MetOx International

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

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U.S. manufacturer scaling domestic production of second-generation HTS "Xeus" wire for grids, data centers, and fusion

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

ABSTRACT

MetOx International is a Houston-based developer and manufacturer of high-temperature superconducting (HTS) wire, a class of conductor that carries large electrical currents with drastically reduced resistive loss once cooled into its superconducting state. Its branded product, Xeus, is built on second-generation YBCO technology (yttrium barium copper oxide, the ceramic compound at the heart of modern HTS wire). The distinctive move is industrial rather than scientific: MetOx is attempting to stand up volume domestic manufacturing of a material that has existed in labs and niche applications for decades but has never reached the scale or cost grid operators, hyperscalers, and fusion developers would need. Anchored by a planned North Carolina factory and federal clean-energy support, the company is positioning HTS wire as critical infrastructure for three converging demand sources: aging power grids, AI data-center buildout, and the fusion-energy push. The open question is whether MetOx can convert announced capacity and addressable markets into shipped wire and revenue.

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

1. Snapshot

MetOx International Inc. is a U.S.-based developer and manufacturer of second-generation HTS wire, headquartered in Houston, Texas. Leadership pairs co-founder and Chief Science Officer Dr. Alex Ignatiev (University of Houston), who anchors the underlying materials science, with CEO Bud Vos running the commercial scale-up. The board added Executive Chairman Keyvan Esfarjani (ex-Intel) and Dr. Richard Gottscho in 2026, signaling a push toward high-volume manufacturing discipline. On funding, the most solidly documented event is a $25 million Series B Extension closed in September 2024, led by Centaurus Capital and New System Ventures; the company also received a $3 million U.S. Department of Energy ARPA-E grant in 2023. As a private company, the key unknowns are material: revenue, shipped-kilometer volumes, customer contracts, headcount, and the realized (versus announced) build-out of its planned capacity are not publicly disclosed.

2. Thesis: Why This Company, Why Now

The bet is that HTS wire is shifting from a science-project material to genuine infrastructure, and that whoever industrializes domestic supply first captures a structurally short market. MetOx's thesis rests on a demand convergence: aging grids that need more throughput in constrained corridors, fusion developers who need vast quantities of HTS for their magnets, and the AI compute buildout straining power delivery.

The AI linkage is real but should be stated precisely. Hyperscale and AI data centers are a *stated target market*, not demonstrated demand. The mechanism is plausible: dense compute clusters need to move enormous current in tight physical footprints, exactly where a low-loss conductor earns its premium. But MetOx's order book for data-center HTS is not publicly evidenced, so AI is best read as an option on demand rather than a booked driver. The reachable near-term market is narrower than the headline TAM spanning grid, fusion, MRI, wind, aerospace, and defense. Fusion is currently the most concrete pull, because magnet-heavy reactor designs consume HTS in volume.

3. The Core Idea in Plain English

A superconductor carries electricity with essentially no resistance once it is cooled below a critical temperature. "High-temperature" is relative: still very cold, but warm enough to cool with liquid nitrogen rather than far more expensive liquid helium, which is what makes commercial use conceivable.

The analogy that maps: ordinary copper wire is a crowded highway where friction (resistance) wastes energy as heat and caps how much current you can push through a given cross-section. HTS wire is closer to a frictionless track, so you can move far more current through a far thinner conductor. Old world: to carry more power, you add more or thicker copper, losing energy along the way. New world: a compact HTS conductor moves large currents in a fraction of the space, with the resistive loss in the wire itself driven toward zero.

4. The Technical Space

The category problem is moving large electrical currents through limited physical space without the losses and bulk that copper imposes. The standard incumbent is copper (or aluminum) conductor, which is cheap, well understood, and easy to install, but resistive and space-hungry. HTS wire competes on current density and footprint, not on raw material cost.

What "good" looks like in HTS manufacturing comes down to a few dimensions that actually decide commercial viability:

- **Critical current per width.** How much current a tape can carry before it quenches out of the superconducting state, normalized to its physical size. Higher is better and directly sets system economics.
- **Yield and length.** HTS tape is grown as a multilayer coated conductor; defects kill performance, and customers need long, uniform, defect-free piece-lengths, not short coupons. Manufacturing consistency at length is the hard part.
- **Cost per kiloamp-meter.** The honest unit of value, blending current capacity, length, and price. This is where HTS has historically lost to copper outside specialized applications.

