ETN NEWS

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**ETN is a non-profit association bringing together the entire value chain of the gas turbine technology community in Europe and beyond. Through the cooperative efforts of our members, ETN facilitates gas turbine research and technology development, promoting environmentally friendly stationary gas turbine technology with reliable and low cost operation.**

## In this issue



**Christer Björkqvist**
*Managing Director*

### *Increased international commitment and cooperation required*

*In order to tackle global climate change, increased international cooperation between continents, countries, industries and stakeholders will be required on political as well as technical levels.*

*With the upcoming COP21 Climate Summit in December this year, all eyes are turned to Paris in anticipation of the outcome. Expectations are set on a wide global agreement with emission targets for 2030 with some kind of review mechanism. Alongside global climate targets it would be important to establish a strong technology cooperation mechanism to assist in further developing existing technologies as well as providing research, development and demonstration opportunities for future promising technology solutions. International cooperation and willingness to set-up global demonstration programmes would in particular be important for $CO_2$ capture technologies and advanced innovative cycles.*

*In parallel the European Commission, with Maroš Sefčovičč̆n the lead, is making progress with the development of a European Energy Union strategy and implementation plan that is expected in December this year. In this context, Mr Sefčovičč̆ecently stated that "Gas is a big component of the EU's transition towards renewable energy". The European Commission has also stressed that gas is the best option to balance out more uneven power generated by wind and solar. These are very important statements that can hopefully influence the current odd situation where coal plants in many European countries, running with a spinning reserve, are the back-up power option to intermittent renewable power.*

*To help the gas turbine user community to overcome today's difficult market situation and to ensure a future wide role for the gas turbine technology, we are, within ETN, trying to increase international technical cooperation among the wider industry players and the most suitable experts from the R&D community. The objective is to explore cooperation and cost-effective development opportunities for today's gas turbine fleets. In parallel we are focusing on defining R&D topics for the next generation of fleets taking into account the needs of the user community, energy policies and future emission targets.*

*In preparation of our upcoming ETN workshop (21-22 October) in Madrid, we are evaluating and reviewing the requirements and needs from both the Power Generation and Oil & Gas industries. We are currently in the process of selecting topics to focus on, under the following top priorities: reduction of operational costs, lifetime extension, increase of operational flexibility such as fuel and load variations and the development of low carbon solutions. I look forward to welcoming a wide participation from the whole value chain to this important workshop in Madrid. Together we can change the future.*

## *The future of gas turbine technology*

# Call for papers for the 8th International Gas Turbine Conference

***12-13 October 2016 | Brussels, Belgium***

***The IGTC-16 Conference Advisory Board welcomes submission of Papers in the following gas turbine research areas and application fields:***

**Review Papers** giving a comprehensive technology overview of the past 2 years or **Case Study Papers** describing recent experiences as well as **Technical Papers** describing technoloy advances and innovative solutions are welcome in the following areas:

### *Flexible Operation & Fuel Flexibility:*

- Fast & reliable start, high ramp rate and low cost
- Efficiency at low load, and low emissions
- Fuel flexibility: $H_2$ in natural gas, syngas, biofuels, low BTU, $CO_2$- rich gas, corrosive gases ($H_2S$, NH3, Cl, ...)
- Service and maintenance aspects, retrofits

### *Materials*

- Material developments - New alloys for high temperatures - Additive Manufacturing
- Coatings
- Failure mechanisms
- Heat exchangers

### *Plant and System Integration*

- Air filtration & general aerodynamics interfaces
- Exhaust and waste heat recovery units
- Hybrid systems: GT technology integration with renewables/ solar, fuel cells and energy storage devices
- Heat exchangers; externally heated GTs

### *Turbomachinery*

- Compressor performance, degradation & fouling
- Blade design and cooling technologies
- CFD: turbomachinery fluid dynamics
- Integrated modeling approaches; complete system modeling

### *Power Generation Operator Priorities*

- Operator experience with flexible operation
- Tailored maintenance approaches e.g. for GTs with (very) low operating hours
- Open cycle vs combined cycle operation
- Cost reduction

### *Manufacturing and Repair*

- New advanced manufacturing techniques (3D printing)
- New repair technologies (LMF, additive laser melting)
- Influence of manufacturing/repair on performance
- Cost reduction technologies

### *Oil & Gas Operator Priorities*

- 25 000 hours of uninterrupted operation
- Condition-based maintenance
- Novel Inspection techniques (online, hot components)

### *Combustion*

- Ultra low emission systems for retrofit
- Dilute combustion (flue gas recirculation; steam injection, combustion in $sCO_2$)
- New combustion techniques (multiple fuel injection, staged combustion, high preheat temp. comb.)
- CFD: high fidelity combustion CFD

### *Submission of Papers*

An abstract of maximum 400 words should be submitted in a Word document by e-mail with the title "Abstract" to etn@etn-gasturbine.eu before 13 November 2015. When your abstract is submitted correctly, you wil receive a confirmation email.

