MetOx International

The U.S. bet on domestic high-temperature superconducting wire

Explainer · June 1, 2026

U.S.-based developer and manufacturer of high-temperature superconducting (HTS) wire for grid, fusion, and AI applications

COMPANY	MetOx International, Inc.	**HEADQUARTERS**	Houston, Texas, USA
OWNERSHIP	Private	**CEO**	Bud Vos

ABSTRACT

MetOx International manufactures high-temperature superconducting (HTS) wire, a specialized conductor that carries large electrical currents with near-zero resistive loss when chilled to cryogenic temperatures. Its proprietary product, Xeus™ wire, is built on second-generation YBCO (yttrium barium copper oxide) chemistry, a ceramic compound that superconducts at temperatures reachable with liquid nitrogen rather than the far colder liquid helium older superconductors require. The company is scaling from a Houston base toward a roughly $193.7M facility in Chatham County, North Carolina, financed by a stacked private round and courted with conditional federal support. The bet is that demand from grid expansion, fusion-energy magnets, AI data centers, medical imaging, and defense will outrun a thin domestic supply base. The implication for an investor: this is an industrial scale-up story whose technical credibility is real but whose commercial pull, as of mid-2026, remains largely unproven in public.

Keywords: high-temperature superconductors; HTS wire; YBCO; fusion energy; grid infrastructure; domestic manufacturing; deep tech; AI data centers

1. Snapshot

MetOx International, Inc. is a Houston-based developer and manufacturer of high-temperature superconducting (HTS) wire, a conductor class that moves large currents with almost no resistive loss once cooled to cryogenic temperatures. The founding year is disputed in available sources (1998 or 2002), and the relationship to predecessor names like Metal Oxide Technologies is not formally documented, which bears on whether this is a long operating history or an effectively recent vehicle. Leadership is unusually senior for a company at this stage: Bud Vos is President and CEO; Dr. Alex Ignatiev is co-founder and Chief Science Officer; Keyvan Esfarjani, formerly of Intel, is Executive Chairman; and semiconductor veteran Richard Gottscho joined the board in April 2026. The company raised roughly $40M in Series B financing across 2024, with earlier strategic backing from Koch Disruptive Technologies (Dec. 2023), an Elemental Impact investment (Dec. 2024), and a $3M DOE ARPA-E grant (2023). Not publicly known: revenue, customer count, named offtake contracts, current headcount, and measured wire performance specs.

2. Thesis: Why This Company, Why Now

The bet is straightforward: HTS wire is a critical input for several capital-intensive build-outs at once, and the United States has almost no domestic capacity to make it. MetOx positions Xeus™ as a supply solution for grid expansion, fusion-energy magnets, hyperscale data centers, MRI and medical imaging, aerospace, and defense. The AI linkage is real but indirect. HTS conductors enable denser, lower-loss power delivery and superconducting cabling that could matter for the extreme power densities of AI data centers, but this is a forward-looking use case, not a shipping product line, and demand here rides entirely on the broader AI-capex cycle.

The "why now" is partly a manufacturing-sovereignty argument: building a resilient U.S. HTS base before fusion and grid programs scale. That framing comes from the company and from North Carolina's economic-development apparatus, not from an independent market study. Treat the often-repeated "demand far outweighs supply" line as the company's and investors' characterization rather than established market fact. The reachable near-term market is narrower than the aspirational list, anchored to fusion R&D procurement and early grid pilots, and no named customers or offtake agreements have been disclosed publicly.

3. The Core Idea in Plain English

MetOx makes wire that, when cold enough, conducts electricity with essentially no resistive heat loss. **The analogy.** Think of ordinary copper as a crowded hallway where moving people (electrons) constantly bump walls and each other, shedding energy as heat. An HTS conductor below its critical temperature is closer to a frictionless track: the current flows without the resistive drag that wastes power and forces bigger, hotter equipment.

Old world: copper and aluminum, cheap and forgiving but lossy and bulky at high power. New world: ceramic superconductors that carry far more current per cross-section, enabling smaller magnets, denser cabling, and the intense magnetic fields fusion reactors need. The catch is that "no loss" only holds within strict temperature, current, and field limits, and the cooling itself costs energy.

4. The Technical Space

The category problem is moving or storing enormous electrical current without the losses, heat, and physical bulk that conventional conductors impose. Second-generation (2G) HTS wire, often called "coated conductor," is the dominant modern approach: a thin film of YBCO deposited onto a flexible metal tape with buffer and stabilizer layers. YBCO superconducts at temperatures reachable with liquid nitrogen (around 77 K), dramatically cheaper and easier to handle than the liquid helium that older low-temperature superconductors demand. Many magnet applications, however, push the wire down to roughly 4–20 K in high magnetic fields, where performance must be separately characterized.

