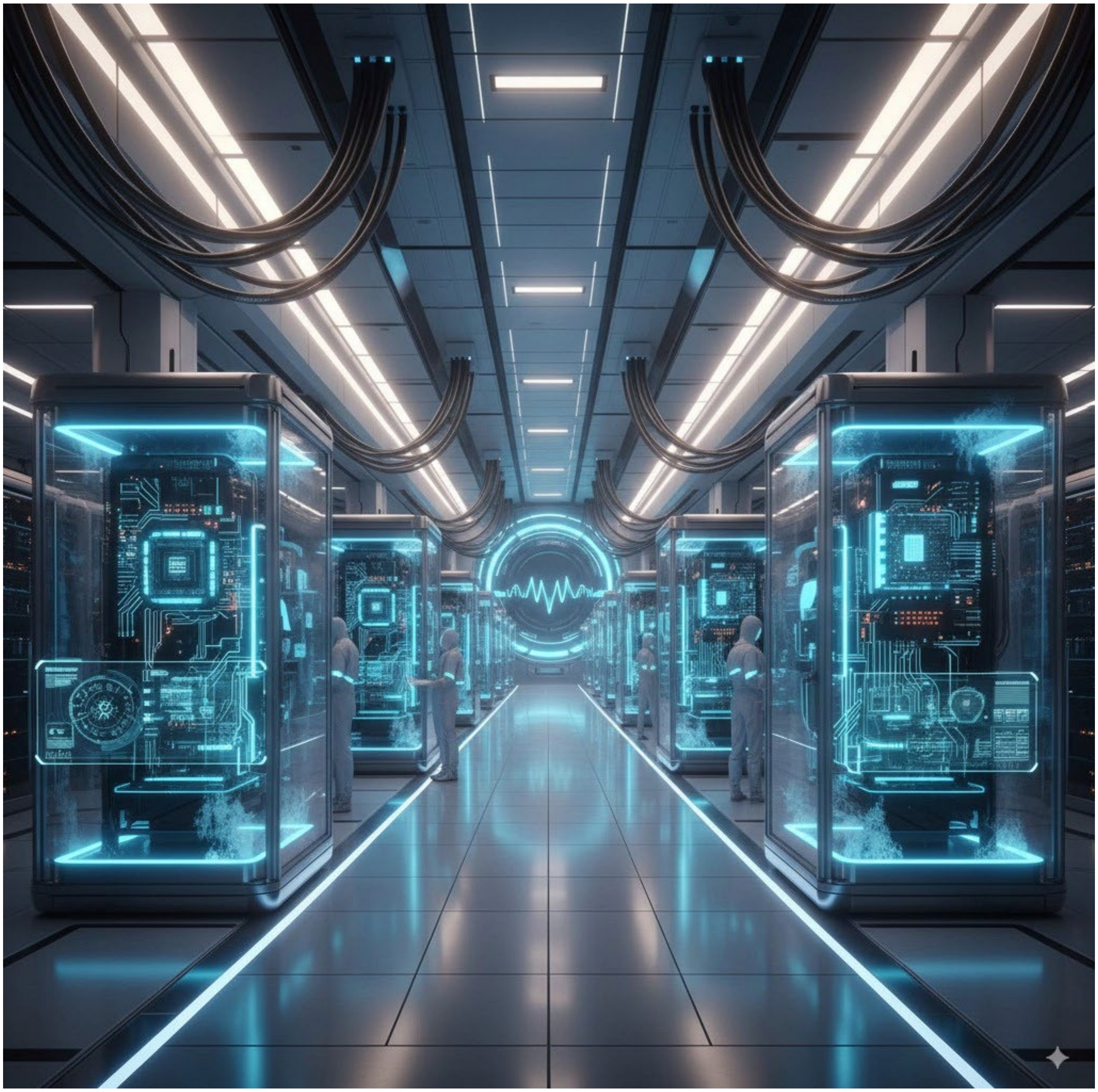

2025 ANNUAL REPORT

IEA Technology Collaboration Programme
on High-Temperature Superconductivity

Technology Collaboration Programme
by iea

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List of Acronyms and Abbreviations

AC – Alternating Current

CERN – European Organization for Nuclear Research

DC – Direct Current

DSO – Distribution System Operator

ENEA – Italian National Agency for New Technologies, Energy, and Sustainable Economic Development

