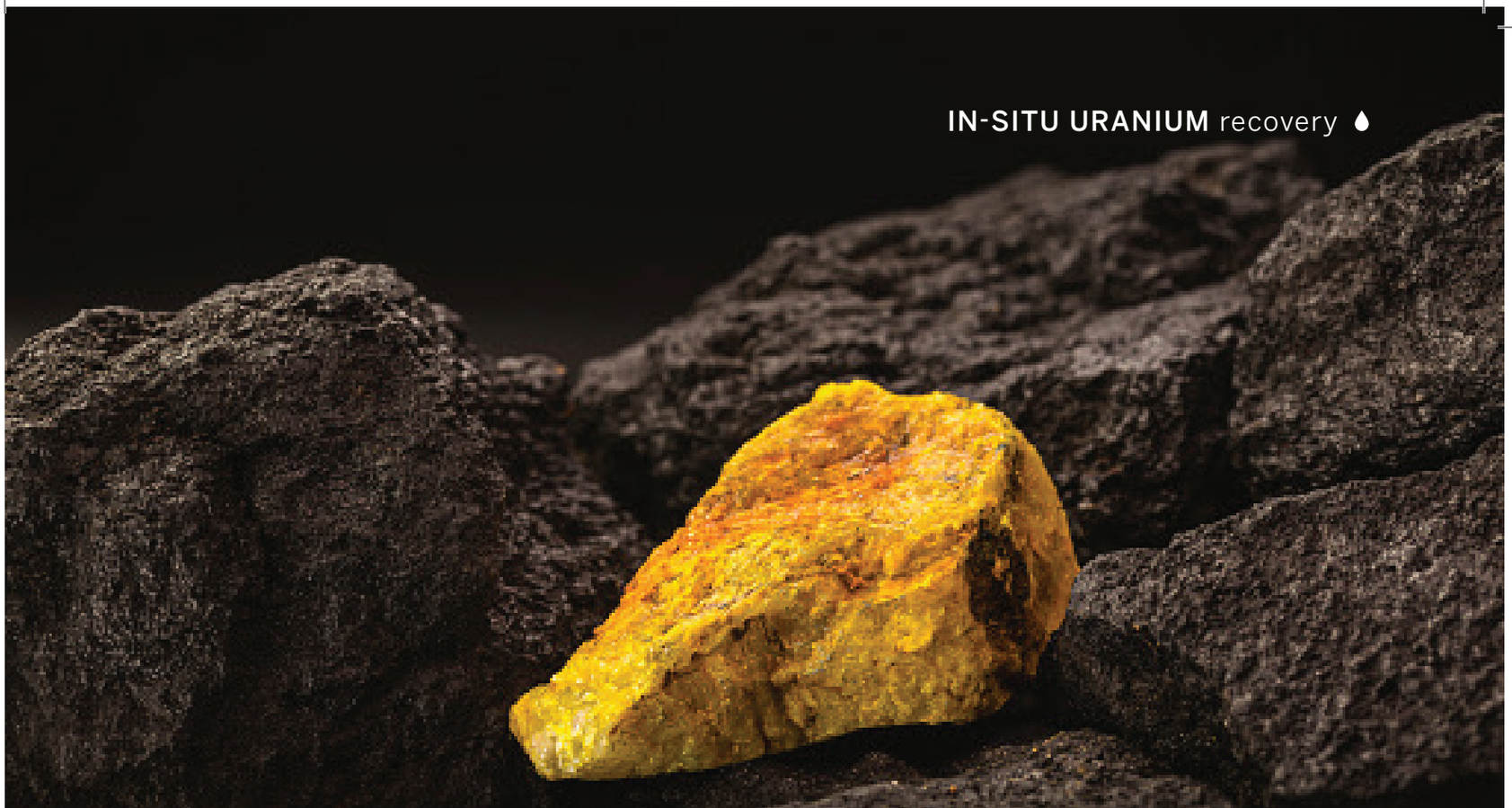


IN-SITU URANIUM RECOVERY IN TEXAS AND BEYOND: MYTH VS. FACT

By Michael D. Campbell, Henry M. Wise, Bruce Handley and Kevin T. Biddle
The I2M Corporation

IN THE MODERN ENERGY LANDSCAPE, nuclear power has gained renewed attention as a reliable, safe and carbon-free energy source. However, misinformation about in-situ uranium recovery projects — a vital component in nuclear fuel production — has always fueled unnecessary skepticism.