What "good" looks like comes down to four dimensions that actually matter. First, critical current density: how much current a given cross-section carries before superconductivity breaks down, ideally sustained under high magnetic fields. Second, performance in-field, since fusion magnets operate at very high fields where many conductors degrade. Third, manufacturable length and yield, because deposited-film processes are notoriously hard to run long and uniform at scale. Fourth, delivered cost per kiloamp-meter (kA·m, the standard commercial unit that ties current capacity to length and price), the figure that decides whether superconductors beat copper economically.

Two honest caveats temper the marketing. The "zero loss" property is resistive and direct-current; under alternating current, HTS conductors still incur AC hysteresis losses. And the system always carries cryogenic cooling overhead, so net energy savings depend on the full installation, not the wire alone.

5. How Their Technology Works (and What's Proprietary)

MetOx's product is Xeus™, a 2G HTS wire built on YBCO chemistry. Architecturally it sits at the materials-and-components layer of the stack: MetOx supplies conductor that magnet builders, cable makers, and system integrators wind into coils and cables. The core of the company is its thin-film deposition process for laying down uniform, high-performance YBCO over long tape lengths, the step that most determines yield, cost, and consistency in this field.

The proprietary question divides into what is genuinely hard and what is replicable.

- **Process know-how is the real edge.** Depositing YBCO films that hold high critical current density over kilometers of tape, with acceptable yield, is the central manufacturing challenge in 2G HTS. Accumulated process recipes, equipment tuning, and defect control are difficult to copy quickly and represent the most defensible technical asset. This is process IP, not patent-protected in a way that bars a well-funded competitor from developing an alternative route.
- **The underlying chemistry is not proprietary.** YBCO and the 2G coated-conductor architecture are well-published and used by every serious HTS maker. MetOx's differentiation lies in execution at scale, not in inventing the material class.
- **Quantitative performance is unverified.** No public source provides measured critical current density, operating-temperature window, in-field behavior, or cost per kA·m for Xeus™. Without those numbers, an outsider cannot benchmark Xeus™ against competing conductors, and the claim of being "up to ten times more efficient than copper" rests on an undefined metric from interested parties, with no source specifying whether "efficient" means current density, line loss, footprint, or full system cost including cryogenics. This is the single biggest gap in evaluating the technology.

A well-resourced competitor or national lab could in principle replicate the approach; the moat, if there is one, is the time and capital embedded in MetOx's specific deposition line.

6. Business and Go-to-Market

MetOx sells a physical industrial input, so the business is fundamentally a manufacturing and capacity story rather than a software-style margin story. The commercial motion implied by its market list is sales-led and partner-heavy: long qualification cycles selling into fusion programs, utilities, magnet and cable makers, and defense buyers, each of whom must validate the conductor before committing volume.

Traction is the conceded weak point. No customer, pilot deployment, or offtake contract is named in any public source. The growth thesis presumes commercial pull, but the supporting evidence is funding and facility announcements, not revenue.

What is documented is capital and capacity intent. The company raised about $40M in 2024 Series B financing, comprising a $25M extension announced September 23, 2024 (led by Centaurus Capital and New System Ventures) and an additional $15M closed in November 2024, with investors including Duquesne Family Office, Piedmont Capital, Crosscut Ventures, and John Doerr's family office. Koch Disruptive Technologies led a strategic investment in December 2023, Elemental Impact invested in December 2024, and a $3M DOE ARPA-E grant landed in 2023. The flagship commitment is a roughly $193.7M Xeus™ facility planned for Chatham County, North Carolina, expected to create 333 jobs at an average salary near $75,132, above the county's roughly $48,413. Gross margins are undisclosed; with a capital-intensive cost base (deposition equipment, cleanroom, cryogenic testing), facility utilization and the unprovided dollars-per-kA·m figure will dominate unit economics.

7. Competitive Landscape and Moats

MetOx competes in a small global field of 2G HTS coated-conductor manufacturers. The corpus contains no independent competitive survey, so rivals are best treated as industry context rather than a ranked threat map. The most plausibly direct, head-on comparison is SuperPower Inc., a U.S.-based YBCO coated-conductor maker pursuing the same material class and many of the same end markets. Adjacent and international players include Japan's Fujikura and SuperOx, each producing competing HTS tape.

Where MetOx might win versus SuperPower. A fresh, large purpose-built U.S. line plus deep capital backing and senior semiconductor-manufacturing leadership could give MetOx an advantage in delivering high-volume, consistent supply tuned to fusion and grid programs, and a domestic-sourcing story that resonates with U.S. federal buyers.

Where MetOx loses. Established makers tend to have longer track records and, critically, published or fielded performance and real customers, whereas MetOx has disclosed neither measured specs nor named offtake. On evidence in hand today, the incumbents are more proven.

On moats, two are plausibly real and one is asserted. First, **process and scale economics**: a working, high-yield deposition line at volume is genuinely hard to replicate and is the strongest claim. Second, **accumulated manufacturing data**, the yield and defect-control learning that compounds as the line runs, a market-structure advantage that strengthens only once the NC plant is operating. The asserted moat is the self-reported "North America's largest dedicated HTS plant" superlative, unverifiable without an independent facilities survey. Platform risk is modest but real: this is hard physical manufacturing, not a layer a foundation lab disrupts overnight, yet a deep-pocketed entrant, a national lab, or a fusion developer choosing to vertically integrate its own wire supply could fund a competing line.

