Bringing together the entire value chain of gas turbine technology


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ETN

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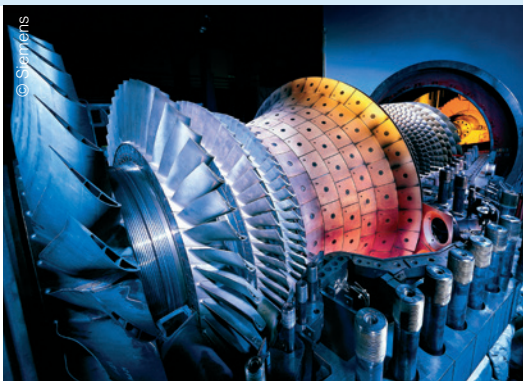
President's Message

"ETN works hard to reduce cost, optimise operations, accelerate innovation and eliminate barriers to the deployment and growth of new technology solutions"

ETN established its presence in Europe in 2005 and has since built a strong association representing the whole value chain of gas turbine technology development. As the President of the ETN Board, I have continually promoted an active participation of the Users, because it is the operators of gas turbines who bring the technology development requirements and needs to the table. Together with the OEMs, Suppliers, Service Providers, Universities, R&D Institutes and Consultancies, ETN works hard to reduce cost, optimise operation, accelerate innovation and eliminate barriers to the deployment and growth of new technology solutions. With today's market uncertainties, knowledge exchange and R&D cooperation at international level are more important than ever for bringing development opportunities for gas turbines to the market. This is what makes ETN a unique and powerful organisation.

I hope you will find this brochure informative and that it will encourage you to join us in our activities as we continue our pursuit towards innovative gas turbine technology developments.

Bernard Quoix
ETN President, Total



What ETN members are saying

ETN is a platform where OEMs can interact with Users and have an open dialogue about what are the demands and the new trends in the industry. It is a platform where users can raise their demands and influence the way OEMs develop their product. Due to this, ETN has great value for us and we would also encourage others to join. The more users we have the more power we have.

Dieter Krapp,
Senior Vice-President
OMV

OEMs, exhaust system vendors, operators in both power generation and oil & gas were all at the same place to discuss exhaust systems issues. This was a way for users to speak up and to be heard by OEMs and exhaust system vendors and this wouldn't have been possible without ETN.

Amélie Pesquet, Chair of the Exhaust Systems Project,
Rotating Equipment Engineer
TOTAL

We joined ETN because we were looking for more connections with other suppliers and customers and we wanted to keep up-to-date with the developments in the industry. If you want to broaden your horizons and want to stay updated on developments and issues you should join ETN.

George Strating,
Technical Director
VBR TURBINE PARTERS

ETN offers first-hand information on what is going on in Europe which is very important for an OEM like us. ETN also offers a unique opportunity to meet everybody who is involved in the business.

Pascal Decoussemaeker,
Product Manager HRSG Services
GE Power

We are now recognized as the voice of the gas turbine industry in Europe towards all the parties who are active in this field.

Andre Mom,
ETN President Emeritus
ETN

About ETN

Overview

ETN is a non-profit membership association, bringing together the **entire value chain of the stationary gas turbine technology** (power generation and mechanical drive) community. ETN addresses the main challenges and concerns of gas turbine users globally in Committees and projects composed of experts across the entire value chain. ETN believes a common strategy and research effort between all stakeholders, along with supportive energy and research policies, will enable growth and increased competitiveness of the gas turbine sector.

Vision

Environmentally sound gas turbine technology with reliable and low cost operation.

Mission

To encourage and facilitate information exchange, research and technology development in areas of importance to the user community.

Objectives

- to strengthen the gas turbine industry and users' market globally;
- to initiate projects and standardisations that can achieve tangible advances and cost reductions in gas turbine technology;
- to provide operational technical input to policy makers in terms of gas turbine environmental compliance, technology watch and R&D needs;
- to act as a platform for exchange of knowledge and experiences;
- to avoid R&D duplication as well as to reduce risk, cost and time in technology development.

