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

Emissions, gas prices and an EU Energy Union at the forefront of political debates

In March, Faith Birol, the IEA chief economist, announced that in 2014 the global emission of carbon-dioxide did not rise for the first time in 40 years. This is quite remarkable as the global economy grew by 3%. This reduction is mainly due to a lower energy consumption in China, a major shift from coal to natural gas in the US and an increased overall use of natural gas in Asia. LNG demand in Asia has been growing over the last decade as a result of economic growth and the need to curb air pollution. The high demand in regions without gas supplies has over the last years resulted in a huge price differentiation between Asia, Europe and North America.

The race to benefit from these high prices has only resulted in a growth in supply by the end of 2014 after four years of flat production. Constructions and interconnections of LNG terminals take time to build, but now new LNG productions have started to flood the international market as several major projects come on stream after huge investments and years of developments. A big wave of LNG supply is coming from Australia which is expected to become the world's biggest exporter of LNG – overtaking Qatar, by 2019. Additional supply from the US Gulf of Mexico will also come on stream by the end of 2015.

At the same time demand is being stalled. China's economic growth is slowing down with an expected domino effect across Asia and in June Japan aims to gradually restart some of their nuclear facilities after the Fukushima disaster, suppressing further demand for LNG. As a result, spot LNG prices in Asia have now reached a three-year low and most likely we will see even lower prices as production increases further by the end of 2015.

Future prices are difficult to predict but the LNG market will for sure become more volatile over the next few years as a result of the 'uneven' supply and market-side additions. Hopefully, lower prices and price differentials between Asia and Europe will result in a higher LNG delivery to Europe, as only 18% of the capacities of LNG terminals in Europe were being used in 2014. But in order to fully use the European LNG, capacity interconnections also have to be extended and Europe has to be prepared to share infrastructure to a higher extent than today.

In Europe, with the recent EC communication and push for the development of an "Energy Union", energy policy is at the forefront of the political debates. With the recent conflicts in Russia and as the EU imports 53% of its energy, the security of supply and gas supplies have been in the centre of the discussions, with a focus on gas supplies, energy efficiency and renewables. My concern is that the impact of the intermittency of renewable power generation is often neither sufficiently highlighted nor fully understood in this debate.

In mid-March, I participated in an energy debate at the European Parliament with Vice-President Maroš Šefčovič, European Commission, in charge of Energy Union. The fact that he was bombarded by questions from Members of the European Parliament and senior industry representatives shows that there are still many question marks related to the recent released communication. However, I was impressed by his way of dealing with the "interrogation" and I believe he has the required leadership skills and determination. If this will be enough to convince the Member States and the European Parliament to progress towards an Energy Union, we will only know after November 2015 when the EC will present its complete strategy proposal.

The impact on the energy mix, our industry and how we can exploit cooperation opportunities to face the current market environment will be discussed at our upcoming annual meeting (21-22 April) in Dublin. I look forward to welcoming you to this meeting and to celebrate our 10th anniversary with you.

What's new on the ETN website?

ETN Video Section

ETN has recently published promotional videos and individual interviews on its website.

ETN's new video section features clips describing the association and the current market and presents interviews with senior ETN members, high-level representatives of oil & gas companies and utilities, policy-makers, journalists and more.

All videos are available on the ETN website as well as on ETN's Youtube channel.

- **ETN – Who We Are?** Key stakeholders involved in the European Turbine Network explain who we are and what we do

- **What Are the Priorities of ETN?** Bernard Quoix, Total (ETN's President)

- **Challenges and Future Opportunities of Oil & Gas Operators in South America** Marcelo Accorsi Miranda, Petrobras, Brazil

- **EU's Energy/Climate Priorities and the Role of Gas Turbines** Mechthild Wörsdörfer, European Commission

- **The Future of Gas** Beate Raabe, Eurogas

- **Recent developments in the gas turbine market** Junior Isles, The Energy Industry Times

New dedicated page for each Technical Committee

ETN has created new dedicated pages for each Technical Committee (TC).

Information available to the whole gas turbine community

Each TC page presents the new TC Chairs and co-Chairs, contains the latest news related to the TC, provides guidelines on how to submit an initiative on the ETN platform and presents the related events, videos, technical papers, projects and research areas.

Section available to ETN members only

When logged in onto the Members' Area, ETN members can also access reports, presentations, minutes of meetings, surveys and much more. The new Technical Committees' pages also include a list of ETN members which expressed interest in these Committees.

These pages will be updated regularly by the TC Chairs/co-Chairs and by the ETN office. However, TC members as well as technical experts from the gas turbine community are also welcome to feed these pages with events, technical papers and reports by sending the information to the ETN office at etn@etn-gasturbine.eu.