8. Risks and Open Questions

The picture turns on a handful of unknowns, each one I would press a founder on directly.

- **Customers and offtake.** Who has actually committed to buy Xeus™ wire, in what volume, and under what contract? Zero deployment evidence is public, and this is the gap that most undermines the demand thesis.
- **Measured performance.** What is the wire's critical current density, in-field behavior, operating-temperature window, and delivered cost per kA·m, and are claims like "largest dedicated HTS plant" and "ten times more efficient than copper" tied to defined metrics and test conditions? Without numbers, differentiation is unprovable.
- **Federal support status.** The $80M sometimes folded into the company's growth narrative reflects being "selected to negotiate," with no public evidence of an award or disbursement. Is it secured or conditional, and what milestones gate access?
- **Execution on the NC facility.** Construction timing is reported variously as 2025 or 2026, and the "5× Houston" capacity multiplier appears only in secondary write-ups. Can MetOx hit yield and cost targets at scale, the step where coated-conductor projects historically stumble?
- **AI-capex cyclicality.** Demand tied to data-center and fusion build-outs is exposed to swings in AI and energy capital spending, a first-order risk for a capacity-heavy manufacturer.

9. Bottom Line

The core read: MetOx is a credibly backed, well-led industrial scale-up in a genuinely strategic and supply-constrained niche, but its commercial story is still mostly promise. The single biggest reason it could work is structural: a thin domestic HTS supply base meeting fusion, grid, and AI power demand, with MetOx building purpose-built U.S. capacity to fill it. The single biggest reason it might not is the complete absence of public customer, offtake, or measured-performance evidence. The one thing to watch next: a named anchor customer or offtake agreement tied to the North Carolina plant ramp, alongside resolution of the DOE negotiation.

10. For the Nerds

The technical bet that decides everything is whether MetOx's deposition process holds high critical current density, especially in-field, over long, high-yield tape lengths at a cost copper cannot match. In 2G coated conductors the value concentrates in the YBCO film's microstructure: grain alignment (texture) and engineered pinning centers determine how much current survives in strong fields. Those pinning centers are nanoscale defects deliberately introduced to trap magnetic flux vortices and stop them moving under the Lorentz force, which would otherwise dissipate energy and collapse the superconducting state. Introducing them without disrupting the film's epitaxial texture is a delicate process tradeoff. Fusion magnets are the demanding case, where in-field critical current, not the headline self-field number, is what matters.

Two open questions are worth pressing. First, AC-loss management: in grid and power-delivery use the wire carries alternating current, inducing hysteresis losses even below critical current, which fine filamentary striation of the YBCO layer mitigates at a cost to yield. Second, the economic crossover versus copper, which only clears when reduced ohmic loss, higher current density per footprint, and routing flexibility together outweigh cryocooler capex, opex, and maintenance. That crossover is application-specific, which is exactly why publishing long-length Ic uniformity, AC-loss curves, and thermal budgets matters more than any single peak number.

WHERE SOURCES DISAGREE

Founding year: 1998 or 2002?

Multiple sources (LinkedIn, Deep Tech Week) cite 1998 and tie it to co-founder Ignatiev. EquityZen cites 2002

Unresolved: no corporate filing in the corpus settles it; 1998 is better corroborated but the discrepancy is real

Corporate identity: Is "MetOx International, Inc." the same legal entity as "Metal Oxide Technologies / MetOx Technologies"?

Likely a rebrand or continuation of the same core entity. But no source documents a formal restructuring

Unresolved: no corporate filing confirms the relationship, and it bears on whether the company has a long operating history or is effectively recent

DOE $80M status: secured support or conditional?

Company framing folds it into growth/"DOE support." Primary sources state only "selected to negotiate $80 million," with no evidence of award or disbursement

Unresolved: no public document confirms the negotiation concluded or any funds were obligated

NC facility construction start: 2025 or 2026?

Official DOE/NC sources say "scheduled to begin construction in 2025"; a LinkedIn-sourced profile says 2026

Unresolved: the discrepancy may reflect planning-vs-groundbreaking but is not reconciled in the corpus. The fuller 2027-hiring/2029-completion chain rests on a single source and is likewise unverified

Houston capacity (~2,000 km/yr) and NC "5× capacity" multiplier

Secondary profiles cite 2,000 km/yr and a 5× NC multiple. Primary MetOx material (2023) states only "over 1,000 km/year" as a target, and no primary NC/DOE source states the 5× figure

Unresolved: the stronger numbers appear only in secondary write-ups with no primary update

"North America's largest dedicated HTS plant"

Company-aligned profiles assert it. No independent survey of competing HTS facilities exists in the corpus

Unresolved: the superlative is self-reported and unverifiable without market/market-share data