MetOx International

The HTS wire maker betting that superconductors become infrastructure for fusion, the grid, and AI power

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ABSTRACT

MetOx International manufactures high-temperature superconducting (HTS) wire, branded Xeus, built from YBCO thin films deposited by metal-organic chemical vapor deposition (MOCVD) onto tape substrates. The wire carries large electrical currents at near-zero resistance when cooled to cryogenic temperatures, which lets it move power in a fraction of the footprint of copper. MetOx's distinctive bet is industrial-scale, low-cost production of this second-generation HTS wire, the supply bottleneck that gates whether compact fusion magnets, dense grid cables, and AI-scale power systems become buildable. Its Houston plant is positioned as North America's largest dedicated HTS wire facility, with a far larger second plant planned in North Carolina. If MetOx hits volume and cost targets, it becomes a critical input supplier to multiple capital-intensive industries at once. If it does not, it remains a promising materials shop competing against entrenched global HTS producers in a market still waiting on its anchor demand.

Keywords: high-temperature superconductors; YBCO; HTS wire; MOCVD; fusion magnets; grid modernization; AI data centers; advanced manufacturing

1. Snapshot

MetOx International (metoxtech.com) makes high-temperature superconducting wire, sold under the Xeus brand, for energy, grid, fusion, and hyperscale computing applications. The company is headquartered in Houston, Texas, and traces its origins to the late 1990s, when it was co-founded by Dr. Alex Ignatiev, now Chief Science Officer and a University of Houston physics and materials science professor. The leadership team includes Bud Vos (CEO), Keyvan Esfarjani (Executive Chairman, appointed March 2026, formerly a senior global operations leader at Intel), Mark Kennard (CTO), Jason Reid (COO), and James Carr (CFO). In 2024, MetOx raised a Series B totaling roughly $40 million, including a $25 million extension, with investors including Centaurus Capital, New System Ventures, Eighty Eighty Group, Piedmont Capital Investments, and Elemental Impact. Not publicly known: revenue, current production volumes, valuation, named pilot customers, and headcount.

2. Thesis: Why This Company, Why Now

The bet is that HTS wire is shifting from a lab-grade specialty material to an industrial input, and that whoever can produce it at scale and acceptable cost captures a chokepoint across several converging demand curves at once. Three forces make the timing plausible: a renewed wave of fusion startups that need high-field magnets, grid modernization pressure where copper transmission is constrained, and the AI compute buildout straining power delivery.

The AI linkage is real but should be read carefully. MetOx positions its wire as relevant to hyperscale data centers serving AI workloads, meaning the same compute-capex wave driving energy demand could pull HTS into power-dense applications. That demand is more emergent than proven. The most concrete near-term pull is fusion magnets and grid cables, where MetOx markets transmission up to ten times more efficient than copper. The reachable market today is narrower than the broad "electrified future" framing implies, gated by how fast fusion and grid buyers actually order wire at volume.

3. The Core Idea in Plain English

MetOx makes a flat tape that conducts electricity with essentially no resistance once it is cooled. The active ingredient is a thin layer of YBCO, a ceramic that becomes superconducting at temperatures reachable with liquid nitrogen rather than the much colder, costlier helium older superconductors required.

Think of it like swapping a garden hose for a fire hose that also never leaks: you push far more current through a much smaller cross-section, with no energy lost to heat. Old world: thick copper cables and bulky electromagnets that waste power and take up space. New world: thin superconducting tape that carries the same or more current in a fraction of the footprint, making compact fusion magnets and high-capacity grid cables physically feasible.

4. The Technical Space

The category is second-generation (2G) HTS wire, and the central problem is manufacturing, not physics. YBCO's superconducting properties have been understood for decades; the hard part is depositing a high-quality, crystallographically aligned YBCO film uniformly along hundreds or thousands of meters of moving tape, cheaply and reproducibly. A single defect or grain misalignment degrades the current the whole length can carry.

Standard approaches diverge mainly on deposition method. Common routes include MOCVD (MetOx's choice), pulsed laser deposition, and chemical solution deposition, each trading off throughput, film quality, and cost. All require an engineered substrate stack with buffer layers that template the YBCO crystal orientation.

What "good" looks like comes down to a few dimensions that matter. First, critical current density: how much current per unit width the wire sustains, especially under high magnetic field, which is what fusion magnets stress. Second, cost per kiloamp-meter, the metric that decides commercial viability against copper. Third, length-wise uniformity and yield at production scale. Fourth, mechanical robustness, since the tape gets wound and strained in real magnets and cables.

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

MetOx builds Xeus by depositing YBCO thin films via MOCVD onto tape substrates, producing wire that carries high current at near-zero resistance at cryogenic temperatures. It sits at the materials-supply layer of the stack: MetOx is the input vendor to magnet builders, cable makers, and fusion developers, not the system integrator. The company emphasizes proprietary large-scale manufacturing technology aimed at commercial cost and volume, which is the right framing because in 2G HTS the manufacturing process is the product.

The honest decomposition of what could be proprietary versus replicable:

› **The MOCVD deposition process.** MetOx's specific recipe, precursor chemistry, and reactor design for laying down high-quality YBCO at speed and yield is the most plausible locus of genuine, hard-to-copy IP. MOCVD itself is a known technique; the tuned, scaled implementation is where decades of accumulated know-how could live, consistent with the company's late-1990s origins.