ETN Members

ETN represents **more than 100 member organisations** active in the whole supply chain of the sector: power generation and oil & gas companies, Original Equipment Manufacturers (OEMs), R&D institutes and universities, suppliers and service providers, technology consultancies and industry associations.

For the complete list of ETN members, please visit the ETN website.

A strong partnership bringing together the whole value chain

Organisation Structure

ETN Board

The ETN Board consists of ten elected representatives from five member categories. The Board is responsible for **proposing the strategy** of ETN to the General Assembly for final approval. The Board ensures an efficient and sound management of the Association in line with the strategy and goals adopted by the General Assembly.

ETN Project Board

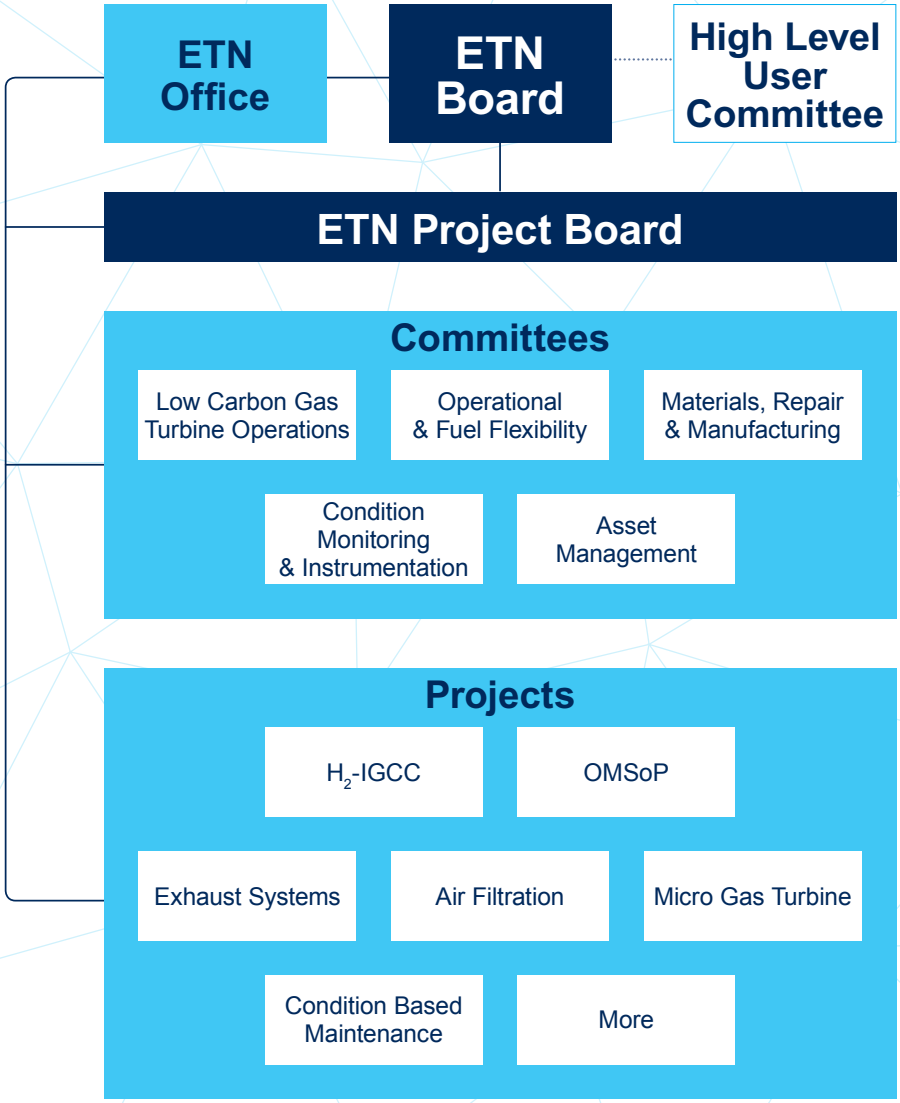
The Project Board provides a **consultative forum and independent support** to new initiatives or issues that are brought to the ETN platform. Its role is to maximise the potential of initiatives and to provide technical and strategic advice as well as support in the project development process.

