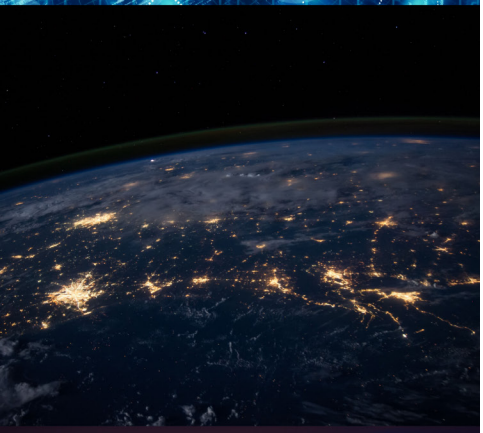


The International Energy Agency's (IEA) Technology Collaborative Program for High Temperature Superconductivity

Electricity is the lifeblood of the world's economy. We depend on the electric power system more than ever to power our residential, commercial and industrial sectors. To this end, new technologies and tools are being developed to provide a reliable, flexible, resilient and secure transmission and distribution system. High temperature superconductivity is one of the technologies that has the potential to do this.

Almost thirty years of research and development have brought new equipment incorporating high temperature superconductivity (HTS) to the threshold of greatly improving electricity transmission and distribution.

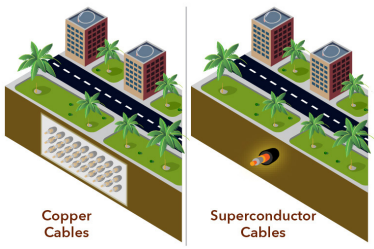
Laboratory scale tests have transitioned to large scale HTS based projects that serve utility customers. HTS projects are being considered as permanent infrastructure to solve real world electric grid problems.

HTS wire can be used to replace copper in today's equipment, enabling smaller, lighter, safer, more efficient, future power equipment. For example:

- **Wind energy:** HTS based wind turbines have the potential to generate the same amount of power with roughly half the size and weight of conventional designs, making installation easier, and using significantly less rare earth metals.

- **Electric Transmission and Distribution:** Superconducting cables transport electricity with little to no losses. They can also transmit up to ten times more power than conventional copper cables or carry equivalent power at much lower voltages, alleviating constraints with limited right of ways.

  Many of the world's utilities are coping with increasing fault (short-circuit) currents, possibly requiring new substation circuit breakers. A HTS fault current limiter (FCL) can help manage increasing fault currents more cost-effectively while reducing the losses by at least 50% with respect to solid state FCLs, and by at least 90% with respect to fault current limiting reactors.



- **Motors:** Electric motors account for almost two-thirds of all electric energy consumption in the United States. Superconducting motors have the potential to reduce losses by 50% and can be less than half the size and weight of conventional designs, which can help improve propulsion and maneuverability of transportation vehicles.

- **Aircraft:** All-electric planes can be exceptionally quiet, more energy efficient, and easier to maintain compared to conventional aircraft. Superconductivity is a key enabler for high power density systems needed for air vehicles and can reduce fuel burn without compromising payload, range, or cruise speed.

- **Energy Storage:** Energy storage can help increase the penetration of renewable resources and improve power quality. Superconducting Magnetic Energy Storage (SMES) has several advantages over other storage technologies including very fast response times, nearly infinite charge/discharge cycles without degradation, and almost 100% round trip efficiency.

The International Energy Agency's (IEA) Technology Collaborative Program for High Temperature Superconductivity

The International Energy Agency's Technology Collaborative Program on High Temperature Superconductivity (HTS TCP) is working to identify and evaluate the potential applications and benefits of superconductivity and the technical, economical and regulatory barriers to be overcome for achieving these benefits. Through its ten contracting parties and one sponsor, the HTS TCP is developing technical communications documents to provide information that will help a range of stakeholders.

The IEA actively promotes the dissemination and awareness of energy-related information, covering technical topics such as smart grids, demand-side management, renewable energy sources, and energy efficiency. HTS for electric power system application is the focus of the IEA program for "Assessing the Impacts of High-Temperature Superconductivity on the Electric Power Sector," the HTS TCP.

This international group fosters the penetration of HTS applications in electric power grids. The HTS TCP mission is twofold:

(1) to evaluate the status of and assess the prospects for the electric power sector's use of HTSs within the developed and developing world and

(2) to disseminate the findings to decision makers in government, the private sector, and the research and development (R&D) community.

The HTS TCP conducts outreach and directs it toward the following groups of stakeholders:

- Electric utilities, those who make decisions about technology adoption;
- Governments, those who make decisions about policies, subsidies, and funding for research, development, and demonstration (RD&D);
- The professional engineering community, those who implement and advise; and
- The RD&D community, those who invent, innovate, and solve complex problems.

These four groups are sources of expertise that can inform the evaluations and assessments undertaken by the TCP. HTS TCP participants also recognize the importance of educating the next generation of engineers and see this endeavor as a key outcome of their information sharing. The HTS TCP's mission has attracted interest and action from collaborators across the globe. HTS demonstration projects have been successfully carried out in Asia, Europe, and North America, and new projects are underway. This work can produce better HTS materials, conductors, products, and devices at a time when public demands for energy efficiency and resilient systems are changing power sector requirements and increasing the need for impactful, cost-effective, government-sponsored RD&D.

Superconductivity
INTERNATIONAL ENERGY AGENCY

The International Energy Agency's HTS TCP members and sponsors include those from the following countries:


France


Germany


Italy


Japan


Korea


Switzerland


United States

ASG Superconductors is a sponsor of the HTS TCP.

For more information please visit **www.ieahts.org**