EUCAS – European Conference on Applied Superconductivity

ExCo – Executive Committee

GW – Gigawatt

HTS – High-Temperature Superconductivity

HVDC – High Voltage Direct Current

INL – Idaho National Laboratory

IRIS – Research Infrastructure on Applied Superconductivity

ISGAN – International Smart Grid Action Network

KEPCO – Korea Electric Power Corporation

KEPRI – Korea Electric Power Corporation Research Institute

KIT – Karlsruhe Institute of Technology

LCA – Life Cycle Assesment

MgB_2 – Magnesium diboride

MRI – Magnetic Resonance Imaging

NEDO – New Energy and Industrial Technology Development Organization

REBCO – Rare-Earth Barium Copper Oxide

REWP – Renewable Energy Working Party

RD&D – Research, Development and Demonstration

RDD&D – Research, Development, Demonstration, and Deployment

RSE S.p.A – Ricerca sul Sistema Energetico

SCARLET – Superconducting CAbles foR sustainabLe Energy Transition

ScGA – Superconductivity Global Alliance

SFCL – Superconducting Fault Current Limiter

SMES – Superconducting Magnetic Energy Storage

TCP – Technology Collaboration Programme

TSO – Transmission System Operator

U.S. DOE – United States Department of Energy

Message from

The Chair

In 2025, I had the honour of continuing to chair the International Energy Agency (IEA) Technology Collaboration Programme (TCP) on High-Temperature Superconductivity (HTS).

Over the past year, we have observed a growing shift in interest from individual HTS components toward complete systems and their integration into existing infrastructure. Increasing attention has been paid to stakeholders' perspectives and to the potential barriers to deployment. Costs and system complexity remain the main challenges perceived by Transmission and Distribution System Operators, together with the need to demonstrate long-term reliability. Despite these challenges, HTS applications in the power grid continue to represent a highly promising technology for more efficient power transmission and enhanced grid protection.

New demonstrators are increasingly need-driven, meaning they are designed as concrete solutions to specific grid challenges. A representative example is the replacement of conventional cables with HTS cables within the same pipeline, as demonstrated by the Munich project. This approach is particularly well suited to urban contexts, where the increasing energy demand must be met without the possibility of building new infrastructure, due to high costs, the complexity of additional excavation, and limited social acceptance.

Soon, a new and rapidly growing energy-demanding actor in the power system, the data centres, can also benefit from HTS solutions. In 2025, in collaboration with an industrial partner, the TCP investigated the application of superconductivity in data centres, assessing significant potential benefits both on the computing side and on the power distribution side. The results of this work were presented at the European Conference on Applied Superconductivity (EUCAS).

At EUCAS, the TCP also organized a dedicated informational side event aimed at reaching a wide audience of countries actively engaged in superconductivity research and already participating in the conference, with the goal of promoting new memberships in the HTS TCP.

Internally, in the first half of 2025, the TCP prepared the documentation for the Request for Extension. This process provided an opportunity to reflect on the positioning of the TCP and the value of participation, and to agree on expanding the scope of HTS technology assessments for the power grid to include sustainability aspects—economic, environmental, and societal.

Once again thanks to the Vice-Chair Hiroyuki Ohsaki, to the Secretaries, and to all members of this TCP for their constant and fundamental support.

HTS TCP Chair

Laura Serri

The State of the Art in High-Temperature Superconductivity

Science and History of Superconductivity

Example of superconducting tape. Credits: ENEA

All materials exhibit some degree of resistance to the flow of electricity and release heat as a result. Even universally recognized conductors like copper wires resist electricity to some extent. After a century of scientific discovery, though, a growing set of materials have been found to lose their electrical resistance entirely at very low temperatures. These materials, known as “superconductors,” conduct electricity with perfect efficiency, capable of transmitting up to two hundred times more electrical current than copper wires of equal size.

Superconductivity is a phenomenon of quantum mechanics that explains this advantage. Every superconducting material has a specific, “critical” temperature below which it begins to superconduct electricity. Below this temperature, electrons lock into pairs (called “Cooper pairs”), allowing them to move through superconducting materials (or superconductors) in a coordinated, frictionless way with zero resistance. Superconductors also expel magnetic fields through another phenomenon known as the Meissner effect that locks objects into their quantum state and suspends them midair.