TC1: Low Carbon Gas Turbine operations

Chair: Mohsen Assadi, University of Stavanger
Co-chair: to be determined

TC2: Operational and Fuel Flexibility

Chair: Jean-Louis Vignolo, GE Power & Water
Co-chair: Yannis Hardalupas, Imperial College London

TC3: Material Degradation, Repair Technologies and Manufacturing

Chair: Ron van Gestel, Chromalloy
Co-chairs: Daniel Mack, Jülich Research Center and Nigel Simms, University of Cranfield

TC4: Condition Monitoring and Instrumentation

Chair: Chris Dagnall, GL Noble Denton
Co-chair: Herwart Hönen, RWTH Aachen

TC5: Asset Management

Chair: Pascal Decoussemaeker, Alstom
Co-chairs: Christoforos Romesis, NTUA and Giuseppina Di Lorenzo, University of Cranfield

Interview with Tomas Alvarez, Endesa, on the Rotor Life Extension Project

Endesa and EPRI, two ETN member organisations, jointly developed a condition-based rotor life management approach. Tomas Alvarez, Technology, Mechanical Maintenance and Systems Manager at Endesa gives us more details about the project.

What are the main objectives of the Rotor Life Extension Project?

Endesa, the largest electric utility in Spain, organised and led a team, including EPRI and Spanish companies, to develop an independent, condition-based life management approach for the continued safe operation of Endesa's fleet of gas turbines beyond the original equipment manufacturer (OEM) nominal limit for turbine rotors of 5,000 starts.

How does this project differ from or expand on previous work?

Turbine manufacturers typically place design life limits on rotors based either on equivalent operating hours or start-stop cycles. While previous gas turbine rotor life extension efforts have focused on hours-based operation, this project was the first to challenge the more difficult cycles' limitation. Experience gained from this effort enabled Endesa to extend the useful life of its GTs and contributed to further rotor developments through life analysis, nondestructive evaluation (NDE), and miniature material property testing.

Endesa operates a fleet of 18 GE 6B heavy-duty GTs serving isolated islands. The duty of these gas turbines is cyclic and spinning reserve, which results in several starts per day and few operating hours.

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Interview with Tomas Alvarez, Endesa on the Rotor Life Extension Project

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For this joint project, Endesa provided the project team with access to disassembled compressor and turbine rotors, which were then dimensionally scanned and used to develop stress analysis models. A root-cause analysis was performed of a turbine disc rabbet crack. A Non Destructive Technology (NDT) method was developed to detect the early crack development without rotor de-stacking. This technique was validated with field experience. Material testing was also performed to establish baseline properties and life thresholds.

What were the main findings of the project?

The findings of this project were very valuable to Endesa, and the life management approach has been implemented across the utility's 6B fleet. Once a rotor exceeds 5,000 starts, NDT is performed at each hot-gas-path inspection to ensure the disc rabbet integrity. As a result of this evaluation, Endesa has implemented a rotor life extension program which has extended rotor life limits from 5,000 to 8,000 starts.

How is this project impacting Endesa?

The replacements of the installed rotors are based on condition by means of an Ultrasonic Inspection performed in place without removing and de-stacking the rotor. This NDT is performed on those rotors which have exceeded the OEM limitation set at 5,000 starts. So far, four rotors have been replaced following this new approach based on rotor condition and allowing extending the rotor life to 8,000 starts.

The rotor life extension project has led us to implement a life-extension program among the entire Endesa MS6001B gas turbine rotor fleet, enabling us to extend the initial cycles limitation and perform the replacement based on actual rotor condition.

To view the full report, please click here.

New ETN members

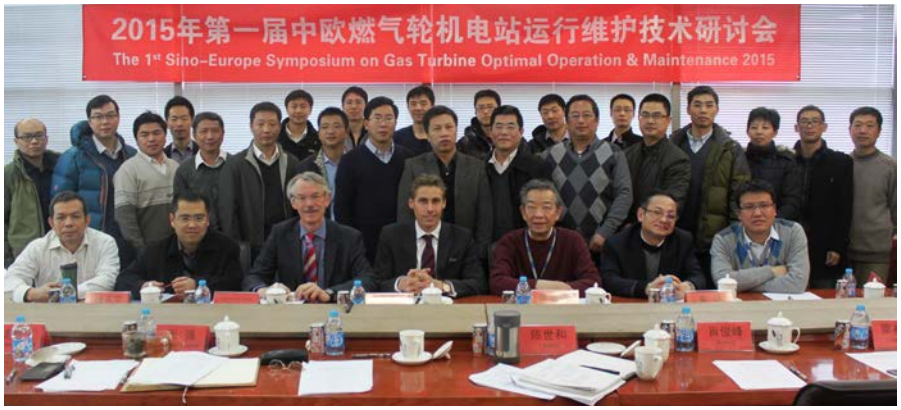
- SSE (UK Utility)

- ITSM – University of Stuttgart

ITSM
Institute of Thermal Turbomachinery and Machinery Laboratory
University of Stuttgart

Reaching out to new global markets: Latest developments

Christer Björkqvist, ETN's Managing Director, recently travelled to China and to the United Arab Emirates in order to strengthen the cooperation with key organisations in these markets.



