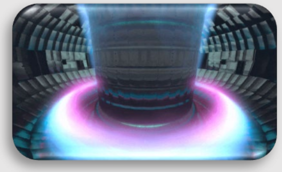
ZERO
RESISTANCE
SUPERCONDUCTOR TECHNOLOGIES

Growing technology and energy demand is pushing the limits to conventional conductors such as copper making HTS a necessity in the future (1/2)

Technological advancements across sectors

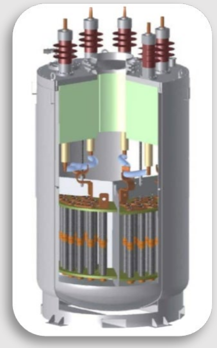
Energy and Power sector

Nuclear Fusion

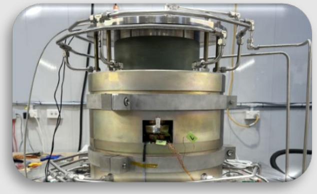


Superconducting cable

HTS Fault Current Limiter



Superconducting generator



SMES

Transportation and Space tech

Maglev trains

Electric Aircrafts

Superconducting propulsion

Applications	Why?	Scope of HTS
Nuclear Fusion	Copper cannot hit required magnetic fields	Compact, viable fusion reactors
Superconducting Cable	Urban space constraints and grid losses	High-capacity, zero-loss urban power
HTS FCL	Power surges exceed switchgear limits	Instant, self-healing surge protection
Generator/Motor	Multi-megawatt units are too heavy and bulky	Lightweight, high-power/torque generation
SMES	Batteries are too slow for instant spikes	Near-instant, infinite-cycle stabilization
Maglev Trains	Standard magnets require too much power	Efficient, frictionless high-speed transit
Electric Aircrafts	Standard motors are too heavy to fly	Ultra-light, high-density flight motors
Superconducting Propulsion	Massive torque requires massive engines	Compact, high-torque ship propulsion

ZERO RESISTANCE
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Growing technology and energy demand is pushing the limits to conventional conductors such as copper making HTS a necessity in the future (2/2)

Technological advancements across sectors

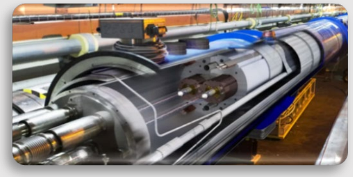
Medical and Pharma

NMR Spectroscopy

MRI Machine

R&D

Particle accelerator



High field magnets

Industrial and Research

Magnetic separation

Si-crystal growth

Induction heaters

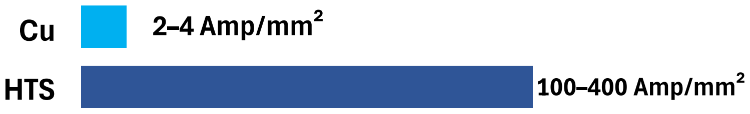
Applications	Why?	Scope of HTS
NMR Spectroscopy	Low fields limit molecular resolution and sensitivity	Ultra high-resolution chemical and structural analysis
MRI Machines	Helium shortages and bulky, heavy scanner designs	Helium-free, open, or ultra-high-field medical imaging
Particle Accelerators	Standard magnets limit beam energy and ring size	Next-gen, ultra-high-energy compact colliders
High Field Magnets	Resistive magnets melt under extreme power/cooling needs	Continuous, ultra-high steady-state fields for physics research
Magnetic Separation	Weak fields fail to capture fine, weakly magnetic impurities	High-throughput, efficient industrial ore/fluid purification
Si-Crystal Growth	Thermal convection causes defects in large silicon ingots	High-field damping for flawless, larger semiconductor wafers
Induction Heaters	Massive resistive losses heating large metal billets	Near-zero loss, deep-penetration industrial thermal processing

ZERO RESISTANCE SUPERCONDUCTOR TECHNOLOGIES

Technological advancements have pushed copper to its physical limits, making superconductors with 10x higher power density and near-zero losses essential for the future of power transmission.

