ETN NEWS

OCTOBER | DECEMBER 2018 ■ Volume 2018 ■ Issue 04

ETN is a non-profit association bringing together the entire value chain of the gas turbine technology community globally. Through cooperative efforts and by initiating common activities and projects, ETN optimises turbomachinery research and technology development and promotes environmentally sound gas turbine technology with reliable and low cost operation.

In this issue

Christer Björkqvist
Managing Director

Strong commitment to meet UN energy & climate targets by the ETN gas turbine community

The pressing needs to cut CO_2 emissions as well as local air pollution became a key topic of discussion at ETN's International Gas Turbine Conference (IGTC), as the latest UN IPCC report was published just before the conference. Energy systems are undergoing fundamental changes across the world and the report will likely result in an accelerated phase-out of coal-fired power plants parallel to increased investments and development of carbon-neutral system solutions. It was encouraging to see that the wider gas turbine community attending the IGTC conference expressed collective support for development of integrated energy solutions to keep global warming below 1.5°C.

It was highlighted in the IGTC keynote presentations and panel discussions that continuous Research & Development (R&D) investments in the turbomachinery sector will enable broader contributions to the energy and climate targets in the transition phase and bring us closer to cost-competitive carbon-neutral energy system solutions.

ETN's newly published R&D Recommendation Report provides numerous pathways to the development of carbon-neutral turbomachinery solutions. The topics covered in the report are all promising areas where continuous R&D in the turbomachinery sector is of paramount importance to provide significant contributions to a global low emission pathway and beyond.

This report is a result of common efforts of the ETN Project Board and ETN members to summarise recommendations for R&D topics based on the User community's needs as well as energy and climate policy targets outlined in the COP21 agreement.

I hope that you find this report interesting and that the subjects suggested will trigger new initiatives in various forms: R&D projects; feasibility studies; best practise guidelines; development of standards and technical briefing papers. Within ETN we are in constant search for new and improved solutions as well as ways to optimise operations by exchanging experiences and initiating common activities. I can promise you that our Project Board and the ETN office will provide you with the required support and visibility to any new ideas or initiatives.

A wider collaboration towards a commonly agreed vision will reduce costs and risks but also increase our innovativeness and reduce the time of bringing new developments to the market. As ETN's President Bernard Quoix stated in his opening speech at the IGTC conference, "we need an increased cooperation among all the stakeholders in order to define the most cost-efficient way overcome the challenges ahead and ensure a prosperous turbomachinery community". Based on the accumulated extensive knowledge and wide expertise within the ETN community, the prospect of success is high if we follow his advice.

ETN Project Board presents its new R&D Recommendation Report

A new edition of ETN's Research & Development Recommendation Report was published in early October 2018, ahead of the International Gas Turbine Conference 2018. This publication, which involved experts from research institutes and universities, OEMs, suppliers and Users, builds on the previous version and underlines the necessary R&D efforts needed for the turbomachinery sector in the near future.

The purpose of this report is to summarise recommendations for the most relevant R&D topics based not only on the needs mentioned, but also on energy policy targets towards the deployment of carbon neutral energy services and products, and envisioned market trends. The report is updated biennially, and it aims at delivering concise chapters on the most relevant topics of interest for the industry, providing guidelines on the most required research, as well as the trends for turbomachinery operations under changing market conditions and policy framework.

The suggested subjects should trigger respective actions within the ETN community in various forms, resulting in R&D projects, feasibility studies, best practice guidelines, development of standards and technical briefing papers.

New chapters: Advanced Repair and Digitalisation

Based on the inputs from the ETN community, two new chapters on Advanced Repair and Digitalisation were added to the report, highlighting the opportunities that the related technologies can provide.

Advanced repair techniques answer to a fundamental need of operators who seek to reduce their maintenance costs. Extending the range of damage that can be repaired, and improving the performance of repaired parts with regards to previous techniques are the most sought-after results. These service upgrades enable longer life time and extension of overhaul intervals.

Digitalisation is nothing new, but it is gaining momentum among oil & gas and power generation industries, where the need for new efficiencies is urgent. Advantages must gain in visibility, while concerns related to technology, e.g. cyber security, need to be further addressed. Increased data (from machine, asset and business) provides improved analysis opportunities. A broader implementation of digitalisation on an end-to-end basis can rapidly and radically change the industry.