A critical caveat: a real HTS *system* is not loss-free. Cooling, alternating-current effects, joints, and current leads all introduce losses. The zero-resistance property belongs to the conductor in its superconducting state, not to the deployed system.

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

MetOx manufactures second-generation coated-conductor HTS wire branded Xeus, built on the YBCO family of ceramic superconductors. In its superconducting state the conductor carries large currents with drastically reduced resistive loss. Second-generation YBCO tape is fundamentally a thin-film deposition challenge: a superconducting ceramic layer must be grown on a flexible metal substrate with precisely engineered buffer layers, then stabilized, all while holding crystalline alignment across long lengths to preserve current-carrying capacity.

Where defensibility plausibly sits:

- **Deposition process and recipe.** The proprietary edge in 2G HTS is typically the specific deposition method, buffer-layer stack, and process control that yield high critical current at long, uniform lengths. Dr. Ignatiev's University of Houston materials lineage is the credible source of this know-how. This is process IP and accumulated yield learning, which is genuinely hard to copy quickly.
- **Manufacturing scale-up.** Translating a working recipe into high-throughput, high-yield volume production is its own discipline, which is why the board added semiconductor-manufacturing leadership.

The blunt read: the underlying YBCO chemistry is not proprietary, and other 2G HTS makers exist globally. What can be defensible is MetOx's specific process, yield curve, and cost-per-kiloamp-meter at scale. Promotional framing such as Xeus being far more efficient than copper, or claims of loss-free operation, should be treated as company claims absent third-party benchmarks; the verifiable technical fact is reduced-resistance current transport, not a loss-free system.

6. Business and Go-to-Market

MetOx is a wire manufacturer, so the model is fundamentally selling kilometers of HTS conductor (or licensing/process value) into capital projects, not subscription software. The strategic spine is capacity: MetOx announced it will build a major production facility in Chatham County, North Carolina, a $193.7 million investment expected to create 333 jobs, announced December 17, 2024 by Governor Cooper, facilitated by a Job Development Investment Grant and an associated roughly $80 million DOE investment. These are forward-looking, incentive-contingent projections, not realized spend, and the company is best described as *scaling toward* commercial-scale output rather than already there.

Go-to-market is project-led and capital-intensive by nature: grid operators, fusion developers, and magnet builders buy on qualification, reliability, and long-term supply security, not self-serve. Stated target applications span grid transmission and distribution, hyperscale and AI data centers, fusion magnets, next-generation wind, MRI magnets, aerospace, and defense. These are *addressable markets*, not disclosed contracts. The unit-economics question is the whole ballgame: cost per kiloamp-meter at the new facility's yields will determine whether Xeus competes beyond niche, premium applications. No revenue or shipped-volume figures are public.

7. Competitive Landscape and Moats

MetOx competes in a small global field of 2G HTS manufacturers. The most direct comparable is SuperPower (the U.S. 2G HTS producer with a long commercial history), with Japanese and other international coated-conductor makers as the broader peer set; fusion-driven players such as those supplying magnet programs represent adjacent demand-side pull.

Where it wins against the closest rival. Versus an established 2G HTS incumbent like SuperPower, MetOx's edge is timing and capital: it is building dedicated new domestic capacity with federal backing precisely as fusion and grid demand inflect, potentially positioning it as a scaled U.S. supplier when supply is short. **Where it loses.** The incumbent has shipped product and qualification history MetOx must still prove at volume; MetOx's scale-up is announced, not demonstrated, and a customer qualifying HTS for a multi-decade asset weights track record heavily.

On moats, separating real from asserted:

- **Process know-how and yield learning.** Real but partial. Accumulated manufacturing experience compounds, on top of the technical edge above, but the chemistry is public and rivals exist.
- **Domestic supply and policy position.** Potentially durable. DOE backing and U.S.-located capacity matter for defense, grid, and sovereign supply-chain buyers who value non-foreign sourcing.