### *The abstracts must contain:*

- Title of the paper;
- Names, affiliations, and full addresses of all authors;
- Up to five keywords in descending order of importance;
- Language: All abstracts must be written in high quality English and authors of selected papers must be able to present their topics in English.

The Conference Advisory Board will only select promising abstracts of high quality. Accepted abstracts will be invited to submit a final paper.

## DEADLINES

| | |
|---|---|
| *Submission of abstract* | *13 November 2015* |
| *Notification of abstract acceptance* | *1 February 2016* |
| *Submission of final papers* | *29 April 2016* |
| *Notification of paper acceptance* | *17 June 2016* |

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## *The future of gas turbine technology*
# International Gas Turbine Conference 2016

The International Gas Turbine Conference is organised biennially and aims to raise the awareness of gas turbine (GT) technology development needs – from both oil & gas and power generation operators' perspectives - and to provide the opportunity to meet and exchange ideas with policy makers and GT experts from the whole value chain attending from Europe, America, Middle East, and Asia. The conference will highlight the energy market outlook in Europe and in key markets globally, as well as to present and discuss R&D activities on flexible, efficient and environmentally sound gas turbines.

The **keynote sessions and panel discussions** will address critical issues related to climate change mitigation in the context of the different and fast changing markets. Special attention will be given to increased operational flexibility, fuel flexibility, retaining reliability and lower emissions for both single cycle and combined cycle operation. Energy policies that set boundary conditions and initiatives for GT technology development in Europe and globally will be presented, followed by panel discussions with distinguished experts and high level policy makers.

In parallel, **technical sessions** on critical research and development activities necessary for the advancement of GT technology, from operational, environmental and cost perspectives will be addressed. Recent GT technology and new, innovative solutions will be explored. The technical sessions will combine research initiatives and experience reports of real case applications, with the aim to give a balanced view of current developments and future needs for research in GT applications. ■

***For more information, download the Call for Papers here***


### *Conference Advisory Board: 8th International Gas Turbine Conference*

ETN is pleased to present the members of the Conference Advisory Board as well as the Review Board for its 8th International Gas Turbine Conference:

#### *Conference Advisory Board*

- Giovanni Cerri, University Roma TRE
- Catherine Goy, E.ON Technologies
- Robert Steele, EPRI
- Chris Dagnall, DNV GL
- Abdulnaser Sayma, City University London
- Henk van den Berg, Xenergy
- Yannis Hardalupas, Imperial College
- Stefan Geisse, Sciemus
- Sonia Clarena Baron, EUTurbines

#### *Additional reviewers*

- Sauro Pasini, Enel
- Ian Macafee, Oxsensis
- Peter Griebel, DLR
- Daniel Mack, Julich Research Centre
- Jennifer Santos, Sciemus
- ETN project board

# Upcoming ETN event: Pre-User Meeting/ETN Workshop

*ETN will be hosting its biennial Workshop on 21-22 October 2015 in Madrid, Spain.*

The ETN Workshop's objectives are to provide a clear message to the industry and R&D community on the priority issues of the oil & gas and power generation user communities, generate real actions with short- & medium-term objectives that can address and help the user community to overcome their main issues, identify medium- & long-term research issues where ETN can push for research opportunities in future EU-funded R&D programmes and progress on on-going/new initiatives.

*The Workshop is open exclusively to ETN members. If you would like to become an ETN member and participate in ETN workshops/events, please contact the ETN office at info@etn-gasturbine.eu*

### *Pre-Workshop User Meeting: Pressing issues from the GT User community*

A user meeting will also take place prior to the ETN Workshop in order to identify and agree on the issues that hurt the most from an economical point of view for both the oil & gas and the power generation user communities.