ETN Project Board involvement

This publication represents the involvement of 13 ETN Project Board Members who have contributed to writing the chapters of this new edition. The ETN Project Board consists of ETN member representatives who provide independent support to new initiatives or issues brought to the ETN platform, thanks to their expertise in a wide range of technical areas in the turbomachinery sector. All Project Board members are involved in ETN's projects and Working Groups, introduced in the last chapter of the report – ETN Support Schemes for Projects. ■

Download the new R&D Recommendation Report: www.etn.global/etn-RDRR

Air Filtration Working Group

ETN's Air Filtration Working Group met in Brussels on 24-25 September 2018 to discuss the latest revision of the ETN Water/Salt test procedure related to the standard ISO 29461 – Part 5: Test methods for static filter systems in marine and offshore environments. During the previous Air Filtration Working Group meeting, which took place in Genoa in conjunction with ETN's Autumn Workshop in October 2017, it was decided to set up a sub-group working on harmonisation of the test procedures, and issue the 3rd draft of the ETN Water/Salt test procedure. Regular teleconference calls have taken place since the previous meeting, and a smaller working session was also organised in conjunction with ETN's Annual General Meeting in Bucharest in March 2018. During the meeting in Brussels last month, the Working Group members reviewed all the previously submitted comments and planned the timeline for the 4th draft of the procedure, to be finalised ahead of the next ISO/TC 142 meeting, set to take place in September 2019. The Air Filtration Working Group will hold their next meeting in Brussels on 22-23 January 2019. ■

New members

Maharatna Oil and Natural Gas Corporation Limited (India) and **Mechanical Field Support** (The Netherlands) recently joined ETN.

Maharatna ONGC is the largest crude oil and natural gas company in India, contributing around 70% to Indian domestic production.

Mechanical Field Support is a supplier specialised in gas turbine maintenance, services and site management.

We are pleased to welcome Maharatna ONGC and Mechanical Field Support to our network! ■

New ETN Project Board member nominated

ETN Project Board for 2018-2020 has been further strengthened, as **Olaf Brekke** from Equinor was nominated as a Project Board member. ETN's Project Board is responsible for bringing in new initiatives and projects and ensuring the progress of ongoing ETN activities. Olaf is actively involved in ETN's User Groups and Air Filtration Working Group, and will report about these ETN activities to the Project Board. The next Project Board meeting is scheduled for 11-12 December 2018. ■

ETN's White Paper on digitalisation published

ETN's White Paper on Industrial Internet: the next age of productivity for European GT based plants, drafted by Chris Dagnall (DNV-GL) and Pascal Decoussemaeker (GE Power), is now available on ETN's website. The objective of this paper is to provide support and guidance to the ETN members on Industry 4.0 and the Industrial Internet. The content was developed during ETN Workshops in 2016-2017, in a joint effort between Technical Committees 4 and 5, and the full paper was presented at ETN's IGTC in October. ■

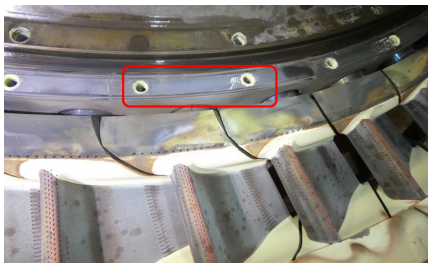
Middle East Rotating Machinery Conference

SECOND ANNUAL ME RoTIC Conference & Showcase
Middle East Rotating Machinery Technology & Innovation Conference
25th to 27th September - 2018, Dubai, United Arab Emirates
Email: info@aldrichme.com www.roticmiddleeast.com

The "Middle East Rotating Machinery Technology & Innovation" conference was held on 25-27 September 2018 in Dubai, United Arab Emirates, where ETN President Bernard Quoix (TOTAL) delivered an opening keynote speech for the second year in a row. He highlighted that the two most important topics for oil & gas companies are the urgent need to reduce our operational expenditure of rotating machines without impacting safety, and to ensure competitive innovation and technology development in line with the User community's needs and requirements.