ETN Technical Committees

The Technical Committees cover the most **crucial areas of future gas turbine technology development**. They serve as forums where the ETN members meet to share experiences and discuss ideas and initiatives, which can later be developed into individual projects.

ETN Office

The ETN Office is located in Brussels, Belgium. It acts as a secretariat for the organisation and conducts the running of the association. The role of the ETN Office is to implement the strategy set by the General Assembly, facilitate and coordinate projects and activities of the members, and disseminate the deliverables and results of their initiatives and projects.



ETN R&D Recommendation Report

Every two years, the Project Board publishes ETN's R&D Recommendation Report based on input coming from the entire ETN platform (ETN Board, HL User Committee and Technical Committees). It outlines key research topics of gas turbine development based on the current market outlook and the users' demand.

ETN Technical Committees

TC1: Low Carbon Gas Turbine Operations

Vision:

The decarbonisation of gas-fired power generation will be required in the coming years to meet the significant CO_2 reduction targets of those countries where gas is a major contributor to the energy mix, while retaining the operational flexibility needed to balance the increased levels of generation from intermittent renewables. This includes new build plants with integrated CO_2 capture technologies, enhancements to improve efficiency/increase exhaust CO_2 levels (exhaust gas recycle), firing of low CO_2/high H_2 fuels, the retrofit with CO_2 capture of existing installed plants and advanced cycles, including oxy-firing.

Research areas include:

- Minimisation of CO_2 emissions across the full operational range required for flexible operation;
- Process integration to minimise the energy/cost penalties of implementing post combustion capture technologies of various types;
- Oxy-fired and other advanced GT power cycles for improved efficiency combined with CO_2 capture, including improved turbomachinery aerodynamic design/blade cooling for the changed hot gas path environments;
- Impact of the integration of CO_2 capture technologies on operational and fuel flexibility.

TC2: Operational and Fuel Flexibility

Vision:

Improved performance of GT components and intelligent system integration will enhance fuel efficiency and environmental performance of future power generation units. The objective is to have GTs capable of operating in an efficient, safe and reliable manner utilising a wide range of fuels for a broad operational range whilst minimising polluting emissions such as NO_x and aiming at zero CO_2 emissions.

Research areas include:

- Increased plant operational flexibility and efficiency, using retrofit solutions as well as new technologies;
- Optimisation of the GT efficiency over a wide operating range;
- Development of new combustion concepts (e.g. catalytic combustion, flameless oxidation, wet combustion, etc.);
- Increased fuel flexibility for the use of broader range fuels, such as Shale Gas, LNG Syngas, Hydrogen and other renewable fuels, which requires further research in combustion kinetics.

TC3: Material Degradation, Repair Technologies and Manufacturing

Vision:

Achieve full insight in the mechanisms that have a negative effect on the performance of the engine, the individual components specifically, and understand how these mechanisms can be positively influenced by an alternative operation/maintenance strategy. The interaction of the different mechanisms will also be considered. With the knowledge collected, develop – in line with the requirements – alternative, improved alloy-coating combinations that can be used in the current and future turbine designs and that perform in accordance with the demands stated for that design.

Research areas include:

- Identification of the life limiting degradation models of the key GT engine components;
- Extension of the predictability and modelling of the key degradation mechanisms;
- Consequences of repair processes on future component lifetimes;
- Development of alternative, improved alloy-coating combinations and manufacturing procedures that fulfil the defined requirements.

TC4: Condition Monitoring and Instrumentation

Vision:

Optimisation of the overall GT power plant equipment effectiveness (reliability, availability, maintainability and performance), by a systematic coordination of all activities and an optimum use of the knowledge embedded in the organisation, in order to properly define the time to next service for flexible operating GTs and to go beyond 25000 hours of continuous operation.

