MetOx International

Domestic high-temperature superconducting wire, built for the AI-and-grid power era

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U.S. manufacturer scaling domestic production of second-generation high-temperature superconducting (HTS) wire for grid, fusion, AI data centers, and defense

COMPANY	MetOx International, Inc.	HEADQUARTERS	Houston, Texas, USA
OWNERSHIP	Private	CEO	Bud Vos
TOTAL RAISED	~$40M (2024 Series B extension; lifetime total not publicly reconciled)		

ABSTRACT

MetOx International manufactures second-generation high-temperature superconducting (2G-HTS) wire, branded Xeus, that carries large electrical currents through a tiny cross-section with near-zero loss and no heat generation. The distinctive bet is industrial: MetOx is one of a small handful of firms trying to scale domestic HTS wire production at a moment when grid upgrades, fusion magnets, and AI-driven power demand are all converging on the same scarce material. The company raised roughly $40 million in a 2024 Series B extension and was selected by the U.S. Department of Energy in October 2024 to negotiate up to $80 million toward a planned North Carolina manufacturing facility, a $193.7 million project expected to create 333 jobs. If MetOx executes the scale-up, it becomes a critical-supply-chain node for American energy and defense infrastructure. If it stumbles on yield, cost, or the conditional DOE money, it remains a promising pilot-stage materials company in a capital-punishing category.

Keywords: high-temperature superconductors; HTS wire; YBCO; grid modernization; fusion energy; AI data centers; domestic manufacturing; DOE funding

1. Snapshot

MetOx International, Inc. develops and manufactures second-generation (2G) high-temperature superconducting (HTS) wire under the Xeus brand, material that conducts electricity with effectively zero resistance once cooled, at a facility in Houston, Texas. The founding year is contested across sources (one profile cites 1998, another circa 2002; unresolved), and the company has operated under at least two prior names, Metal Oxide Technologies and MetOx Technologies, Inc., though the formal rebranding history is not documented. The company's documented capital is a ~$40M Series B extension across 2024: a $25M close in September 2024 led by Centaurus Capital and New System Ventures, plus a further $15M in November 2024 from Duquesne Family Office, Piedmont Capital, Crosscut Ventures, John Doerr's family office, Ryan Panchadsaram, and others. Strategic backers include Koch Disruptive Technologies, Safar Partners, and Elemental Impact. Leadership pairs operating depth with science: Bud Vos (CEO), co-founder and CSO Dr. Alex Ignatiev (University of Houston physicist), Executive Chairman Keyvan Esfarjani (ex-Intel global operations), and board appointee Dr. Richard Gottscho (semiconductor veteran). As a private company, MetOx's revenue, customer count, current headcount, and lifetime funding total are not publicly established.

2. Thesis: Why This Company, Why Now

The bet is that HTS wire is becoming a strategic bottleneck material, and that the United States needs domestic supply of it. Three demand waves are arriving at once: grid modernization and transmission-and-distribution (T&D, the high-voltage network that moves power from plants to load) upgrades, magnetic-confinement fusion (where HTS is central to the high-field magnet designs that confine the plasma), and the power-density crunch inside hyperscale data centers built for AI. The AI linkage is direct and material: AI compute buildout is driving unprecedented load growth and substation density, and HTS cables can move far more power through a given footprint than copper. That makes MetOx's timeliness partly a function of AI capex, with all the cyclicality that implies. The addressable market the company points to is broad (grid, fusion, data centers, wind, MRI, aerospace, defense), but the reachable near-term market is narrower: customers qualifying wire today, mostly fusion developers and grid pilots. The October 2024 DOE selection to negotiate up to $80M signals policy alignment with reshoring this supply chain, though it is a selection, not obligated money.

3. The Core Idea in Plain English

A superconductor carries current with no electrical resistance, meaning no heat and almost no loss. MetOx makes a flexible tape, Xeus, that behaves this way when chilled to liquid-nitrogen temperatures (around minus 196°C), letting a thin ribbon carry the current of a far thicker copper bundle.

The useful analogy is a garden hose with a slow leak along its entire length: ordinary copper bleeds energy as heat every meter, which caps how much current you can push before the wire itself becomes the problem. An HTS tape is a hose with no leak at all below its critical temperature, so you move dramatically more current through a much thinner conductor with no heat penalty. In the old world you ran thick copper or dug new trenches and accepted resistive losses and bulk. In the new world a slim superconducting tape moves the same or more power with near-zero loss, provided you can keep it cold and manufacture it consistently.

4. The Technical Space

The category is "coated conductor" 2G HTS wire, and the central problem is brutally physical: the superconducting compound only works as a near-perfect crystal, yet you must deposit it kilometers long, on flexible metal tape, cheaply and reproducibly. The active material is typically REBCO (Rare-Earth Barium Copper Oxide; MetOx uses the yttrium variant, YBCO). It must be grown with its crystal grains aligned within a couple of degrees, because misalignment sharply degrades current-carrying capacity.