A handful of technologies, like particle accelerators and magnetic resonance imaging (MRIs), managed to harness superconductivity in the 20th century, but many potential applications remained unattainable, considering that superconductivity had only ever been observed at a few degrees above Absolute Zero–a temperature far too low to achieve practicably. In the late 1980s, though, scientists discovered an even narrower class of materials that exhibited superconductivity at temperatures above the boiling point of nitrogen (~77 Kelvin or -196°C), giving birth to “high-temperature” superconductivity (HTS) and an even broader array of potential applications.

High Temperature Superconductors (HTS), primarily REBCO and MgB_2 tapes (operating between 20 and 77 K), offer unique advantages for power systems thanks to their ability to carry extremely high current densities with negligible resistive losses. These properties enable compact, efficient, and high-power density components compared to conventional copper based technologies. In recent years, progress in material performance, cryogenic engineering, and system level design has renewed global interest in HTS technologies for grid applications.

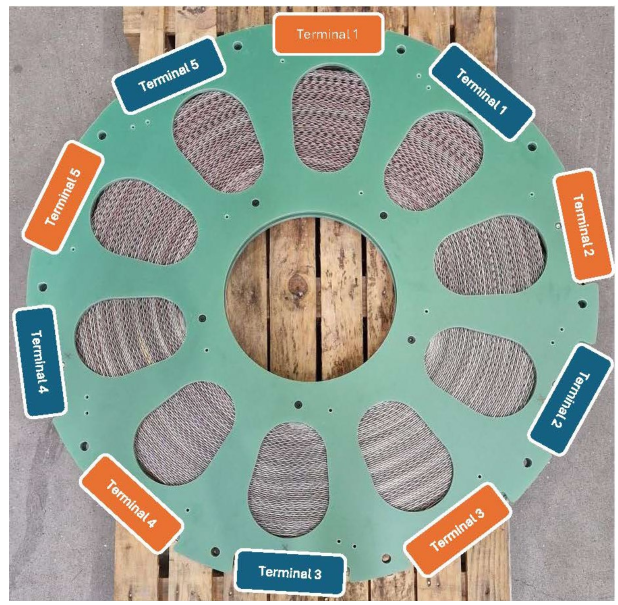
HTS applications in the Power Grid

In the present and future energy scenarios with an expected high increase of renewable generation and electrification, strong reinforcement of power grid will be required. According to IEA (2023), achieving all national climate and energy goals will require adding or replacing 80 million kilometres of power lines by 2040 - equal to the entire existing global grid. The superconducting cables and components can efficiently contribute to this.

HTS devices have demonstrated their ability to enhance grid resilience (in line with 2026 REWP Mandate) by providing N-1 redundancy, enabling higher power transfer in constrained networks, supporting renewable-energy integration, and improving fault-current management. However, HTS technologies still face several challenges, including high conductor costs, AC losses, quench management, manufacturing scalability, and the complexity of cryogenic systems. Ongoing global efforts aim to reduce tape costs and improve long-length reliability to support broader commercial deployment.

Grid Transmission and Distribution Cables

HTS Alternate and Direct Current (AC- DC) cables allow the transmission of large amounts of power at lower voltages and within reduced space, making them particularly attractive in dense urban environments or constrained transmission corridors. Their high-power density can alleviate bottlenecks in existing grids and reduce the need for new high voltage lines. Demonstration projects in Germany, the US, and Asia (China, South Korea and Japan) have shown technical feasibility, although large scale deployment is limited by cost, cryogenic complexity, and reliability over long lengths. European project SCARLET aims to develop HTS cables (1 GW-1km DC cable also cooled by hydrogen) for connecting onshore and offshore renewables. France SupraMarine project launched in 2025 has the goal of creating an AC power-transmission demonstrator based on HTS superconducting cables to connect offshore wind farms located far from the coast. Italian IRIS project is creating a new national infrastructure dedicated to applied superconductivity, developing advanced laboratories and two key demonstrators—a 1 GW superconducting power line and a 10 T HTS magnet—to support research, industry, and highly sustainable energy applications.



HTS pancake prototype developed in Scarlet. Courtesy of the Supergrid Institute

Superconducting Fault Current Limiters

Superconducting Fault Current Limiters (SFCLs) are among the most mature HTS devices. They provide instantaneous, self-acting limitation of short circuit currents, helping utilities manage rising fault levels due to increased distributed generation and grid interconnections. HTS materials enable compact designs and rapid recovery, making SFCLs suitable for both AC and DC networks. Several prototypes and early commercial units have been deployed worldwide.