Research areas include:

- Control and predictive measurement of emissions;
- Increased machine monitoring with advanced instrumentation for damage detection and monitoring of components;
- Instruments applicable for high pressure (50 bar) and high temperature;
- Control logics for predictive (performance) analysis.

TC5: Asset Management

Vision:

Use knowledge on the condition of the assets in a GT based plant to optimise competitiveness over the complete lifecycle of the plant in a sustainable manner. This is needed to adapt in a flexible, sustainable and competitive manner to the uncertainty in the grid caused by changing operation profiles to support renewables and to ensure competitive power generation in a changing environment.

Research areas include:

- Development of a concept and method to efficiently and effectively apply risk based maintenance (RBM) / risk based inspection (RBI) for all the main systems of GT based plants;
- Development of effective methods and tools to monitor the asset condition of the main equipment;
- Development of smart systems that are able to handle the large amount of data that is generated continuously on a power plant in order to provide value.

Addressing Users' Issues

High Level User Meetings

ETN is primarily a user-driven association with a strong user voice within the ETN Board. Every year, ETN organises a High Level User Meeting bringing together users from the highest management from both power generation and oil & gas industries to discuss issues of strategic importance to the GT market.

Engine-specific Meetings

The ETN user community has a strategy in place to address GT users' issues and trigger a dedicated response from OEMs, Independent Service Providers (ISPs) and the R&D community. This strategy is being implemented together with GTUsers.com for various independent User Group Meetings on selected frequently used GT engines for both power generation and oil & gas sectors.

1	**Collection**	The GT user community reports operational and technical issues as well as future requirements.
2	**Review & Investigation**	Issues are reviewed and short-listed based on frequency and economic impact. Key GT issues are reported to OEMs, ISPs and R&D community.
3	**Solution**	Solutions to the major GT issues and requirements are being explored with the OEMs, ISPs and R&D community.

The objectives of the Engine-specific Meetings are to:

- Provide a continuous and focused dialog between the user community, OEMs and ISPs in order to define and develop solutions to prioritised operational issues/requirements;
- Identify more generic issues that can be brought to ETN's Technical Committees in order to explore potential solutions together with leading experts from the R&D community;
- Explore opportunities to reduce issues through development of standardisation of GT packages. ETN already has two on-going successful projects in this field related to exhaust systems and air filtration.

Educational Gas Turbine Courses/ Workshops

ETN can organise tailor-made courses or Workshops globally in areas of importance for the users. These courses would be given by selected experts from the European R&D and industry community.

ETN Projects

ETN is a **project-focused association** where members can initiate project proposals or participate in projects coordinated by ETN. All initiatives that are brought to the ETN platform are provided with support and guidance by the ETN Project Board.

Examples of project collaboration schemes:

- Best Practice Guidelines
- Development of Standards
- Pre-Studies & Feasibility Studies
- R&D Projects
- Industry-funded and EU-funded Projects
- Educational Courses
- Position Papers and Technical input to the European Commission

Ongoing projects include:

- Exhaust Systems
- Air Filtration
- Thermal Barrier Coatings
- Micro Gas Turbine
- Condition Based Maintenance
- OMSoP
- Engine-specific Issues

Current EU-Funded Project:

OMSoP (Optimised Microturbine Solar Power system)

The OMSoP project, co-funded by the European Union's 7th Framework Programme for R&D, has the objective to provide and demonstrate technical solutions for the use of a state-of-the-art concentrated solar power (CSP) system coupled with a micro-gas turbine to produce electricity. The 4-year project kicked off with 8 partners from 4 countries in March 2013 and the budget is 5.5 million euro (EU funding 3.9 million euro). City University London is coordinating the project and ETN is leading the dissemination activities. www.omsop.eu.

Past EU-Funded Project:

H_2-IGCC (Low Emission Gas Turbine Technology for Hydrogen-Rich Syngas)

ETN has completed the coordination of the H_2-IGCC project, co-funded by the European Union's 7th Framework Programme for R&D. It was a major project, running from 2009 to 2014, with a total budget of 17.8 million euro (EU-funding 11.3 million euro) and with the participation of 24 partners from 10 countries.