› **The substrate and buffer-layer stack.** Templating YBCO crystal orientation along the tape is essential and difficult, but it is also an area where the broader HTS field has published heavily, so differentiation here is less certain.

› **Scale-up engineering.** Translating lab process to a Houston plant targeting 2,000 km/year, and a North Carolina plant planned at five times that capacity, is itself a defensible capability if achieved, and likely why an ex-Intel operations leader was brought in as Executive Chairman.

The unverified core question is quantitative: the bundle gives no critical current density, operating-field, or cost-per-kiloamp-meter figures. Without those, the proprietary-versus-replicable line cannot be drawn with

confidence. A well-funded competitor or national lab could pursue the same MOCVD route; the moat, if any, is process maturity and yield, not the chemistry itself.

6. Business and Go-to-Market

MetOx is a hardware manufacturer selling a physical input, so the commercial engine is production capacity converted into wire shipments, almost certainly via direct, sales-led relationships with magnet builders, utilities, and fusion developers rather than self-serve. The Houston facility is described as North America's largest dedicated HTS wire plant, targeting 2,000 km of annual production as it ramps, with pilot deployments cited in grid transmission and fusion energy projects.

The capacity story is the traction story. The planned North Carolina facility in Chatham County represents a roughly $193.7 million investment, is projected to create 333 jobs, is backed by a state incentive package including a Job Development Investment Grant, and is planned at five times Houston's capacity with development beginning in 2026. That is a large bet on demand materializing.

Several commercial unknowns are material. Current actual production volume versus the 2,000 km target is not disclosed; no pilot customers are named; and there is no published revenue. The unit-economics question is acute: the entire thesis hinges on cost per kiloamp-meter falling enough to win against copper and rival HTS, and no independent cost benchmark is available in the bundle. Government support, the $3 million 2023 ARPA-E grant plus the North Carolina incentives, partly de-risks capex but does not confirm end-market pull.

7. Competitive Landscape and Moats

MetOx competes in a small global field of 2G HTS wire producers. The comp set spans direct YBCO-tape rivals and adjacent superconductor suppliers serving fusion and grid buyers. The bundle does not name competitors, so the head-to-head read here is structural rather than name-specific, and that itself is a diligence gap: a serious assessment requires benchmarking Xeus's critical current and cost against the established HTS makers MetOx must displace.

Manufacturing scale is the asserted moat. MetOx's clearest claim to durability is being North America's largest dedicated HTS wire plant with a far larger second facility planned. If it genuinely reaches volume at competitive cost while rivals remain capacity-constrained, that is a real advantage in a supply-starved market. It is asserted until the volumes and costs are shown.

Process know-how is the candidate technical moat. Decades of MOCVD experience since the late 1990s could translate into yield advantages that are hard to replicate quickly, layered on top of the technical edge above. This is plausible but unverified without performance data.

Accumulated field data is thin so far. With only pilot deployments cited and no named customers, MetOx has not yet built the operational track record that would create switching costs or reference-customer lock-in. Platform risk is moderate: this is a materials business, less exposed to a foundation lab pivoting in, but fully exposed to a better-capitalized HTS manufacturer or a national-lab-backed entrant scaling the same chemistry.

8. Risks and Open Questions

The picture turns on a handful of unknowns, each of which a founder should be able to answer directly:

› **Performance, undisclosed.** What is Xeus's critical current density across relevant operating temperatures and magnetic fields, and how does it benchmark against competing HTS wire? The entire technical moat is unverifiable without this.

› **Cost roadmap.** What is the current and target cost per kiloamp-meter, and is there any independent benchmark showing a credible path to beating copper and rival HTS?

› **Real demand versus planned capacity.** With a plant planned at five times Houston's output, who are the named pilot customers, what have early field results shown, and what contracted demand underwrites the North Carolina expansion?

› **Execution and timing.** What is the precise North Carolina timeline beyond a 2026 development start, and how close is Houston to its 2,000 km/year target today?

› **AI-capex cyclicality.** If the data-center power thesis is a meaningful demand pillar, a slowdown in AI compute buildout would hit one of MetOx's growth narratives directly.

9. Bottom Line

MetOx is a credible, decades-seasoned HTS wire manufacturer making a large scale-up bet just as fusion, grid, and AI-power demand could converge. The single biggest reason it works or fails is the same variable: whether its MOCVD process delivers competitive critical current at a cost per kiloamp-meter low enough to win, which the public record does not yet show. The thing to watch next is the North Carolina facility, specifically whether named, contracted demand emerges to justify a plant planned at five times Houston's capacity.

10. For the Nerds

The deepest open question is in-field performance, not just self-field current. Fusion magnets operate at very high magnetic fields, and YBCO's critical current degrades with field strength and orientation relative to the tape. The figure that matters for the compact-fusion thesis is lift factor and angular dependence at field, which determines how much wire a magnet actually needs, and therefore the real delivered cost. None of that is in the public record here.

A second frontier issue is yield economics at length. MOCVD throughput and defect density set the achievable cost curve; a process that hits target critical current over one meter but drops over a kilometer is commercially very different. Watch whether MetOx publishes statistical distributions of critical current over full production lengths, not headline peak numbers.

Finally, the substrate stack and quench behavior matter for real magnets: how the tape handles strain when wound, and how it dissipates a localized loss of superconductivity, governs whether system integrators design it in. These are the questions that separate a strong materials demo from a bankable supply contract.