Energy Storage

HTS based Superconducting Magnetic Energy Storage (SMES) systems offer very fast response times (milliseconds), extremely high cycling efficiency, and long operational lifetimes without performance degradation. These characteristics make SMES promising for frequency regulation and grid stability services. However, their relatively low energy density and high capital cost currently limit them to niche applications. Research continues to improve cryogenic efficiency and reduce conductor cost.

Other Related Applications

HTS applications are currently in the RD&D stage across various sectors, including wind energy (superconducting turbine generators), HTS motors, aviation (electric and hybrid aircraft propulsion), fusion energy (Tokamak magnets), data centers, and Magnetic Resonance Imaging (MRI magnets). Some of these sectors – fusion and data centers – are expected to require large volume of HTS tapes and components in the next five years could accelerate cost reduction, massive manufacturer and wide commercialization of HTS components for the power grid. At present the demonstrators and application seem to be "need driven."

Data Centers

Data centers are relatively new actors in the energy system at the global level, but their share of electricity demand has exploded in just a few years as the use of large language models(LLMs) and artificial intelligence (AI) has become widespread. IEA estimates that global data center electricity consumption will double in just five years, reaching 945 TWh by 2030, which will represent just under 3% of total global electricity consumption. Many researchers have highlighted the benefits of using high-temperature superconductivity technologies in data centers to achieve these goals. On the power distribution side, traditional AC-based systems suffer from multiple conversion stages and resistive losses, which account for up to 15–30% of total energy waste. By contrast, superconducting busbars and cables offer zero-resistance transmission, drastically reducing losses and heat dissipation.The economic analysis shows that, despite higher initial capital costs, the total cost of ownership becomes favorable within 3–5 years due to significant energy savings and reduced cooling requirements. This information is further detailed in the HTS TCP's "**Superconductivity used in data centers**" poster, presented at EUCAS 2025.

Railway Sector

The Railway Technical Research Institute (RTRI) in Japan developed a practical railway power supply system incorporating superconducting cables to deliver electrical energy from substations to trains. It was the world's first commercial superconducting power transmission on rail, and continues to operate, entering its second year. The system has provided a stable power supply during continuous operation on a suburban railway line (Sunzu Line, Izuhakone Railway Co., Ltd.) in Shizuoka. A 408-m-long superconducting cable was also installed on an urban commuter line (Chuo Line, JR East) in Tokyo where multiple long trains operate. Currents of up to 4,500 amps were supplied from a substation to accelerate commercial trains. A regenerative current of up to 2,889 amps flowed in the reverse direction. Even under such high-power supply conditions on a densely operated line where the current magnitude and direction frequently fluctuate, almost no voltage difference occurred between both ends of the superconducting cable. The system operated stably and provided the required power, as confirmed by the data obtained. These demonstrate that the superconducting feeding system is capable of providing stable power supply in dense metropolitan railway networks. Using this system, more than 61,000 train services were operated, collectively transporting approximately five million passengers.

Aviation Sector

Airbus is exploring the use of HTS as a key enabling technology for future electric and hydrogen-powered aircraft. HTS materials can carry high electrical currents with virtually no resistance, allowing the development of lightweight and highly efficient motors, generators, power cables, and power electronics. Through initiatives such as the Advanced Superconducting and Cryogenic Experimental Powertrain Demonstrator (ASCEND), Airbus is researching superconductive propulsion systems that could operate at cryogenic temperatures, which would significantly reduce the weight and energy losses of electrical aircraft systems. These advances have the potential to support the development of zero-emission aircraft by enabling megawatt-class electric propulsion and improving the overall efficiency of future aircraft.

Challenges and Opportunities

HTS grid components demonstrators are growing in number and size; however many challenges are still to be solved to reach their commercialization and large adoption. The main challenges are grouped by topics in the following.

Scientific challenges

- Fully understand the physics of HTS.
- The physics of AC losses in HTS materials.
- Discover new materials with higher critical temperature and better performances.

Technical Challenges

- Find reliable and effective quench detection system for large components.
- Optimization of ancillary components (current leads, power electronics).
- Improve mechanical robustness.
- Understand aging of materials.
- Efficiency of cryogenic cycles.

Manufacturing challenges

- Limited supply of HTS wires.
- Improve HTS wire and tapes properties.
- Manufacturing long-length conductors
- Scalability
- Guarantee replicable properties of HTS tapes and wires.
- Decrease manufacturing costs.
- Avoid geographical concentration of HTS tapes and wires manufactures.

