MetOx International

YBCO high-temperature superconducting wire, made in America for the grid, AI, and fusion

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ABSTRACT

MetOx International manufactures high-temperature superconducting (HTS) wire from YBCO, branded Xeus™, and is scaling domestic U.S. production at a moment when superconductors are moving from lab curiosity toward grid, data-center, and fusion infrastructure. The distinctive bet is supply: MetOx is positioning as a domestic American source of a material that fusion magnet builders, hyperscalers, and grid operators may need in volume, anchored by an announced $193.7 million North Carolina expansion. The mechanism is a coated-conductor wire that, at the material level, carries large current with zero DC resistance below its critical temperature, enabling far higher current density than copper in a given cross-section. Three implications follow: the company's value is gated by manufacturing yield and throughput, not science novelty; its timing rides the same AI-and-fusion capex wave funding the rest of the sector; and almost every commercial signal here remains a forward projection rather than a booked contract.

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

1. Snapshot

MetOx International is a Houston, Texas-based manufacturer of high-temperature superconducting wire made from YBCO, sold under the Xeus™ brand. The company is privately held and pre-IPO, was incorporated in 1998 (a founding date contested against a 2002 figure in one investor profile), and employs roughly 51 to 200 people as of mid-2026. It raised approximately $40 million across a 2024 Series B: a $25 million extension co-led by Centaurus Capital and New System Ventures in September 2024, plus roughly $15 million in November 2024 from Duquesne Family Office, Piedmont Capital, Crosscut Ventures, John Doerr's family office, and Ryan Panchadsaram. That round is distinct from a December 2023 strategic round led by Koch Disruptive Technologies. Bud Vos is President and CEO; Dr. Alex Ignatiev (University of Houston) is co-founder and Chief Science Officer; Keyvan Esfarjani (ex-Intel) was named Executive Chairman in March 2026, and Richard Gottscho joined the board in April 2026. Not publicly known: post-money valuation, revenue, named customers, and contract values.

2. Thesis: Why This Company, Why Now

The bet is that the United States will need a domestic source of HTS wire, and MetOx wants to be it. YBCO coated conductors are a genuine enabling material for compact fusion magnets, denser power transmission, and high-field devices, and the constraint on adoption has been manufacturable, affordable wire at volume rather than the underlying physics. MetOx's response is to scale capacity, anchored by an announced $193.7 million facility in Chatham County, North Carolina, expected to create 333 jobs. Those figures are state-announced projections, not binding commitments.

The AI linkage is real but indirect. HTS demand is driven less by data centers buying wire directly and more by the grid buildout and the fusion-energy push that the AI compute wave is helping finance and justify. That makes MetOx an upstream supplier to several adjacent booms at once, and exposes it to the same capex cyclicality. Domestic-supply policy preferences add a directional tailwind for U.S.-made superconductor,

though that is a procurement bias rather than established causation. The company and its investors argue demand far outweighs supply; independent HTS market reports describe a younger, competitive, niche market where demand is anticipated rather than realized, so treat the imbalance as an interested-party claim.

3. The Core Idea in Plain English

MetOx makes wire that conducts electricity with no resistance once it is cooled below a critical temperature. A useful analogy: a normal copper wire is a crowded two-lane road where friction (resistance) generates heat and caps throughput; an HTS conductor is closer to a frictionless track that moves far more current through the same cross-section without the loss copper incurs at DC.

Old world: move large power with thick copper or aluminum, accepting resistive losses and bulk. New world: move much higher current density through a thin coated-conductor tape, which is what makes compact fusion magnets and dense grid links physically feasible. The catch is that the wire must be kept cold. The real economic move is a swap: pay for cryogenic cooling instead of copper and resistive losses, betting that the cooling cost is lower at sufficient power density. That bet gets more attractive exactly as AI infrastructure and fusion magnets push power density up.

4. The Technical Space

HTS wire is a materials-manufacturing problem disguised as a physics product. The category is dominated by "coated conductors," also called 2G HTS tape: a rare-earth barium copper oxide (REBCO, of which YBCO is the canonical case) deposited as a thin film on a flexible metal substrate with buffer and stabilizer layers. The physics has been understood for decades; the hard part is depositing a crystallographically aligned superconducting film, kilometer after kilometer, without defects that throttle current.

Production approaches differ mainly in how the superconducting layer is laid down, including metal-organic and vapor-based deposition methods, each trading off speed, yield, and uniformity. What "good" looks like reduces to a few dimensions that actually matter:

- **Critical current per width.** How much current a tape carries before it stops superconducting, often specified in a magnetic field for fusion use.
- **Yield and throughput.** Usable kilometers per year at consistent quality, the metric that gates price.
- **In-field performance.** Retaining critical current under the high magnetic fields fusion magnets impose.
- **Cost per kiloamp-meter.** The number that decides whether HTS displaces copper or stays niche.