› **Capacity lead and lock-in.** Asserted for now. First-at-scale advantages only become a moat once qualified into long-lead programs; claims of being the largest dedicated HTS plant are company narrative absent independent audit.

8. Risks and Open Questions

The picture turns on execution risk more than science risk. The questions I would put to the founders:

- Can the North Carolina facility hit target yields and cost per kiloamp-meter, and what is the actual shipped-kilometer plan versus the announced capacity headline?
- What fraction of the $193.7M and the associated ~$80M DOE support is committed versus incentive-contingent, and what milestones unlock it?
- What is the real order book today, by application, and how much is signed contract versus letter of intent or addressable-market framing?
- How exposed is the thesis to AI-capex cyclicality? Data-center demand is a stated target; a compute-spend pullback would remove an option the narrative leans on.
- On platform/dependency risk: how reliant is the scale-up on continued federal funding, and what happens to the build if grant timelines slip?

The throughline: MetOx's differentiation is plausible, but nearly every load-bearing number is a projection or a target, not a realized result.

9. Bottom Line

Three takeaways. First, MetOx is a credible domestic HTS manufacturing bet anchored by real materials lineage, real federal backing, and a genuine demand convergence across grid, fusion, and potentially AI infrastructure. Second, it works or fails on manufacturing execution, namely yield, length, and cost per kiloamp-meter at the new facility, not on whether superconductivity is real. Third, the thing to watch next is conversion: shipped kilometers, signed qualification contracts, and committed (not announced) capital that turn an incentive-backed plan into an operating supplier.

10. For the Nerds

The deeper bet is on coated-conductor manufacturing physics. 2G HTS performance hinges on biaxial texture: the YBCO grains must be crystallographically aligned in-plane across the entire tape, because grain-boundary misalignment sharply degrades critical current. Achieving that alignment over kilometer lengths on a flexible metal substrate, through a multilayer buffer architecture, is the manufacturing problem that has kept HTS expensive for thirty years.

An open question worth probing: pinning and in-field performance. Many target applications, especially fusion magnets, demand high critical current under intense magnetic fields, which requires engineered defects (flux pinning centers) introduced during deposition. How well Xeus performs in-field, not just at self-field, is a distinct technical axis that promotional efficiency-versus-copper claims gloss over.

Finally, AC loss matters for grid and data-center use. Even with near-zero DC resistance, alternating-current operation induces hysteretic and eddy losses in the conductor, and cryogenic cooling carries a steep thermodynamic penalty. The system-level efficiency story is therefore an engineering tradeoff, not a free lunch from zero resistance.

WHERE SOURCES DISAGREE

Founding year

One source (EquityZen) gives 2002. Another (LinkedIn) gives 1998, while a company profile says "late 1990s."

Unresolved: the corpus sources directly conflict and none is authoritative over the others

Corporate identity/continuity

"MetOx International Inc." is presented as the operating entity. EquityZen lists "Metal Oxide Technologies / MetOx Technologies" as a related corporate name

Unresolved: no source clarifies whether this is one legal entity, a rebrand, or a parent/subsidiary structure

Total Series B size and investor roster

One reading rolls the round up to ~$40M (a Sept. $25M extension plus a Nov. ~$15M close adding Duquesne, Piedmont, Crosscut, NSV, and John Doerr's family office). The other treats tranches separately, noting sources vary between "announced" and "closed" and that not all name the same co-investors

Unresolved: no single source reconciles whether totals are cumulative or new money across tranches

Identity of the December 2024 "Elemental" investor

Analyst-A names "Elemental Impact." Analyst-B flags possible confusion with a distinct "Elemental" brand (e.g., Excelerator vs. Impact) with a different role (grantmaking vs. equity)

Unresolved: the cited source naming is ambiguous and the instrument was not verified

2026 leadership appointment dates

Esfarjani is dated to March 2026 as Executive Chairman; one citation links his quotes to a 2024-era PR URL, and Gottscho is dated to April 2026

Unresolved: a source timeline mismatch could not be reconciled within the corpus