Economic Challenges

- High price of HTS conductors.
- High price of cooling systems.
- High initial capital costs.
- Lack of consensus about the evaluation of economics of HTS systems.
- Difficult to monetize the benefits.

System integration challenges

- Complexity of cryogenic cooling systems.
- Complexity of integration (presence of cooling system in the power grid environment).
- Standards and regulations.
- Lack of experience and consensus about cryogenic cooling requirements.
- Safety, reliability, and interoperability of integrated systems of HTS components.
- Lack of long-term proof of reliability.
- Lack of information on maintenance.
- Lack of proper standards and clear certification rules.
- Difficulty in assessing environmental impacts (LCA, etc.)
- Difficulty in assessing decommissioning.
- Lack of trained workforce.
- Lack of system developers.
- TSO and DSO perception and reluctance.
- Lack of awareness in decision makers.

About the IEA TCPs

International Energy Agency

At the heart of the global dialogue on energy security and clean energy transitions, the International Energy Agency (IEA) is the world's leading energy authority. IEA works with governments and industry to shape a secure and sustainable energy future for all. It provides reliable and comprehensive data, analysis, and policy recommendations with the goal of shaping a secure, sustainable, and affordable energy future for all while meeting the climate change objectives of the 2015 Paris Agreement.

The IEA was founded in 1974 to ensure the security of oil supplies. Energy security remains a central part of its mission, but today's IEA has a wider mandate. In 2015, the IEA's Ministerial Meeting approved the modernization strategy presented by the Agency's newly appointed Executive Director, Dr. Fatih Birol, to strengthen and broaden the Agency's commitment to energy security beyond oil, to engage with major emerging economies, and to provide a greater focus on clean energy technology, including energy efficiency.

Today's IEA focuses on a full range of energy issues, including climate change and decarbonization, energy access and efficiency, investment and innovation, and ensuring reliable, affordable and sustainable energy systems. It examines the full spectrum issues including renewables, oil, gas and coal supply and demand, energy efficiency, clean energy technologies, electricity systems and markets, access to energy, demand-side management, and much more.

Since 2015, the IEA has opened its doors to major emerging countries to expand its global impact, and deepen cooperation in energy security, data and statistics, energy policy analysis, energy efficiency, and the growing use of clean energy technologies. This "open door" policy has since allowed the IEA to deepen its collaboration with 13 new countries through the Association programme: Argentina, Brazil, China, Egypt, India, Indonesia, Morocco, Thailand, Singapore, South Africa, and most recently, Ukraine, which joined in 2022, and Kenya and Senegal, which joined in 2024. This IEA family of members and association countries now represents over 80% of global energy consumption, up from 40% in 2015.

IEA member governments agreed to further expand the Agency's mandate at the Ministerial Meeting of March 2022, to guide countries as they build net-zero emission energy systems to comply with internationally agreed climate goals, and to broaden the Agency's scope to include the critical minerals and metals needed to develop clear energy technologies.

The Technology Collaboration Programme

The Technology Collaboration Programme (TCP) is a multilateral mechanism established by the International Energy Agency that was created with a belief that the future of energy security and sustainability starts with global collaboration. The programme is made up of thousands of experts across government, academia and industry in 55 countries dedicated to advancing common research and the application of specific energy technologies.

The Technology Collaboration Programme supports the work of independent, international groups of experts that enable governments and industries from around the world to lead programs and projects on a wide range of energy technologies and related issues. The experts in these collaborations work to advance the research, development, and commercialization of energy technologies. The scope and strategy of each collaboration is in keeping with the IEA Shared Goals of energy security, environmental protection, and economic growth, as well as engagement worldwide.

The breadth of the analytical expertise in the Technology Collaboration Programme is a unique asset to the global transition to a cleaner energy future. These collaborations involve over 6,000 experts worldwide who represent nearly 300 public and private organizations located in 55 countries, including many from IEA Association countries such as China, India, and Brazil.

Currently there are 38 individual technology collaborations working across several technology or sector categories: energy efficiency end-use technologies (buildings, transport, industry and electricity), renewable energy and hydrogen, fossil energies, fusion power, and cross-cutting issues.

Purpose and Scope of the IEA HTS TCP

The HTS TCP was founded in 1990 a few years after HTS was discovered, which launched a global race to find even “warmer” superconductors and additional application areas. HTS TCP operates under the IEA Committee on Energy Research and Technology (CERT) and reports through the Renewable Energy Working Party (REWP). In 2024 HTS TCP joined the IEA Hydrogen Coordination Group.