Key topics will include:

- Remedial actions on failing components or major cost issues that have an industry-wide effect on availability of GT and/or operating cost. Redesign solutions (avoid/prevent failure, reduce maintenance cost);
- Reduction of the inspections/life time extension - material analysis (new materials, failure analysis, repair methods);
- Improved operating (start-up/shut-down) procedures and performance of GTs;
- Control/Monitoring system of critical rotating equipment;
- Standardisation of rotating equipment packages, including ancillaries;
- Fuel flexibility issues (fuel flexibility abilities on the same engine);
- Measurement techniques;
- Prediction of CO emissions;
- And more…

# Interview with Ron van Gestel on the Thermal Barrier Coating project

*The Thermal Barrier Coating (TBC) project group has published a "Practical Guide for TBCs in Gas Turbines" on the ETN website. Ron van Gestel, Chair of the TBC project from Chromalloy, gives us more details about the TBC project.*

***As the Chair of the Thermal Barrier Coating project group, could you explain the main objective of the project?***

The objective of the TBC project was to offer gas turbine users means to gain insight into the main issues with regards to TBCs. The goal was especially to provide the operators with sufficient knowledge to make well-based decisions in the various selection processes occurring during the life span of a gas turbine (component).

***When was it initiated and who was involved?***

The project was initiated during the ETN meeting in Germany in 2012, where an Oil & Gas user expressed a concern related to the options and the repair houses the Original Equipment Manufacturers (OEMs) are offering to extend the life of the airfoils. The key point was the lack of knowledge to make well-thought through decisions with regards to the use of thermal barrier coatings. Given the fact that this concern was shared by multiple users, ETN's Technical Committee 3 "Materials degradation & repair technologies" initiated this project. The project partners were **Chromalloy**, **Total**, **Cranfield University** and the **Julich Research Center**. Initially the intention was to provide a state-of-the-art paper by means of a survey of recent literature. However, due to the amount of publications as well as the number of topics addressed, it was decided to provide an overview of recent literature sorted to the various topics. Specific topics can be addressed in follow-up actions.

***What is the main achievement of the project?***

The deliverable of the project is a summary of recent publications on the topic of "Thermal Barrier Coatings" sorted to the various topics. Details of every literature position have been provided as well as the summary. It provides the user direct access to specific papers that discuss the topic of interest, which enables the reader to focus his/hers attention. The report "Practical guide for TBCs in gas turbines" is available for ETN members on the ETN website.

***Following the completion of the practical guide for TBC applications in gas turbines, what do you think the next steps could be? Do you envision a follow-up project?***

It has been the intention that this guide becomes a living document, which means that it will be updated on a regular basis. By doing this, the gas turbine users will have up-to-date information in the field of thermal barrier coatings.

Feedback from the users will provide insight whether there are gaps of knowledge, and areas that have not been addressed up to now. This will also provide useful information to knowledge institutes which could lead to common research projects. ■

# EU News

***Policy***

## Industrial Emission Directive: Conclusions on the TWG Meeting for the review of the LCP BREF document

The Final Technical Working Group (TWG) meeting for the review of the Large Combustion Plant (LCP) Best Available Technologies Reference Document (BREF) took place from 1-9 June 2015 in Seville, Spain. Two representatives from ETN's IED Committee joined the meeting in Seville on behalf of ETN: Tomas Alvarez from Endesa and Neil Dawson from National Grid.

Following the release of the revised Best Available Techniques (BAT) Conclusions, ETN made a series of comments and raised concerns in relation to their content and implications for gas turbine based plant in both generation and mechanical drive applications.

Overall, given the low level of environmental impact of this technology relative to other generation types, the current difficulties in operation of this plant type in the market, and the role of the plant in managing networks stressed by intermittent renewable supplies, ETN felt that the revisions to the conclusions still pose a significant threat to the technology and may penalise it compared to other prime mover types.

A summary report on the comments submitted by ETN is available on the ETN IED Committee webpage or you can access it by clicking here. ■

# EU Emission Trading Scheme Reform

*As the EU Emission Trading Scheme (ETS) faces challenges in the form of a growing surplus of allowances (2 billion), the European Commission (EC) presented in July a legislative proposal to reform the EU ETS for the period after 2020.*

This is the first step in delivering on the EU's target to reduce greenhouse gas emissions by at least 40% by 2030, in line with the 2030 climate and energy policy framework and as part of its contribution to the new global climate deal. The main challenge of the EU ETS' reform is to respect the EU's decarbonisation ambitions, while preserving the EU's competitiveness. This requires making an EU ETS which is flexible and adaptive, that can respond rapidly to changing circumstances and that considers the impacts of the following elements: a future global climate agreement planned to be signed in Paris, potential future economic crisis, the wide variation between Member States' energy policies and the effects of the new low-carbon technologies on the existing power business model.