In this particular period of history, the subjects of nuclear power and in-situ uranium recovery development projects have been raised in discussions where well-founded geoscience is being ignored. Small, but media-trumpeted, anti-nuclear and anti-uranium recovery groups have repeatedly used outdated arguments or incorrect assumptions in attempting to convince the regulatory agencies and general public that nuclear power plants and uranium recovery projects cannot be operated safely and therefore should never be permitted. Nevertheless, nuclear power is rapidly gaining popularity in Texas and other states as well as developed countries around the world.

Texas is not only the oil and gas capital of the U.S., but it could also become the major center for recoverable uranium resources.

The in-situ methodology is now used to recover uranium from sands that are either within known aquifers — which have been naturally contaminated by uranium over relatively limited areas of the aquifer — or when uranium occurs in sand units located well below such drinking-water aquifers. In the cases of multilayered uranium deposits, drinking-water aquifers are separated by clay intervals that protect the shallow aquifers from the recovery fluids during production.

The U.S. has brought into production two new, full-scale nuclear reactors in the past few years in Georgia at the Vogtle plant site, and more are being planned.[1]

China's nuclear power generation capacity has grown by about 900% in the last 20 years. France is building new large nuclear power plants. And many companies and countries are planning to build new small modular reactors when they arrive on the market, likely by the end of the decade or sooner. The old idea that if the U.S. stops using nuclear power, nobody else will use it was obviously wrong.

With the sustained rise in the price of yellowcake and with the need for American uranium to offset the cancelled contracts with Russia and associates as the result of the

Ukraine War and because Russia can no longer be relied upon to provide us with a secure supply of uranium, the need for new sources of uranium is becoming critical.

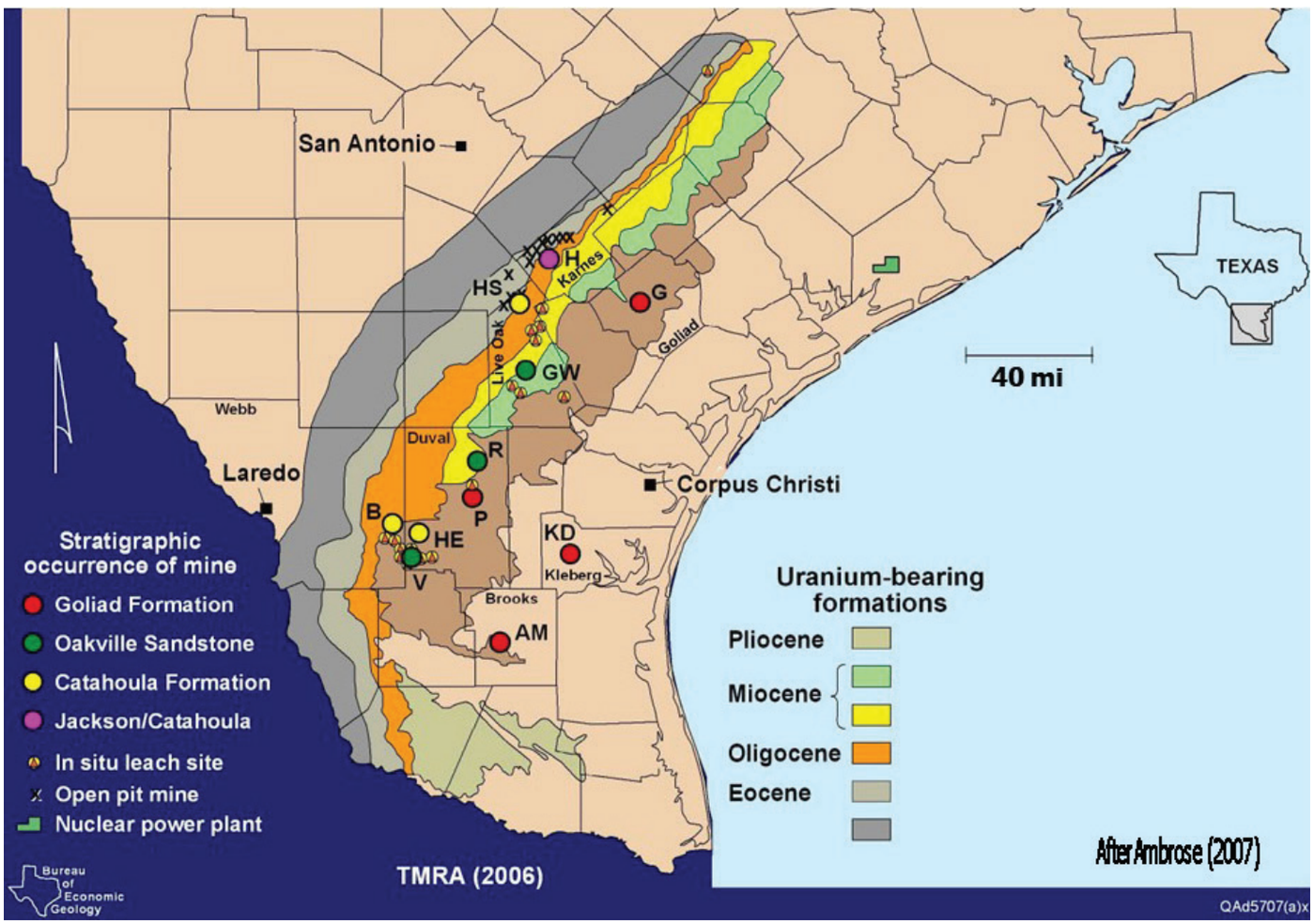
Although South Texas has been a well-known producer of uranium since the 1960s, it is now apparent that uranium occurrences are more widespread than considered possible or even likely by previous uranium geologists (see map).[2] And since Texas is gearing up to build new nuclear power plants, new uranium sources would find ready markets over this decade and beyond.[3]