Scope

The IEA HTS TCP works to identify and assess the potential applications and benefits of superconductivity in the power grid, as well as what technical, economic, and regulatory barriers must be overcome to achieve them. It also monitors applications of HTS in other sectors where successful deployments have created spillover effects that benefit the technology’s power sector prospects.

Membership

TCP membership in 2025 consisted of government, academic, and industry representatives in six contracting parties representing Germany, Italy, Japan, Korea, Switzerland and the United States. In 2025 CERN and Denmark have been observers.

Despite the quite low number of members the TCP covers three continents and almost all the countries deeply involved in the sector. The TCP has already started a “campaign” to increase membership.

Executive Committee

The HTS TCP work programme is governed by an Executive Committee (ExCo), which is tasked with supervising ongoing activities and identifying new strategic priorities for collaborative research. The ExCo is composed of representatives from each participating country or organisation. The committee meets at least twice a year (usually once in person and once virtually) take management decisions and review the implementation of the work programme.

The HTS TCP follows the cost-shared funding model, with the Treasurer who manages a common fund. Country fees are calculated on GDP base. To support administrative and communication activities, all Contracting Parties provide an annual contribution to the HTS Common Fund. The Annual fees are calculated on GDP basis. In 2025 an activity for revision of the annual fee structure for both Contracting Parties and Sponsors has started fee rules for members and sponsors are under revision.

The HTS TCP is managed by a Presidium composed of a Chair, Vice-Chair, a Secretariat Team, Treasurer, and designated support people. The Presidium meets at least once a month to discuss management issues, such as organizing meetings, sending information to ExCo members, performing reviews of TCP workstreams, completing all the formalities for membership, fulfilling IEA Secretariat and REWP requirements, and overseeing the implementation of the TCP’s strategic direction.

In 2025 The Presidium Team was composed of:

- Chair: Laura Serri
- Vice-Chair: Hiroyuki Ohsaki
- Secretaries: Don Mosteller and Brian Marchionini
- Treasurer: Giuliano Angeli
- Support People: Angela Olchini

Nearly every member directly contributed to the advancement of HTS through basic and applied research projects, while also advising the largest private commercial deployments of HTS in their home countries. They also advise their energy and economic development ministers (as well as standards-making bodies) on country-level RDD&D strategies, technological progress, and the development of HTS-supportive policies.

The TCP implements its five-year Strategic Plan carried out a number of foreseen activities. The TCP does not have specific research tasks or annexes, although some proposals are under currently consideration. Instead, all members collectively plan and pursue activities that identify, assess, and communicate the readiness and benefits of HTS for a range of stakeholders, including:

- Developing position papers and strategic documents, such as roadmaps, technical reports, and peer-reviewed journal articles with input and review from technical experts.
- Conducting technology surveillance in collaboration with electric utilities, governments, professional engineering organizations, and the RDD&D community.
- Hosting workshops, special sessions, and giving oral and poster presentations at international meetings and conferences.

TCP members also directly contribute to the advancement of HTS through basic and applied research projects in their professional roles while also advising the largest private commercial deployments of HTS in their home countries. Members advise their energy and economic development ministers, as well as standards-making bodies, on country-level research, development, demonstration, and deployment strategies, technological progress, and the development of HTS-supportive policies.

Contact Information for ExCo Delegates / Alternates

Country	Nomination	Name and Organization	Contact Information
Germany	Delegate Alternate	**Prof. Mathias Noe** *KIT* **Dr. Tabea Arndt** *KIT*	*mathias.noe@kit.edu* *tabea.arndt@kit.edu*
Italy	Chair Delegate	**Laura Serri** *RSE S.p.A.* **Giuliano Angeli** *RSE S.p.A.*	*laura.serri@res-web.it* *giuliano.angeli@rse-web.it*
Japan	Vice Chair Delegate Alternate	**Prof. Hiroyuki Ohsaki** *NIMS* **Yurugi Yoshiko** *NEDO* **Takahiro Yoshizawa** *NEDO*	*ohsaki.hiroyuki@nims.go.jp* *yurugiysk@nedo.go.jp* *yoshizawatkh@nedo.go.jp*
Korea	Delegate Alternate	**Dr. Jeyull Lee** *KEPCO KEPRI* **Dr. Hyung Suk Yang** *KEPCO KEPRI*	*Jeyull.lee@kepco.co.kr* *h.yang@kepco.co.kr*
United States	Delegate	**David Howard** *U.S. DOE*	*david.howard@hq.doe.gov*