Bernard Quoix stressed the importance to ensure that the User community prospers in order for the whole turbomachinery value chain to benefit from this, as well as to ensure a long-term sustainability for the sector. He also called for a strong coordinated User voice and a platform with presence of major vendors, OEMs, key service providers and experts from the research community, where the voice of the Users can be heard and real cooperation projects can be initiated. In his speech Bernard Quoix also introduced ETN's Hot Corrosion Working Group, which aims at understanding the likely causes of hot corrosion and defining ways to address hot corrosion damages on the hot gas path parts of the gas turbine, and invited all the Users who have faced such problems to participate in this initiative. ■

Hexavalent Chromium health risk



Area with yellowish residue
© Kees van den Berk, RWE Generation

Various safety bulletins have recently been issued by the OEMs and service providers relating to the health risks and precautions associated with hexavalent chromium (a yellowish residue found on some components in the gas turbine flow path, including the combustion system, hot gas path and exhaust diffuser). This seems to be a generic risk and potentially applicable to all gas turbines. As a first step we would like to raise the awareness of this issue. If you are exposed to service-run components, please seek guidance on the precautions to take. If you require any further information, please contact the ETN office (vm@etn.global), and we will put you in touch with other members who are already aware of the issue. ■

AGM & Workshop 2019

The dates for ETN's Annual General Meeting and Workshop have now been decided: the AGM & Workshop will be held on ***27-28 March 2019***. Please save the date – location for the event will be confirmed and communicated shortly! ETN's AGM is the perfect occasion to meet all the members and be informed about the latest progress and next steps on all ETN activities. The following Workshop will also provide an opportunity for members to highlight specific needs and requirements, as well as to present new project ideas and initiatives. ■

9th International Gas Turbine Conference

ETN's 9th International Gas Turbine Conference – The Future of Gas Turbine Technology took place on 10-11 October 2018 in Brussels, Belgium. The conference welcomed 150 participants from over 80 organisations, attending from the whole value chain of turbomachinery technology.

In the keynote sessions, high-level political representatives and turbomachinery specialists presented their views on the role of gas turbine technology and development opportunities in the transition to a lower-carbon and carbon-neutral energy scenario. National and regional gas turbine markets and R&D programmes were presented, and the operational needs for the User community were highlighted. On the second day the keynote sessions provided the OEMs the opportunity to present their solutions for optimising and reducing cost of operations and key research and technology areas in the market transition to a lower-carbon society. Interactive panel discussions took place after the presentations.

Over two days, 30 high-quality papers were presented in a total of nine technical sessions, introducing the state-of-the-art technologies and latest developments, covering topics such as operations and maintenance, digitalisation and data analytics, distributed generation technologies, advanced cycles and alternative fuels.

The UN's Intergovernmental Panel on Climate Change (IPCC) Special Report of Global Warming of 1.5°C (see the page 7) was addressed and discussed during several IGTC sessions. In acknowledgement and response to the report, ETN issued a statement to demonstrate how existing gas turbine technology can provide significant contributions to a global low emission pathway and to show the commitment of our community to development of carbon neutral energy solutions. The press release can be downloaded here.

All the IGTC-18 presentations and technical papers are now available for the conference attendees (requires password).

We look forward to welcoming you to our next IGTC, set to take place in Brussels in October 2020!

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9th International Gas Turbine Conference

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We would like to thank again our Sponsors:

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High-Level User Meeting

ETN's High-Level User Meeting (HLUM) took place in Brussels on 9 October, one day ahead of the conference, and gathered input from EDF, Enel, Engie, Uniper, BP, Equinor, Shell and TOTAL. The outcomes of the meeting were reported at the IGTC Keynote session 2: "Operational needs for Utilities, Industrial Users and Oil & Gas Operators in current and future scenarios". Based on the HLUM discussions, ETN President Bernard Quoix (TOTAL) highlighted the "hot topics" in his IGTC keynote presentation, and listed the following R&D interests and needs for the Users to be addressed in the upcoming years:

- Flexibility
- Operation in harsh environment
- Digitalisation
- Energy efficiency and emissions
- Cost optimisation
- Control systems obsolescence
- Preservation of GTs & plants
- Advanced cycles
- (Green) hydrogen

A series of preparation teleconference calls for ETN's next year's meetings will be held ahead of the SGT-A35 and LM2500 meetings, set to take place in May and June 2019. For more details, please contact Valentin Moëns: vm@etn.global.

Cooperation between ETN, EC, US DOE and GTI

In conjunction with our conference, ETN organised a meeting on 8 October with the representatives from the European Commission, US Department of Energy (US DOE) and Gas Technology Institute (GTI) to explore cooperation opportunities on RD&I activities in common areas of interest. All parties involved thought it was a good initiative, and as a result a follow-up meeting is planned to take place later this year for a more detailed review and discussions on suitable topics and cooperation prospects.