But what about the risks involving potential damage to the surface and shallow water-table wells above where in-situ uranium recovery operations would be conducted? It should be noted here that there has never been a specific project case where these risks have been realized in Texas. The existing ISR operations in South Texas have removed millions of pounds of uranium and continue to successfully remove uranium from deep deposits without impact on the environment or groundwater resources. This history demonstrates the overall environmental and economic viability of the uranium production industry in Texas.

The question then arises: Where is all the uranium needed to fuel these new nuclear power plants going to come from? The short answer is from the U.S., Canada, Australia and a few other friendly countries. But there are roadblocks that hinder the development of U.S. uranium resources.

Drawing from The I2M Corporation's database of more than 14,000 (as of early 2025) reports, technical papers and technical news items relating to nuclear power, uranium geoscience and development, and other mineral commodities,[4] we explain the myths vs. the facts.

Myth: Surface uranium mining can pose significant risks



to human health and the environment, as noted in many internet reports.

Fact: There are many reports on the internet that uranium activities are focused on out-of-date or exaggerated information relating to old open-pit (surface) mines and their associated wastes. Many other reports are not relevant to in-situ uranium recovery remediation, which leaves a negligible footprint. There has never been a report of contamination of drinking water aquifers in Texas or elsewhere in the U.S. by in-situ uranium projects.[5]

Myth: Neither the Texas Commission on Environmental Quality nor the Texas Railroad Commission provide sufficient regulation and oversight of in-situ recovery operations in Texas.

Fact: The TCEQ imposes stringent permitting requirements and operational oversight for ISR projects. The TRC regulates surface-mining activities and exploration drilling but not uranium recovery operations. The federal Mine Safety and Health Administration oversees surface-mining operations but does not regulate mining operations in Texas. The federal Environmental Protection Agency is involved on a case-by-case basis when requested by the state.

Myth: Human health and wildlife exposures are significant in uranium operations.