The H_2-IGCC project has advanced the 'technology-readiness' of all aspects when burning hydrogen-rich syngas in gas turbines, including the development of combustion processes, materials, turbomachinery and the optimisation of the whole plant. Several results of the project can also be used for spin-off applications, especially when it comes to the results of the more basic research in combustion, materials, turbomachinery, systems analysis and techno-economical evaluation. www.h2-igcc.eu.

Communication

ETN Website: Members' Area

ETN members are given access to the Members' Area of the ETN website (**www.etn-gasturbine.eu**), where they can find and share databases, studies, industrial research, survey results as well as meeting documents.

Newsletters

The **Monthly News Summary**, available exclusively to ETN members, summarises the latest developments and happenings within ETN, gives the latest EU policy news and updates on upcoming GT events and R&D calls.

The **Quarterly Newsletter** provides extensive information on ETN's activities and EU policy developments and is also used as a dissemination tool for ETN and members' individual developments.

ETN Events and Activities

ETN organises several events each year. These events provide excellent networking opportunities as well as a chance for members to increase their organisation's visibility within the international gas turbine community.

The International Gas Turbine Conference: *"The Future of Gas Turbine Technology"*

The objective of the biennial International Gas Turbine Conference is to present and discuss future challenges and opportunities for the GT community globally. The conference brings together delegates from the international GT community, including utilities and oil & gas users, OEMs, suppliers and service providers, research institutes and universities as well as policy makers from Europe, Asia, Middle East, North and South America.

Annual General Meeting and Workshop

ETN members meet yearly in April during the Annual General Meeting to discuss the progress on activities and agree on the future strategy proposed by the Board. On-going and new initiatives are also presented to the General Assembly. The meeting provides an opportunity to receive a complete overview of on-going activities and to influence future activities.

Gas Turbine Courses

ETN also organises tailor-made GT courses that fit the needs of member organisations, based on expressed interest.

Annual Workshop

The Annual Workshop, held every second year in October, is organised primarily for the Technical Committees and on-going Projects to progress and/or develop new initiatives and newly started projects. ETN also invites guest speakers from outside the association to share and discuss future research needs.

User Group Meetings

ETN organises both High Level User Meetings and Engine-specific Meetings in order to have a single and independent voice communicating users' issues and to link those issues to the whole GT value chain which will provide a strong push for exploring and developing solutions.

Policy Monitoring

EU Energy and Research Agenda

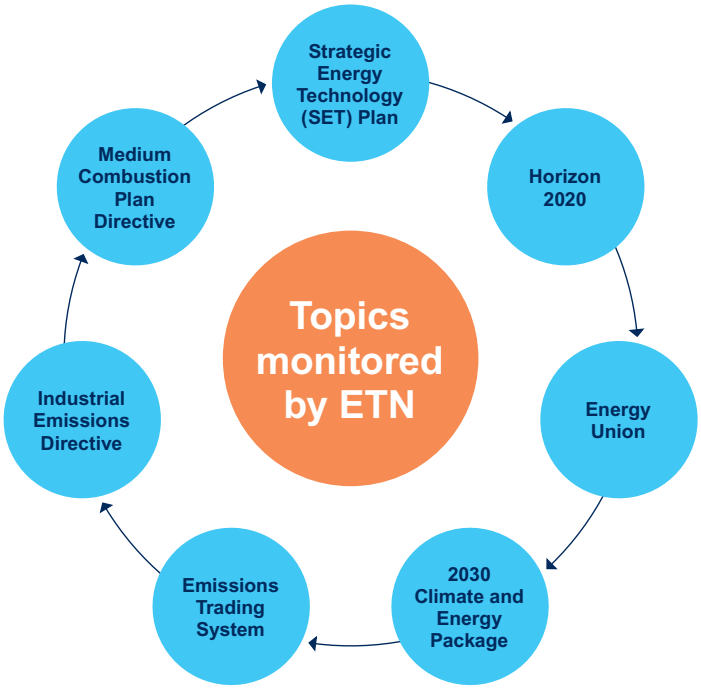
ETN advocates the role of gas turbine technology in the EU Energy Roadmap 2050. ETN is a proactive association that not only **monitors and alerts members** on the policy developments in the energy and research sectors but also provides market and technical input to EU's future energy and research agenda.