Cryogenic cooling and AC losses are real, non-trivial system costs, which is why "near-zero loss" is a material-level DC statement, not a whole-system promise.

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

MetOx builds 2G HTS coated conductor: a YBCO superconducting layer deposited onto a metal tape, branded Xeus™. At the material level, that film carries high current with zero DC resistance once cooled below its critical temperature, which is the property the entire value proposition rests on. The company sits upstream in the stack as a wire supplier; cable makers, magnet builders, and system integrators are its customers, not end users. The specific deposition method MetOx uses is not established in public sources, so claims about a particular route or substrate should be treated as unconfirmed rather than fact.

The honest question is what is proprietary versus replicable. The defensible IP, to the extent it exists, lives in the deposition process and process control: the recipe and equipment that yield long, uniform, high-critical-current tape at acceptable cost. That know-how is hard-won and not trivially copied, and it is where deep-tech manufacturers genuinely differentiate. But the underlying chemistry and the coated-conductor architecture are

not exclusive to MetOx. REBCO tape is produced by several established players globally, each with its own deposition method, so the science is shared and the moat is execution: who hits the best critical current per dollar at the highest reliable throughput.

Two capacity claims circulate, that Houston is North America's largest dedicated HTS wire plant and runs around 2,000 km per year, but both come from a single profile with no independent, comparative corroboration, so treat them as unverified. The proprietary story, in short, is process maturity rather than a one-of-a-kind material.

6. Business and Go-to-Market

MetOx is a component manufacturer selling wire into capital-intensive systems, which makes it a sales-led, relationship-and-qualification business rather than a self-serve one. Customers in fusion, grid, and high-field devices must qualify a wire supplier over long cycles, so contracts tend to be lumpy, technical, and slow to land. Pricing in this category is typically quoted per kiloamp-meter, reflecting current-carrying capacity rather than length alone; MetOx does not disclose its terms.

The disclosed traction is mostly capital and validation, not revenue. Beyond the venture rounds, MetOx received a roughly $3 million ARPA-E (DOE) grant in 2023 and a December 2024 investment from Elemental Impact, signals that the wire is taken seriously by technical and climate-focused funders. Its stated target applications span power transmission, distribution, and grid expansion, hyperscale data centers, AI infrastructure, fusion energy magnets, advanced medical and MRI devices, and aerospace. Read that as a target list, not a deployment record: no specific named customers or contract values appear despite references to active deployments, and no post-money valuation is disclosed.

The unit-economics question is central. HTS only wins where cost per kiloamp-meter, including cooling, beats the copper or low-temperature-superconductor alternative. The North Carolina scale-up is the bet that volume drives cost down the curve, but until throughput and yield are demonstrated at the new plant, margins are unproven.

7. Competitive Landscape and Moats

MetOx competes in a small global field of REBCO coated-conductor makers, and its position is "credible domestic-scale challenger" rather than category leader.

The closest direct rivals on U.S. soil are **American Superconductor (AMSC)**, a publicly traded HTS wire and power-electronics company, and **SuperPower Inc.**, a long-established 2G HTS tape manufacturer with a Furukawa affiliation. Where MetOx wins: a fresh capital base, a large announced U.S. capacity expansion, and momentum with fusion- and grid-aligned investors that positions it as a scaling domestic supplier. Where it loses, or at least lags: AMSC and SuperPower carry longer commercial track records, qualified-supply histories, and, in AMSC's case, the audited-financials credibility of a public company, while MetOx's headline throughput and "largest plant" claims are single-sourced and unverified. Adjacent producers include Japanese and European REBCO makers (such as Fujikura and Theva), relevant mainly as evidence the technology is not geographically captive.

Process know-how is the only real moat. Deposition recipes and yield optimization are genuinely hard to replicate, but they are a degree of difficulty, not exclusivity, since several firms already produce competitive tape.

Domestic-supply positioning is a policy-timed advantage, not a structural one. U.S.-made superconductor, backed by DOE money, matters for buyers wary of foreign supply chains, but that edge erodes if rivals build domestically or if procurement preferences shift.

The capacity claim is asserted, not proven. Until the North Carolina plant runs at projected output, the scale advantage is a forward projection on an unbuilt facility. One genuinely useful signal sits outside the moats: the March 2026 appointment of Keyvan Esfarjani, who brings semiconductor manufacturing scale-up experience from Intel, reads as a deliberate move toward production execution rather than research, which lowers execution risk on the NC bet without itself constituting a moat.

8. Risks and Open Questions

The picture turns on a few things that are not yet settled, spanning technology, commercial traction, and dependency on markets MetOx does not control.