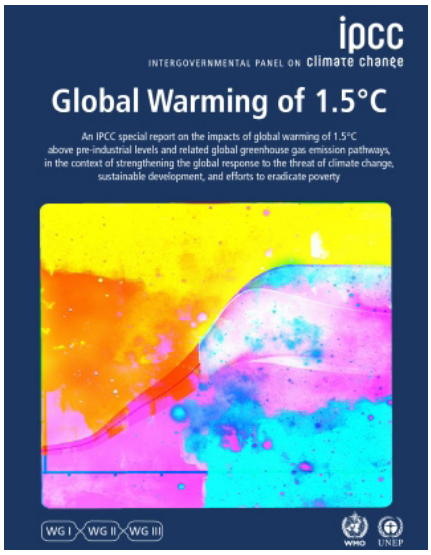
ETN-US-UK workshop

ETN cooperates with the US DOE and the representatives of the Department of Energy and Climate Change (DECC) in the UK within the existing collaboration scheme on advanced materials. In conjunction with the October Workshop 2017, the first ETN-UK-US DOE collaboration meeting was held in Genoa, where the representatives of the UK and US DOE explained their objectives of the ongoing tasks. ETN members raised their interest in the programme with topics such as additive manufacturing and micro gas turbines. A follow-up meeting was held in Pittsburgh in April 2018, and a two-day workshop was organised in Brussels on 8-9 October, ahead of our IGTC.

Additive Manufacturing Working Group meeting

As reported in the previous newsletter edition, ETN's Additive Manufacturing (AM) Working Group was launched earlier this year following the interest among the Users, OEMs, universities, research institutes and consultancy firms to exchange knowledge and experiences and cooperate on AM practices. The Additive Manufacturing Working Group met in conjunction with the IGTC on 12 October. Ernest Ćutuk, the representative from the European Commission's DG Research and Innovation was invited to the meeting to hear about development opportunities in the gas turbine sector and their needs related to Additive Manufacturing. He presented the EU initiatives and programmes for Additive Manufacturing, and explained that under the previous Framework Programme FP7 (2007-2013), over 60 projects were funded with €160 million in EU funding. In the current "Horizon 2020" programme (2014-2020), at least €113 million has been allocated to the AM projects only between 2014 and 2016. Mr. Ćutuk also presented the upcoming calls that may be of interest to the AM Working Group, and introduced the new "Horizon Europe" Framework Programme" for research and innovation for the period of 2021-2027. ETN's AM Working Group is currently reviewing the opportunities for new collaboration projects. The focus of ETN's AM Working Group is on the following three areas: AM equipment and process database; product quality and control; and R&D roadmaps. ■

IPCC Global Warming of 1.5°C report



The Intergovernmental Panel on Climate Change (IPCC), UN body for assessing the science related to climate change published in October its "Global Warming of 1.5 °C" report, which provides different scenarios of global warming and their impacts on the earth. Under the Paris Agreement, which was adopted at COP21 in December 2015, 197 countries agreed to aim to limit the rise in global average temperature to "well below 2 °C" above pre-industrial levels, and to "pursue efforts" to hold the increase in temperature to 1.5 °C. The COP21 parties invited the IPCC to prepare the special report on the impacts of global warming of 1.5 degrees.

The IPCC experts state that in order to limit the global warming to 1.5°C, "rapid, far-reaching and unprecedented changes in all aspects of society" would be required, and concluded that a 2°C warming would be worse than what had been previously thought. According to the report, human-caused warming has already resulted in a 1 °C rise, demonstrating that the world is currently on a path towards 3°C of warming. The experts also note that human-induced CO_2 emissions would need to decrease by about 45% from 2010 levels by 2030 to reach 'net zero' around 2050. The report presents removing CO_2 from the air as one of the possible solutions to achieve this in different scenarios that are provided. "Global Warming of 1.5ºC" report is the first part of a series of IPCC's special reports. ■

Climate Analytics: Germany needs to exit coal by 2030 to meet Paris commitments

Climate Analytics' recently published report showcases that the EU and OECD countries must stop burning coal for electricity by 2030, China by 2040, and the rest of the world by mid-century in order to meet commitments made under the Paris Agreement in the most cost effective manner. The full report is available here. ■