Contact Information for Secretariat Support

Country	Nomination	Name and Organization	Contact Information
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United States	Communications Support	**Kirstin Janocha** *Energetics*	*kajanocha@energetics.com*

Alignment with IEA Mission, Objectives, and Shared Goals

TCP members recognize that power sector applications of HTS technologies are approaching a critical threshold, where sufficient manufacturing volumes are beginning to stabilize, mature, and improve, which is helping many grid components move favorably along the technological readiness scale. By promoting this message and the ones that follow in a more strategic and high-profile manner, the TCP anticipates its efforts will persuade utilities and other laggards to adopt HTS technology in electric grids more rapidly than ever before, especially as HTS diffuses and succeeds in other sectors.

The increased efficiency with which HTS technology can transmit energy clearly *Increases the Efficiency of the Energy System* directly. Additionally, HTS components require far less copper, critical minerals, and material overall than conventional technologies, thereby *Avoiding Environmental Impacts* almost altogether and allowing HTS to minimize or almost decouple its viability from that of critical mineral *Supply Chains* that IEA is working to secure. To illustrate these advantages even further, the width of electric transmission corridors could be shrunk with HTS cables from hundreds of feet to just a few meters.

HTS technology also helps IEA's *Ensure Energy Security* goal, not only by improving the resilience of electric grids with additional redundancy options and fault current protections, but also by enabling the co-delivery of different forms of energy in the same pipeline (e.g. electricity and liquid hydrogen) and the delivery of higher-level electrical currents within distribution grids responding to new distribution demand such as electric vehicles, grid-interactive buildings, and other artifacts of electrification. Considering a longer period, HTS technologies can also contribute to high-level DC voltage in international DC links or connecting large renewable power plants. These advantages help HTS improve grid flexibility, *Diversify Energy Sources*, and significantly facilitate the connection of new renewable energy capacity, thereby *Advancing Energy Transitions* and *Promoting Clean Energy* simultaneously. This outcome is especially anticipated after 2030, when HTS components should reach the commercialization phase and become a "technology enabling the use of renewables to reach the decarbonization" in line with the REWP Strategic Plan 2022-2025 and *Net Zero by 2050 – A Roadmap for the Global Energy Sector*.

Disclaimer

The HTS TCP is organized under the auspices of the IEA but is functionally and legally autonomous. Views, findings, and publications of the HTS TCP do not necessarily represent the views or policies of the IEA Secretariat or its individual member countries.

Summary of TCP Activities in 2025

ExCo Meetings and Request for Extension

Spring 2025 ExCo Meeting — Rome, Italy

- An in-person Spring meeting was organised in Rome, Italy. It featured country updates from Italy, Japan, Germany, Switzerland and the United States. Several industry participants, including the new Italian start up Suprema, ScGA and ISGAN, gave presentations.
- The Request for Extension process was reviewed, and participants made adjustments to the Strategic Work Plan and End-of-Term Report.
- The status of outreach activities, existing membership, and targets of new member engagement were discussed. There were secretary-led discussions of TCP governance lessons-learned, as well as the purpose of the TCP and value of membership.
- Participants got a tour of the ENEA fusion facility which recently adopted a HTS solution.

Fall 2025 ExCo Meeting – Virtual Meeting

- The Fall meeting was held virtually in two parts, one in October and one in November. Country updates were shared from Korea, Japan, the United States and Switzerland. Korea, Japan and the Unites States announced new TCP delegates. Member engagement updates were also shared, with particular attention to Denmark and CERN.
- Updates to the Request for Extension process were reviewed, as well as updates from the Renewable Energy Working Party (REWP).

- Administrative matters were discussed, such as the extension process for Energetics as Task Manager, as well as term length, contract structure, and funding; a Revised Annual Fee Structure; and the approach to the concluding Chair and Vice Chair terms.
- A future ISGAN Joint Event was proposed, with discussion on the overview, goals, format, outcomes and next steps.
- Further updates on these topics were shared at Part 2 of the ExCo Meeting, and a vote was held on the Revised Annual Fee.

Request for Extension (RfE)

The TCP current period ended at the end of February 2026. In preparation for this, in 2025 the TCP organized several discussion sessions on common TCP governance lessons learned, the value of membership on the main contents and communication approach of the new strategic plan, as preparatory activities for the drafting and finalization of the RoE documentation. After a 6-month (through August 2026) extension was approved, the required documentation was submitted to the REWP at the end of May 2026. In June 2026, the REWP approved the five-year (September 2026 – August 2031) extension of the TCP Implementing Agreement).