Current & spatial density

Smart grids, RE integration and smart cities require a denser current conductor

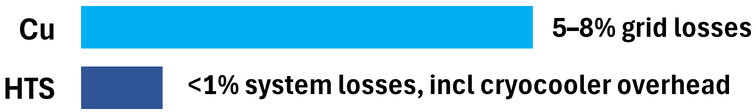


Power density & Weight

Motors and generators are bottlenecked by iron + copper mass

Energy Losses

Copper loses margin as heat through I^2R resistance



Magnetic field ceiling

Copper magnets are heat-limited; REBCO enables high-field systems

HTS deployment opportunities across sectors

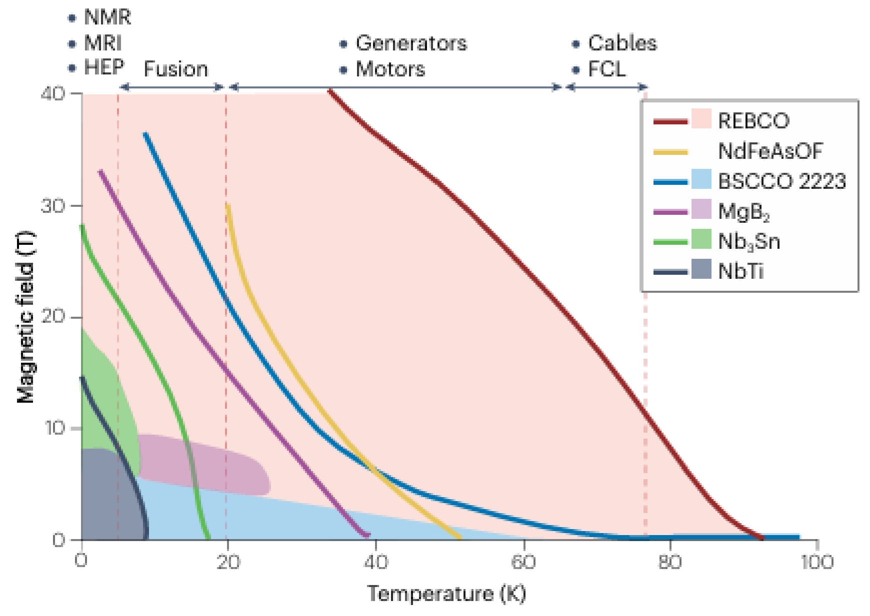
- Power T&D
- Smart Grids
- Data Centers
- Wind Turbine Generators
- Electric Aircrafts
- Space-Tech
- AI Data Centers
- Power Substations
- RE integration
- AI Data Centers
- Superconducting propulsion
- Si-Crystal growth
- Particle accelerators
- MRI Machines
- Nuclear Fusion
- Maglev trains

Source:
Secondary sources

ZERO RESISTANCE SUPERCONDUCTOR TECHNOLOGIES

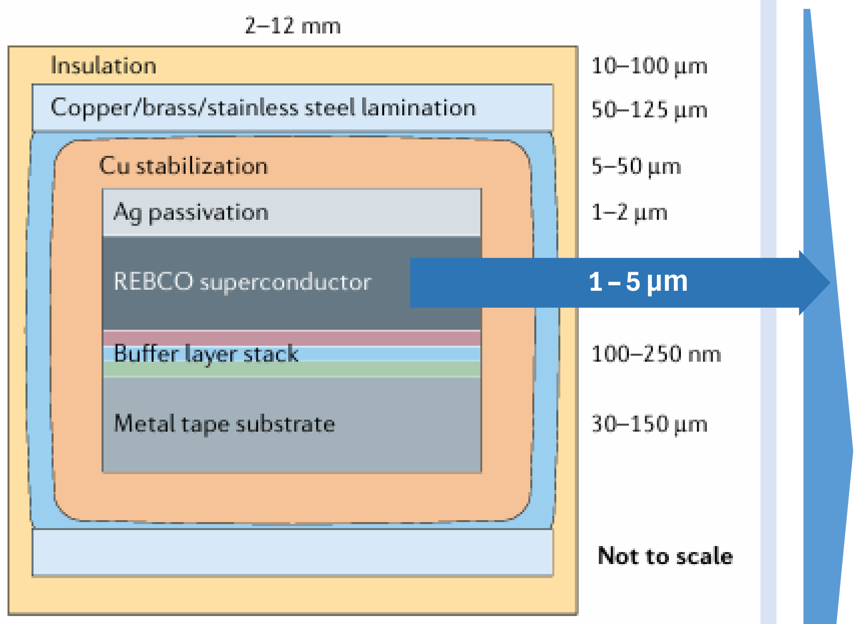
REBCO is the most advanced commercial superconductor, uniquely combining high operating temperatures, ultra-high current density, and unmatched performance in extreme magnetic fields

REBCO vs other superconducting materials



- REBCO is the only commercially viable superconductor that combines high operating temperature, ultra-high current density, and exceptional performance in extreme magnetic fields making it the enabling material for next-generation power infrastructure, fusion, and advanced electrification.