What "good" looks like reduces to four dimensions. First, critical current, how many amps a given width of tape carries before it stops superconducting, the headline performance number. Second, cost per kiloamp-meter ($/kA·m, a unit that normalizes price for both length and current-carrying capacity), the metric that actually decides whether HTS displaces copper. Third, length and uniformity, since a single weak spot can disqualify a long piece, making manufacturing yield the real battleground. Fourth, deposition throughput, because the slow, vacuum-heavy processes that grow the crystal layer are what keep wire expensive. Players differentiate mainly on the deposition technique and on whether they can hold performance while pushing speed and yield.

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

MetOx builds 2G HTS coated-conductor wire: a layered tape with a YBCO superconducting film grown on a buffered, aligned metal substrate, finished with stabilizing layers. Its core technical asset is the deposition method for laying down the YBCO layer, the step that governs both performance and unit cost, and the firm positions Xeus around manufacturability at scale rather than a one-off lab record. The company sits squarely at the materials layer of the stack: it sells wire, which magnet builders, cable makers, and fusion developers then wind and integrate into finished systems.

On what is genuinely proprietary versus replicable, the honest split is as follows.

- **Process know-how is the defensible core.** The hard-won asset in coated conductors is the specific recipe and equipment that yield long, uniform, high-current tape at acceptable cost. That tacit, accumulated process engineering is difficult to copy quickly even for a well-funded entrant, and it is where MetOx's real IP likely concentrates.
- **The underlying material is not proprietary.** YBCO and the coated-conductor architecture are decades-old, openly published physics. MetOx is not inventing the material class; it is competing on how economically it can produce it.
- **Scale itself is unproven.** The claim that matters, consistent high-yield output at kilometer lengths and competitive cost, is precisely what the Houston ramp and the planned North Carolina plant are meant to demonstrate. Company-linked materials cite a Houston capacity figure of roughly 2,000 km and describe the plant as "ramping up," but the annual time basis appears inferred rather than stated, and current actual output is not independently verified. Until third-party qualification confirms it, the manufacturing edge is asserted, not established. The "foundation-style incumbent" threat here is a mature competitor with its own deposition line, not a software lab, so the danger is industrial replication rather than platform extension.

6. Business and Go-to-Market

MetOx's model is component manufacturing: it produces and sells HTS wire by the length to integrators rather than selling finished systems, a classic land-and-qualify motion where customers run multi-month qualification before committing volume. Pricing in this market is typically quoted per kiloampere-meter, normalizing for both length and current-carrying capacity so buyers can compare across tape widths and grades; MetOx's own pricing is not disclosed. The go-to-market is therefore sales-and-partnership-led and slow by nature, gated by each end market's certification cycle.

Its stated target applications are deliberately broad: grid and T&D upgrades, hyperscale data centers and AI infrastructure, fusion magnets, next-generation wind turbines, MRI and medical imaging, aerospace, and defense. These are intended markets, and nothing in the available evidence confirms full-scale, revenue-generating commercial deployments as opposed to pilots, qualification runs, or early orders, an important distinction for any diligence read.

The commercial story is presently an industrial scale-up funded by capital, not yet by product revenue. The ~$40M Series B extension funds the Houston ramp, and the planned North Carolina facility represents a $193.7M investment expected to create 333 jobs, with the DOE's conditional selection to negotiate up to $80M intended to anchor it. Unit economics turn entirely on cost per kiloamp-meter at scale; gross margin is structurally pressured by high capital costs and the energy intensity of cryogenic deposition, though per-unit selling prices run high relative to copper. Whether MetOx reaches copper-competitive economics is the open commercial question, and it is unresolved.

7. Competitive Landscape and Moats

MetOx competes in a thin field of firms that can actually produce 2G HTS wire at length. The comp set:

- **SuperPower** — the most direct domestic rival, a long-established U.S. coated-conductor manufacturer.
- **AMSC (American Superconductor)** — established U.S. HTS supplier with grid and defense relationships.
- **Non-U.S. producers** — major foreign coated-conductor manufacturers serving the global fusion-magnet demand surge, generally with lower labor and facility cost structures.

Against SuperPower, the closest rival. MetOx's plausible win is its scale-up thesis and policy tailwind: a large, purpose-built domestic plant with conditional DOE backing aimed at next-generation capacity and cost. Where it loses, today, is maturity: SuperPower has years of shipped, qualified wire and customer relationships, while MetOx still has to prove high-yield volume output. Esfarjani's and Gottscho's semiconductor-manufacturing pedigree is the strategic answer to that gap, betting that fab-grade process discipline transfers to coated conductors.

On moats, the durable ones are limited and the asserted ones should be discounted.

- **Process and yield advantage (real if proven).** On top of the technical edge above, sustained low-cost, high-yield output would be genuinely sticky, since customers requalify reluctantly. It is not yet demonstrated.
- **Domestic-supply and policy position (real, partial).** The reshoring tailwind and DOE selection confer a procurement edge for U.S. grid and defense buyers, but policy support is conditional and not exclusive to MetOx.
- **Accumulated qualification data and switching costs (real, prospective).** Once wire passes a customer's qualification, displacing it is costly, and every completed qualification run builds a data asset a new entrant must replicate from scratch. This is the most durable moat in the set, but MetOx can only earn it after it ships qualified volume at scale, which the current evidence does not confirm.