Technical Briefing Papers

Coordinated technical briefing papers are prepared by ETN in order to improve the understanding of all stakeholders on gas turbine technology and its role in reducing GHG emissions.

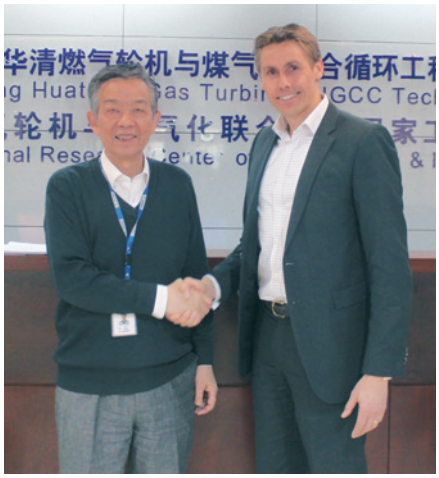
Debates

ETN is an Associate Member of the European Energy Forum (EEF), which provides an opportunity for ETN members to attend debates on energy related topics at the European Parliament.



International Cooperation

ETN has developed close cooperation with international organisations and is often invited to chair or speak at various international conferences. ETN members benefit from market information, established contacts as well as reduced participation fees to renowned global conferences.



Established cooperation with:

- GTUsers.com
- The Gas Turbine Society of Japan (GTSJ) – Japan
- The Industrial Application of Gas Turbine (IAGT) - Canada
- Gas Turbine Association (GTA) - United States
- ASME IGTI
- POWER-GEN
- International Energy Agency (IAE)
- International energy departments (European Commission, Department of Energy (US), etc.)
- Turbine Forum

Professor Jiang, representing the Chinese Government's National Research Centre (NRC) for Gas Turbine and IGCC Technology, with Christer Björkvist, ETN Managing Director.

ETN Membership Benefits

Networking

BE CONNECTED

- Extensive networking opportunities with members in different areas of expertise at European and international level
- Participate in engine-specific user groups
- Be part of ETN's GT community and global users network
- Attend and benefit from tailor-made GT courses
- Attend recognised global GT events at reduced conference fee

International Visibility

BE VISIBLE

- International visibility towards the entire GT value chain
- Wide visibility through ETN's website, global newsletters, conferences & courses
- Host ETN meetings and organise site visits at your facilities
- Various dissemination opportunities (project and demonstration results, technical research achievements and new developments)

Policy & Market Information

BE INFORMED

- Have an impact on the EU energy and research agenda
- Access to a wide range of policy briefing reports
- Receive updates on policies covering the latest EU legislation related to the GT industry
- Access to valuable information on the latest market developments

Project Development & Cooperation

BE INNOVATIVE

- Access to the services provided by the ETN Project Board : technical & strategic advice, guidance on funding opportunities, recommendations on key R&D fields
- Initiate and participate in various international and cross-functional collaboration schemes: studies, R&D projects, best practice guidelines, development of standards
- Receive administrative support to set-up and launch EU-funded projects
- Access to ETN's services and expertise in project management and coordination

Technical Committees

BE INVOLVED

- Receive up-to-date information on the users' needs and requirements
- Exchange knowledge and best practices in priority technical areas
- Explore ideas and discuss any GT related issues with experts in the field
- Receive key information from the R&D community: technical papers, reports and project results
- Influence ETN's R&D Recommendation Report
- Technology watch in key areas

ETN Membership

How to become a member

You can apply for membership by completing the online form available on the ETN website or by contacting the ETN Office.

ETN Office

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ETN

be connected

be valuable

be visible

be informed

be involved

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