REBCO stack



- A REBCO HTS tape is a multilayer engineered composite. While the superconducting layer is only 1–5 µm thick, it is supported by specialized structural, thermal, electrical, and buffer layers that enable ultra-high current density, mechanical durability, and reliable operation

REBCO deposition techniques

Pulse Laser Deposition

Uses high-energy laser pulses to vaporize a ceramic target and deposit a highly crystalline REBCO thin film with exceptional performance

Metal-Organic Chemical Vapor Deposition

Deposits REBCO by decomposing metal-organic precursor gases onto a heated substrate, enabling scalable, continuous manufacturing

Metal-Organic Deposition

Applies a liquid metal-organic precursor that is heat-treated to form the REBCO superconducting layer, offering a low-cost solution process

Reactive Co-Evaporation

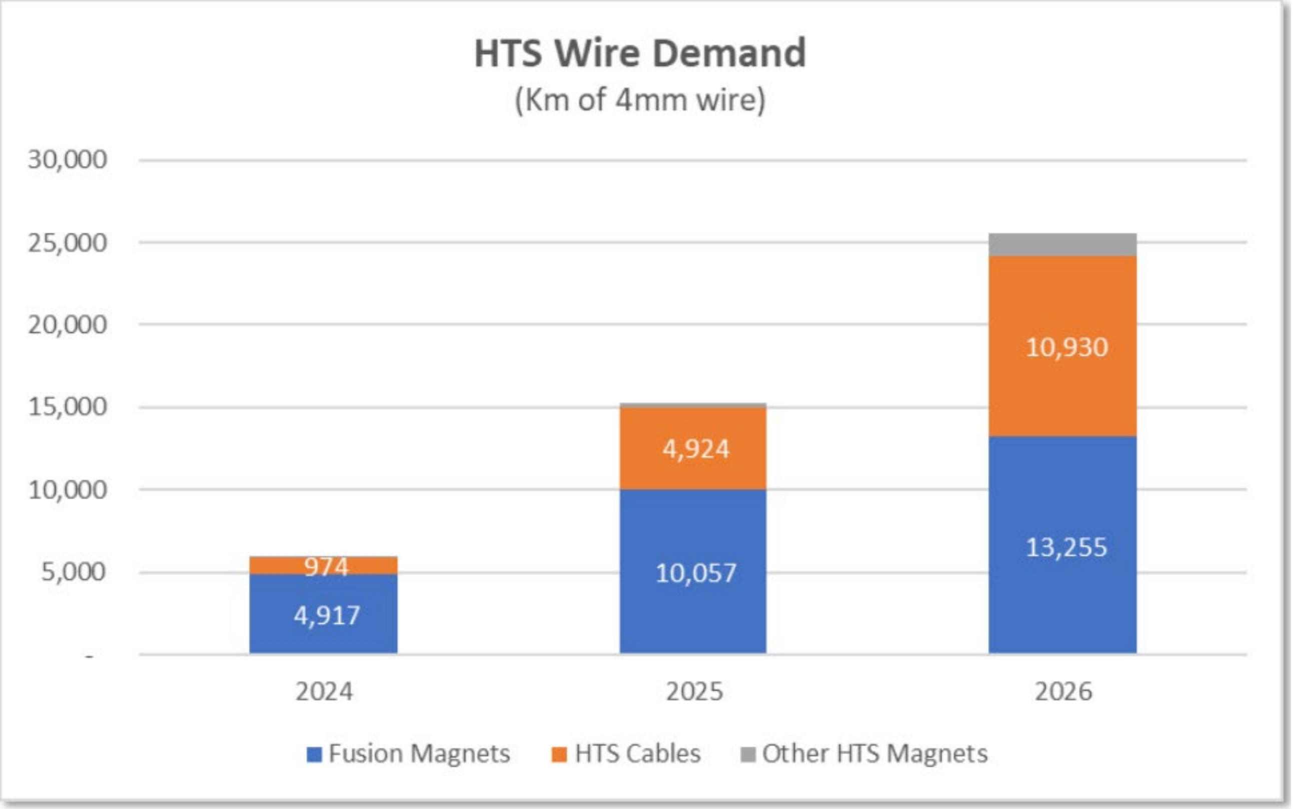
Simultaneously evaporates constituent metals in an oxygen atmosphere to directly form a high-quality REBCO film with high deposition rates

Global HTS Tape Demand

Global HTS demand is mainly driven by Nuclear Fusion applications followed by Power T&D, HTS motors/generators followed by Defense Applications

Actual demand from customer interests across the globe

- Direct expressions of interest from customers/government are ~5,000+ km today, rising to **~25,000+km by 2026**
- We estimate the total addressable market (TAM) can rise over **$5B by 2030** with tape cost reductions over time with volume.