Participation in IEA TCPs and other IEA Events

- **IEA Wind TCP:** The relationship continues at leadership level, considering that HTS TCP present Chairwoman Laura Serri is also the Italian representative in Wind TCP. The HTS TCP can strongly benefit from Wind TCP experience in running tasks.
- **ISGAN**: HTS and ISGAN TCP started the preparation of a common event to be held in 2026 Spring with the aim of fostering mutual understanding of the two technologies and their applications within power grids, exploring the aforementioned commonalities, and identifying topics for future collaboration.
- **Hydrogen Coordination Group:** HTS TCP joined to the Hydrogen Coordination Group and contributed to fill the documents as required. In particular, the potential use of liquid hydrogen as cooling fluid for HTS component. This application, particularly suitable for MgB2 superconducting material, is already studied i.e. in the European Project SCARLET.
- **IEA Secretariat**: Chairwoman Serri participated in each of the REWP's meeting to learn best practices, identify common experiences, promote HTS's interests, implement IEA's directives, and network with other TCPs of interest. The TCP also established strong relationships with its Desk Officer to navigate membership changes, reach other TCPs and energy ministries, and seek legal counsel.

Communications

2024 Annual Report

- Published the 2024 Annual Report, an overview of the HTS TCP's activities in 2024, including trends in the HTS industry and remaining challenges.

EUCAS 2025

- The TCP presented a poster on Superconductivity use in data centers in September 2025 at the European Conference on Applied Superconductivity (EUCAS) Conference in Porto, Portugal. This event had the aim of reaching many countries involved in superconductivity activities that already participating the conference, starting from the organizing country Portugal, offering a question-and-answer information session to learn more about the HTS TCP's work, and how to get involved at this inflection point in HTS history.
- The poster, prepared with the contribution of people from data center field, highlights the benefit of application of HTS in data centers, i.e. the use of superconducting power cables, which minimize resistive losses and improve power delivery efficiency, and of HTS-based cryogenic processors which can dramatically reduce heat generation while increasing processing speed. Similar to fusion and quantum computing, this could be an extremely promising application of HTS technologies to vastly reduce the environmental and geographical footprints of data centres while improving their performance and economic viability.
- The success of the poster presentation at EUCAS helped connect new potential users with the superconductivity community, confirming that HTS applications in the power grid are likely to undergo a strong, demand-driven acceleration in the near future.

HTS Standardization Paper

HTS TCP continues to monitor the standardisation activities in the sector through many of its members who are involved in National and International Standardisation and pre-Standardisation bodies. The TCP focused on the latest activities in HTS standards development, and in 2025 started preparing a HTS Standardization Document, the “Standardization Paper.” This paper will review the status of global standards for HTS wires and grid applications, which are necessary for ensuring the safety, interoperability, and quality of HTS for early adopters; findings will inform recommendations to modify existing standards or establish new ones that will speed the deployment of HTS. There are currently no national or international certification for superconducting cables. The paper will also report the point of view of the TCP’s experts who cover three continents and different contests. The paper will reference other standards as well, such as for cooling liquid nitrogen. The TCP would also identify news outlets or trade publications to publish the document. These ideas were shared with the ExCo for their input.

Participation in Other Sector Initiatives

- **Multilateral Initiatives**: The relation with Superconductivity Global Alliance (ScGA) has continued to explore and coordinate complementary activities intended to increase investments in superconductivity research, demonstrations, and deployments in new industries.
- **Catalysing Impact – Superconductivity Global Challenges**: In December, the TCP participated in the event Catalysing Impact – Superconductivity Global Challenges organised by ScGA and CERN.

Country Report Links

Around the world, projects are demonstrating the technical feasibility of electric power equipment that incorporate HTS tapes. As already mentioned, increasing the technological advancement of the components, system integration becomes more and more important. This is why the TCP decided to introduce for each country an overview of the main status of the policies relevant for the future adoption of HTS components and to give a similar structure to all the country reports.

In continuity with the past years, a section of the report is dedicated to the updates of the status of technology, industries and projects in the member countries. Country reports for the following countries can be found in separate documents at these links:

- **Germany**
- **Italy**
- **Japan**
- **Korea**
- **Switzerland**
- **United States**

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