› **Yield and throughput at scale.** Can the North Carolina facility produce uniform, high-critical-current tape at the volumes and cost implied? What is current yield and uniformity over long tape lengths, and how does it compare to SuperPower's published specifications?

› **Real demand versus anticipated demand.** "Demand far outweighs supply" comes from the company and its investors; independent reports describe a niche, competitive market. What firm purchase orders or qualified-supply agreements exist today, with what dated volumes?

› **Facility financing and capital structure.** A $193.7 million buildout by a sub-200-person company with no disclosed revenue is a large bet. How much of the NC plant is equity, debt, and state incentive, and which revenue milestone triggers the next funding tranche?

› **Unit economics at field.** How does cost per kiloamp-meter at current Houston volumes compare to the crossover point where HTS beats copper for grid applications, and what volume is required to reach it?

› **Execution and entity questions.** The $193.7 million and 333-job figures are projections, and the founding-year and corporate-entity discrepancies (1998 vs. 2002; relationship to Metal Oxide Technologies) should be clarified in diligence. Separately, the "10x more efficient than copper" figure appears only in company and North Carolina economic-development materials, not neutral benchmarking, and should be treated as a marketing claim.

9. Bottom Line

MetOx is a credible, well-funded domestic HTS-wire scale-up whose value rests on manufacturing execution rather than novel science. It works if the company can deliver high-yield, low-cost tape at volume into a fusion-and-grid demand wave that genuinely materializes; it stalls if that demand stays anticipated rather than booked, or if incumbents like AMSC and SuperPower out-execute on cost. The single thing to watch next is hard evidence from the North Carolina buildout, namely real throughput, yield, a funded construction plan, and named customer agreements, that converts the announced capacity story into demonstrated commercial traction.

10. For the Nerds

The differentiation lives in pinning and in-field critical current, not in achieving superconductivity at all. For fusion magnets, what matters is how much current a REBCO tape sustains under tens of teslas at cryogenic temperature, which depends on engineered defects (pinning centers) that trap magnetic flux and prevent it from dissipating energy. A tape's lab critical current at self-field tells you little about its behavior inside a high-field magnet, so in-field performance is the true competitive axis. Worth noting: the marketing-friendly operating point near 77 K (liquid nitrogen) is not the regime fusion cares about, where magnets run closer to 20 K and 15–20 tesla, conditions under which YBCO's advantage over low-temperature superconductors is real but narrower than headline numbers suggest.

The deeper open question is loss management. AC losses and the cryogenic cooling penalty are first-order system costs, which is why the material-level "zero DC resistance" claim and a whole-system efficiency claim

are different things. The economic frontier is cost per kiloamp-meter at field, integrated with cooling overhead. Whoever pushes critical-current density up while driving deposition cost and defect rates down sets the price floor for the category, and that race is decided in reels of tape, not in physics papers.

WHERE SOURCES DISAGREE

"10x more efficient than copper"
MetOx/state materials assert Xeus™ makes cables up to ten times more efficient than copper. Independent technical literature reports no universal "10x" multiplier and stresses system efficiency depends on cryogenics and design
Unresolved: the figure appears only in company/economic-development messaging, never in neutral benchmarking

Houston as "North America's largest dedicated HTS wire plant" and ~2,000 km/yr throughput
A single Deep Tech Week profile asserts both. No independent, comparative capacity dataset confirms the superlative or the throughput
Unresolved: the numbers are single-sourced marketing/profile figures with no audited or comparative corroboration

NC facility = 5x Houston capacity, and the 2026 buildout → 2027 hiring → 2029 completion timeline
Briefs stitch these into a clean arc. Counter-evidence notes the milestones come from different sources and that such announcements routinely shift
Unresolved: the dates describe distinct milestones and the capacity multiple is a forward projection on an unbuilt plant

Founding year: 1998 vs. 2002
Corpora 2 and 3 say founded/incorporated 1998; Corpus 1's EquityZen profile says 2002
Unresolved: the discrepancy may reflect conflation of "MetOx International" with predecessor "Metal Oxide Technologies," and the corpus does not confirm entity continuity

Corporate entity identity
"MetOx International Inc." may be the same legal entity as "Metal Oxide Technologies / MetOx Technologies," or distinct entities under one brand
Unresolved: no corpus source establishes the legal relationship

"Demand far outweighs supply" / the AI-fusion "why now"
Investors and the company state demand far exceeds supply, positioning MetOx as a key U.S. supplier. Independent HTS market reports describe an early-stage, competitive, niche market with anticipated (not yet realized) demand and multiple producers
Unresolved: the imbalance is sourced to interested parties and not supported by neutral market data