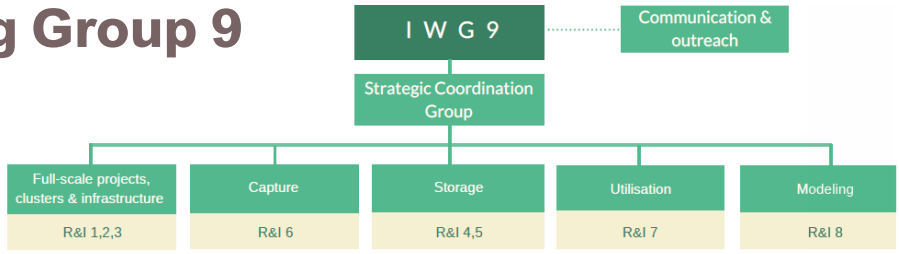
EU's long-term strategy for greenhouse gas emissions reductions

COP24·KATOWICE 2018
UNITED NATIONS CLIMATE CHANGE CONFERENCE

In March 2018, the EU member states invited the European Commission to present its plans for long-term EU greenhouse gas emissions reductions for 2050 and beyond, in line with EU's Paris Agreement commitments. Commission's new vision is expected to be released ahead of COP24, the 24th Conference of the Parties to the UN Framework Convention on Climate, to be held in Katowice, Poland, on 3-14 December 2018. The main objectives for COP24 will be to "work out and adopt a package of decisions ensuring the full implementation of the Paris Agreement". The European Parliament is pushing for net-zero global greenhouse gas emissions by 2050, and in October the Parliament voted in favour of increasing the EU's emissions reduction target from 40 % to 55 % by 2030. ■

SET-Plan Working Group 9

On 20 September 2018, ETN attended the Strategic Energy Technology Plan (SET-Plan) Working Group 9 Carbon Capture and Storage (CCS) and Carbon Capture and Usage (CCU) meeting in The Hague, hosted by the Dutch Ministry of Economic Affairs and Climate. Following the adoption of SET-Plan Temporary Working Group (TWG) CCS and CCU Implementation Plan (IP), the TWG has transitioned to an Implementation Working Group: IWG 9. The IWG 9 will now focus on delivering the eight key research and innovation (R&I) activities, required to achieve the ten targets for CCS and CCU for 2020, agreed by the European Commission, SET-Plan countries and the industry. The IWG 9 has been divided in five subgroups whose aim is to address the targets mentioned above, defined in the Declaration of Intent under SET Plan Action 9.



Proposed structure for Implementation Working Group 9

Subgroup 1 – Full-scale projects, infrastructure & clusters aims at identifying, prioritising and supporting the development of large scale CCUS projects. Such support includes monitoring their progress, identifying regulatory barriers and working on overlapping challenges between projects. Its three R&I Activities are respectively the delivery of a whole chain CCS project operating in the power sector; the delivery of regional CCS and CCU clusters, including feasibility for a European hydrogen infrastructure, and EU Projects of Common Interest for CO_2 transport infrastructure.