Fact: Human and wildlife exposures to uranium and by-products are very minor in Texas ISR projects. Uranium concentration in produced fluids exhibits very low radioactivity. The entire in-situ process, including producing yellowcake, involves very minor radioactivity.

Myth: People who work in processing plants can be exposed to harmful radioactivity.

Fact: Plant personnel are required to wear personal protective equipment via federal and state regulations to mitigate an occasionally dusty environment, but there is zero risk of landowners being exposed to harmful radioactivity.

Myth: Any radioactivity should be avoided as a potential health risk.

Fact: Fear of exposure to radioactivity has been wildly exaggerated by anti-mining and anti-nuclear power groups. Low-level radiation has always been present in our everyday lives from radiation from our sun, X-rays, high-altitude air travel, fertilizers and radioactive potassium in bananas and Brazil nuts.[6]

Myth: The risk of potential damage to the surface and shallow water-table wells where ISR operations are conducted is unavoidable.

Fact: There has never been a specific project case where these risks have been realized.

Myth: Disposal of waste groundwater constitutes another opportunity for contamination of drinking water.

Fact: Only about 1% (by volume) of the recycled groundwater is disposed of in a very deep, highly regulated disposal well. Oil and gas producers also dispose of their excess fluids (brines) in similar deep disposal wells. These disposal wells inject produced brine water into very deep sands containing highly saline groundwater and are also regulated.

Myth: Uranium companies have left the land with significant surface contamination.

Fact: The TCEQ requires all uranium companies to provide financial assurance in the form of insurance or bonds for any required future cleanups. The old days of mining companies abandoning surface mining projects are no longer permitted by the state.

Myth: Property values are going to be adversely affected by the presence of a former in-situ recovery operation.

Fact: Any surface contamination and radioactivity exposure, as discussed, would be minimal. Regarding property values, the selected properties already contain uranium in the subsurface over a wide area and hence any assessment of its real estate value would include a disclosure of uranium-mineralized groundwater in the deep subsurface.

Myth: If a uranium company goes bankrupt, there will be no funds to pay for remediation of affected property.

Fact: Most leases allow for significant funds to be paid to the surface owners for the temporary use of their lands and a commitment that the leased lands would be remediated to at least pre-ISR conditions, with funds guaranteed by a TCEQ-mandated bond.

Myth: It is not the time or place for more in-situ uranium recovery projects.

Fact: Texas citizens are blessed with significant oil and gas reserves and properties containing economic uranium deposits are no exception. Some areas are also fortunate to have deep, economic uranium sands on their flanks. All in-situ recovery operations have stringent state and federal safety protocols, environmental controls, remediation oversight and financial requirements for regulatory compliance. The time is right for developing new uranium projects in Texas because uranium prices have risen 233%

I2M Team Meeting June 2025: From left in front: Kevin T. Biddle, Bruce Handley, Michael D. Campbell, Henry M. Wise and Michael A. Knowles. From left standing: M. David Campbell, Paul Heikkila and Charles Bludau.

in the last five years and millions of dollars would be spent during such projects, which would have long-term beneficial effects on local economies.

Second fact: Uranium-recovery production is more related to oil and gas production than to uranium "mining" of near surface uranium ore. Both produce fluids, the former consisting of hydrocarbons and the latter as dissolved uranium in fluids of very low radioactivity.

Myth: ISR operations would disrupt livestock and other agricultural operations in the area.

Fact: Agricultural operations in the area can be managed with little interference. Surface payments as discussed in many surface leases would address any potentially serious interference or loss of income. Temporary fences would define withdrawal areas until remediation is complete and approved by the TCEQ.

Assumption: Uranium is considered a fuel mineral, according to the U.S. Geological Survey, not a critical mineral.

On the other hand: Uranium should be considered a critical mineral and should qualify for funding from the federal government for encouraging development of uranium projects in the U.S. to contribute to the needs of expanding domestic nuclear power.

While it can be demonstrated that there is no apparent threat to public safety in the groundwater or in the general environment, there is still the need for widespread public support of uranium projects in the same way citizens have supported oil and gas production projects around Texas in the past.

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The full version of their paper is available in link below:

https://i2massociates.com/downloads/Dispelling2025wRefs.pdf

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