### *Short-term solution: Back-loading*

As a short-term measure the EC postponed the auctioning of 900 million allowances in the early years of phase 3 (2013-2020). The auction volume is reduced by 400 million allowances in 2014, 300 million in 2015 and 200 million in 2016. They had been scheduled to return automatically to the market from 2019, but Members of the European Parliaments want them to be put into the Market Stability Reserve instead.

### *Long-term solution: Market Stability Reserve*

So far, the EU ETS has been unable to provide a high price crucial for investment in low-carbon technologies. Early in 2015, discussions took place between EU Member States and the European Parliament's Environment Committee over some measures to reduce the surplus of carbon credits available for trading in order to increase the price. One of the measures proposed is the early introduction of the Market Stability Reserve (MSR), a mechanism that will take hundreds of millions of surplus EU allowances for carbon out of the market. The allowances placed in the MSR could later be put back into circulation if demand rises. The original plan put forward by the EC in 2014 was to start the MSR in 2021, but the Parliament's Environment Committee proposed in February 2015 to bring this forward on 1 January 2019. According to the EC, this would raise the carbon price to an average 35 EUR/ton in the next decade.

On 30 March 2015, the Council started negotiations with the European Parliament on the MSR proposal. At a meeting on 5 May 2015, representatives from the two institutions reached an agreement on the issue and on 18 September, the Council formally adopted the creation of the EU ETS MSR.

### *EU ETS Reform for phase 4 (2021-2030)*

To achieve the 40% EU target, the sectors covered by the ETS have to reduce their emissions by 43% compared to 2005. To this end, the European Council has agreed that the overall number of emission allowances will decline at an annual rate of 2.2% from 2021 onwards, compared to 1.74% currently. Overall, 43% of all emissions allowances will be given out for free and 57% will be auctioned off. The EC plans to limit the free allowances to 50 sectors, down from 177 today. This is expected to reduce emissions from sectors subject to the ETS by some 556 million tons over the next decade – equivalent to the annual emissions of the UK.

The legislative proposal on the EU ETS Reform has been submitted to the European Parliament and to the Council in July 2015 for adoption under the ordinary legislative procedure. With national and industrial interests at stake, the ETS reform is likely to face a long and heated battle in the European Parliament. Ian Duncan of the European Conservatives and Reformists Group has been tasked with steering the proposal through the European Parliament.

### *EU ETS finance support to low-carbon innovation*

The revised EU ETS will provide incentives for innovation and continue to ensure that European industries remain competitive on international markets. An Innovation Fund will be set up to support investments in renewable energy, carbon capture and storage (CCS) and low-carbon innovation in energy intensive industry. Some 400 million allowances – estimated to around EUR 10 billion when sold – will be reserved from 2021 onwards for this purpose. In addition, a further 50 million of the unallocated allowances from 2013-2020 will be set aside to enable the Innovation Fund to start before 2021 and include projects to support breakthrough technologies in industry.

A modernization fund (some 310 million allowances) dedicated to support Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Slovakia upgrade their energy systems and shift to a low carbon model will also be set up. ■

## Upcoming meetings and events

| ETN Meeting/Event | Date | Location |
|---|---|---|
| ASME ORC Power Systems Conference 2015 | 2-14 October 2015 | Brussels, Belgium |
| ETN Micro Gas Turbine Meeting | 8 October 2015 | Brussels, Belgium |
| SGT5-4000F User Conference *(organised by GTUsers.com)* | 12-15 October 2015 | Berlin, Germany |
| GE Frame 6B, 7E & 9E User Conference *(organised by DGTA)* | 13-16 October 2015 | The Hague, The Netherlands |
| IAGT 2015 Symposium | 19-21 October 2015 | Banff, Canada |
| Pre-Workshop User Session | 21 October 2015 | Madrid, Spain |
| ETN October Workshop* | 21-22 October 2015 | Madrid, Spain |
| ETN Air Filtration Meeting* | 27 October 2015 | Brussels, Belgium |
| GE Frame 9FA/FB User Conference | 3-5 November 2015 | Hong Kong |
| 7th EVI-GTI International Gas Turbine Instrumentation Conference | 3-5 November 2015 | London, UK |
| International Gas Turbine Congress - GTSJ<br>***(ETN members are entitled to a special discount)*** | 15-20 November 2015 | Tokyo, Japan |
| ETN Board Meeting* | 15 December 2015 | Brussels, Belgium |
| ETN Project Board and TC Chairs Meeting* | 28-29 January 2016 | Brussels, Belgium |

** Event open exclusively to ETN members*

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