8. Risks and Open Questions

The picture turns on execution, conditional money, and proof of deployment. The questions I would put to the founders:

- **Yield and cost:** What is current Houston output and yield at length, and what cost per kiloamp-meter does the North Carolina plant target versus copper? (Technical/defensibility risk.)
- **DOE conditionality:** The $80M is a selection to negotiate, not obligated funds, and can be reduced, delayed, or terminated on milestones. What is the negotiation status, and what is the financing plan for the $193.7M facility if DOE money slips? (Platform/dependency risk.)
- **Commercial proof:** Which target markets have moved from pilot to firm, revenue-generating orders, and what is the qualified backlog? (Commercial/distribution risk.)
- **Efficiency claims:** Promotional materials cite figures such as cables "up to ten times more efficient than copper." What does delivered efficiency look like after accounting for cryogenic load and AC losses in a representative real-world application, where net efficiency is highly context-dependent?
- **Timeline and lineage:** Accounts differ on whether the NC plant builds from 2026 or hires from 2027 toward 2029 completion; what is the reconciled schedule, and what is the true founding year and corporate lineage given the contested 1998-versus-2002 dating and the prior names?

9. Bottom Line

MetOx is a credible, well-staffed attempt to build domestic HTS wire capacity into a genuine supply bottleneck, sitting on real process know-how rather than novel material science. It works if, and only if, it converts pilot-scale capability into high-yield, cost-competitive volume; that manufacturing proof is the whole ballgame. Watch the DOE negotiation outcome, the North Carolina facility's financing and timeline, and the first publicly confirmed anchor customer in fusion or grid: those signal whether the $80M and the scale-up are real or remain aspirational.

10. For the Nerds

The deepest bet is that semiconductor-style process control can crack the yield problem in coated conductors. The physics constraint is biaxial texture: the YBCO grains must align within roughly a couple of degrees across both in-plane axes, or the supercurrent stalls at grain boundaries. Achieving that over kilometers, on moving tape, through vacuum or chemical deposition, is the unsolved manufacturing challenge that keeps $/kA·m high. The frontier question is throughput-versus-quality: faster deposition tends to degrade texture and critical current, so the proprietary edge lives in whatever lets MetOx push deposition rate without losing performance.

The second open question is field performance. YBCO's critical current density degrades as the applied magnetic field rises, which matters enormously for fusion magnets operating in very high fields. The standard mitigation is artificial pinning centers (APCs), deliberate nanoscale defects introduced into the YBCO matrix that pin magnetic flux vortices and slow their motion under field. Whether Xeus incorporates APC engineering, and how its in-field critical current compares at 4.2 K (liquid helium, the fusion-relevant regime) versus 77 K (liquid nitrogen, the grid-relevant regime), is the single most important technical discriminator for the high-value fusion and defense segments. AC-loss behavior, the energy dissipated per cycle in alternating-current applications like grid cables and transformers, is a second axis rarely disclosed in marketing but decisive for whether the cryogenic cooling penalty pencils out in practice. A fusion-grade tape and a commodity-grid tape pull in different directions, and whether one line can serve both economically is a real strategic fork worth pressing on.

WHERE SOURCES DISAGREE

Founding year

One profile (EquityZen) dates the company to circa 2002; another (its LinkedIn profile) states 1998

Unresolved: the available sources give two different years and no primary corporate registration document reconciles them

Total cumulative funding raised

The well-documented press releases describe a discrete ~$40M Series B extension in 2024; one aggregator (CB Insights) separately reports irreconcilable lifetime totals of ~$134.74M and ~$76.72M plus a $1M convertible note

Unresolved: the $40M figure refers only to the Series B extension, while no primary disclosure establishes a lifetime total, and the aggregator's own figures contradict each other

Corporate identity and name history

Recent press releases, the official website, and SEC filings use "MetOx International, Inc."; older materials reference "Metal Oxide Technologies" and a 2022 "MetOx Technologies, Inc." Sources treat these as the same entity, but the formal rebranding date and reason are not documented, leaving it

Unresolved: whether this was a name change, a related entity, or a single continuous legal entity

Houston plant capacity: "2,000 km" and its time basis

Company-linked materials cite a 2,000 km figure and describe the plant as "ramping up." Independent sources neither confirm "2,000 km per year" (the annual time basis appears inferred, not stated) nor verify current actual output

Unresolved: no third-party documentation establishes the time basis or how far along the ramp-up actually is

DOE funding status: secured vs. conditional

One framing presents the $80M DOE selection as government backing for the company. The actual language is "selected to negotiate," which under standard DOE practice is conditional on due diligence and milestones and can be reduced, delayed, or terminated

Unresolved: the sources document only a selection-to-negotiate step, not a final award or obligated funds

Commercial deployment status

Company materials list numerous high-value end markets (grid, fusion, AI data centers, MRI). No source documents whether MetOx wire is in live, revenue-generating commercial deployments versus pilots, qualification runs, or orders

Unresolved: the available evidence describes target applications and production build-out but contains no confirmation of full-scale market deployment