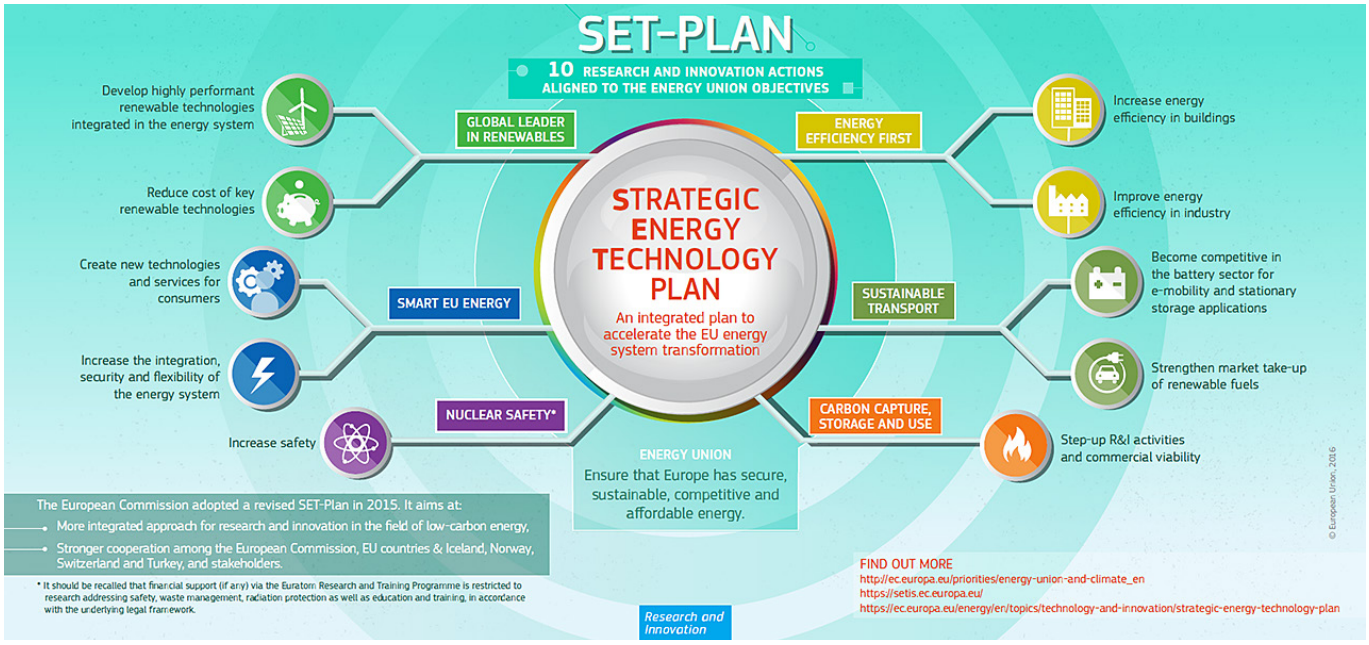
Subgroup 2 – Capture focuses on developing next-generation CO_2 capture technologies (R&I 6) and aims at identifying opportunities to undertake relevant research and innovation. In doing so, the subgroup looks at CCS projects involving industries such as cement, lime, and iron & steel and also follows the development of CCU projects involving biofuels and/or methanol.

Subgroup 3 – Storage wants to engage, develop discussions and co-development across a wide number of actors in order to support the development of transport and storage infrastructure: with the development of ownership & business models, and assessing long-term risks, liabilities and securitisation. In order to do so, it will rely on its R&I Activities: establish a European CO_2 storage atlas (R&I 4) and unlock European storage capacity (R&I 5).

Subgroup 4 – Utilisation is based on CCU action (R&I 7) and has identified at least 14 CO_2 CCU projects in Europe with TRL 6-9. Its objectives are to support the identification of the most promising CO_2 utilisation technologies; to stimulate the emergence and the development of pilot/demo projects; and to coordinate the support from Member States.

Subgroup 5 – Modelling aims at understanding and communicating the role of CCS and CCU in meeting European and national energy and climate change goals (R&I 8). Its objectives are to support the development of energy-systems modelling to understand the role of CCS; to understand and communicate the socio-economic case for investing in CCS and CCU; and to support policy actions to realise socio-economic benefits of CCS and CCU.

More information about the SET-Plan and the topics ETN is monitoring is available on our website. ■



Upcoming meetings and events

Meeting/Event	Date	Location
ETN Project Board meeting	11-12 December 2018	Brussels, Belgium
ETN Board meeting	12-13 December 2018	Brussels, Belgium
Air Filtration Working Group meeting	22-23 January 2019	Brussels, Belgium
ETN Board meeting	13-14 February 2019	Brussels, Belgium
ASME GTS Advanced Manufacturing & Repair for Gas Turbines	19-20 March 2019	Berlin, Germany
ETN AGM & Workshop	27-28 March 2019	To be confirmed
SGT-A35 User Group meeting	May 2019	To be confirmed
LM2500 User Group meeting	June 2019	To be confirmed
ASME Turbo Expo	17-21 June 2019	Phoenix, United States
ETN October Workshop	October 2019	To be confirmed
GTSJ International Gas Turbine Congress	17-22 November 2019	Tokyo, Japan

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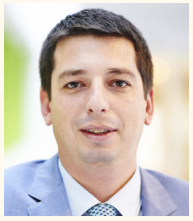

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ETN at a Glance!

Download the ETN Brochure, featuring:

- ETN Mission & Objectives
- ETN Technical Committees
- ETN Projects
- ETN Events & Activities
- ETN Membership Benefits
- And more!

Are you a gas turbine user? Download the Brochure showcasing the benefits of being part of ETN's global gas turbine user community.

Keep in contact and updated with ETN's most recent news.
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