Additionally, Zero Resistance will capitalize on the rising demand for finished HTS products including wires, cables and superconducting coils as well as the HTS Tape

Development of indigenized solutions for HTS wire, cable and coil manufacturing

Initial Business Plan – Applied Superconducting Devices using imported HTS tape

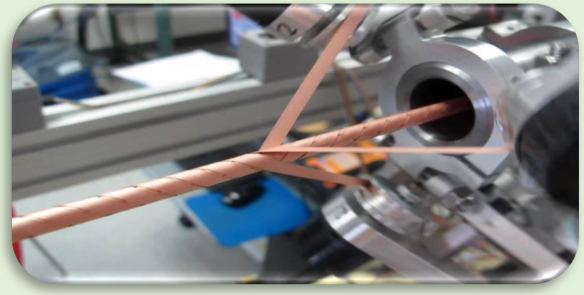
1 Prototype Lab

Objective

Prove ZR-HTS wire architecture and measurement credibility before heavy CAPEX

Milestones / Outputs

1–10 m ZR-HTS wire samples with validated I_c retention, bend/handling performance, and repeatable characterization



0 – 12 months

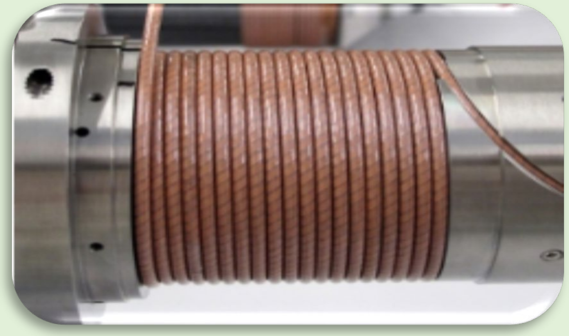
2 Pilot Wire Line and Devices

Objective

Convert commercial REBCO tapes into saleable ZR-HTS wire/conductor products

Milestones / Outputs

Deliver HTS device prototypes and 50–100 m saleable conductor pilot lots, scalable to km-length production



12 to 30 months

Manufacturing indigenous HTS tape
Reducing import dependencies

3 Full Coated-Conductor Pilot

Objective

Localize the high-value REBCO tape stack and reduce dependence on imported HTS tape

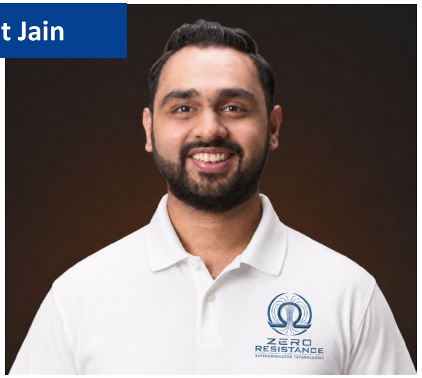
Milestones / Outputs

Produce 10–100 m in-house REBCO tape and establish an integrated Indian HTS tape-to-wire manufacturing stack

5 to 7 years

Our promoters possess deep expertise in materials science, robotics, automation, and destructive & non-destructive testing, providing the technical leadership required to realize our vision

Dr. Rohit Jain



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Co-Founder, IXAR Robotic Solutions

Co-Founder, Industrial X-Ray and Allied Radiography, Uganda

ZERO RESISTANCE
SUPERCONDUCTOR TECHNOLOGIES

Metal Analysis and IXAR Robotic Solutions bring a combined experience of 30+ years across multidisciplinary technical domains – Energy, Defense, Railways, Maritime, Nuclear & Civil Infrastructures

MAS

Metal Analysis & Services

TC-6680

Sample Preparation

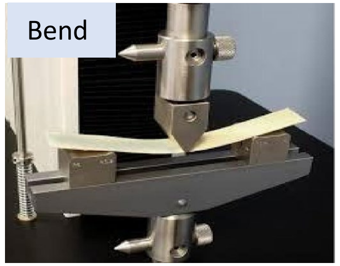
Workshop

Mechanical Testing

Charpy

UTS

Bend



Hardness

Non Destructive Testing

Thickness

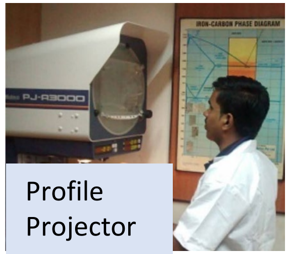
Chemical Testing

OES

PMI

Wet Lab

Microstructural Testing



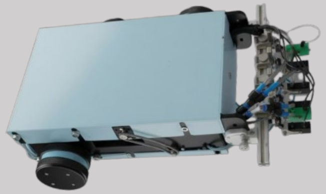
Profile Projector

Optical

IXAR
ROBOTIC SOLUTIONS

Remotely Operated Vehicles

Magnetic Crawlers



Ship Hull Cleaner