Beijing, China

Christer Björkqvist and Dick Van der Vecht, Senior Advisor, ETN (GDF Suez), met with 30 representatives from nine power companies in China to discuss cooperation opportunities related to gas turbine operations and maintenance. The meeting had been organised by ETN and Professor Jiang, on behalf of the Chinese Government's National Research Centre (NRC) for Gas Turbine and IGCC Technology. They also met with TPRI "Users Research Institute" and visited the Beijing Taiyanggong Gas-Fired Thermal Power plant, constructed in 2007 to provide additional power for the Olympic Games.

The NRC provided an overview of operation and maintenance status of gas turbine fleets in China. They reported that quite a substantial increase in gas turbine operations is expected within the coming years, both as a result of a strategy to gradually shift from coal to natural gas generation in the major cities to reduce pollution and due to the increasing amount of renewable power generation where the flexibility of gas turbines will play an important role for cycling and back-up power.

Memorandum of Understanding (MoU)

Following Christer Björkqvist's visit to China, ETN and the NRC have signed a

MoU which will aim to facilitate and encourage a wider-collaboration among the gas turbine user community in China and the stakeholders on the ETN platform. An increased collaboration between the user community in Europe and China as well as with ETN members from the whole value chain will be important to reduce cost, risk and time of bringing development opportunities for gas turbines to the market.

The main objectives of this MoU are to support the gas turbine community, encourage a wider exchange of information, improve best practices, highlight future needs and requirements as well as to open up for an increase cooperation between the gas turbine user community, manufacturing, service industry and the research community.

United Arab Emirates

In January 2015, Christer Björkqvist met with high level representatives of several companies in Dubai and Abu Dhabi: ADGAS, GASCO, ADMA OPCO and Dubai Electricity and Water Authority (DEWA). He also visited the DEWA Jebel Ali Power station (UAE's largest power and desalination plant of 9.6 GW) and received support from local representatives from VBR Turbine Partners, Cranfield University and Ethos Energy.

The meetings, which were all on Vice-President level, were successful and all companies showed strong interest in ETN activities and are now discussing internally the opportunity to cooperate with ETN and become an Affiliate member. ■

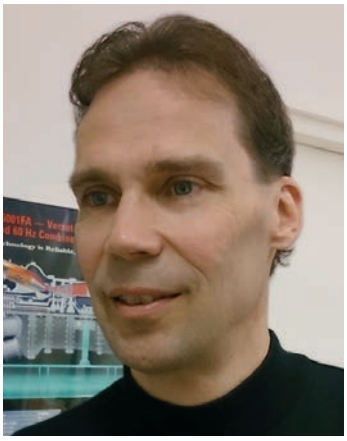
GTUsers.com News

GTUsers.com - Connecting end users and plants since 2002

Interview with Yrjö Komokallio, Managing Director of GASRE (GTUsers.com)

In January 2015, ETN and GTUsers.com have started a new cooperation aiming to increase the impact and to make life easier for the gas turbine user community by combining and linking separate activities, which will reduce duplications of work and activities.

Yrjö Komokallio, Managing Director of GASRE (GTUsers.com) gives more details about GTUsers.com and provides his insight on the recent cooperation between ETN and GTUsers.com.



What is GTUsers.com?

GTUsers.com is a tailor-made Web service for turbine end users to raise problems and share solutions among other end users. We work for the benefit of end users to enable safe, reliable and cost efficient operations of their gas turbines. GTUsers.com improves users' possibilities to share experiences and promotes best technical solutions.

It is important for the end users to discuss problems with other end users or ask for help to find spare parts during maintenance periods. Information on the type of faults of a turbine model and its components is also essential when they make plans concerning maintenance.

GTUsers.com and ETN have started a new cooperation. What benefits will this bring to the user community?

We currently have many industrial end users, and the majority of them use their turbines for power generation. The cooperation with ETN will bring in more users, especially from the oil & gas sector, to our platform. It also provides end user groups with the additional opportunity to bring general non-specific turbine issues to the ETN platform. These issues could then be tackled in development or standardisation projects by the whole gas turbine community in ETN's Technical Committees.

What is the history behind the creation of GTUsers.com?

The history of GTUsers.com dates back to the 1990s, when I purchased four first GE Frame 6FA fleet leader gas turbines in Europe and became the Secretary of a small end user liaison group. The Frame 6FA group started to grow as more end users joined the meetings, and in 2002, a web discussion forum for end users was established under the name GTUsers.com to enable exchange of information between annual conferences.

The GTUsers.com Web service operated as a "hobby" for three years. When GASRE was established in 2005, the service became professionally controlled. In the same year, GASRE launched the famous MS-Excel version of the Capital Parts Asset Management (today Internet-based TMMonitor) program for gas turbine maintenance management and parts tracking and other important supporting services dedicated to Maintenance Best Practices.

Today, GTUsers.com has become an important source of information for turbine end users, and we at GASRE are prepared to make increasing contributions to the service. It is the official Web service for major 50Hz gas turbine groups with more than 2500 end users and 1000 turbine plants. The steering committee of each end user group monitors and controls the group policies established individually for each group.

How does GTUsers.com differ from other organisations/services?

Our personnel have a long experience on gas turbines and web services, which make GTUsers.com a unique service. We develop GTUsers.com constantly based on end user feedback received through web questionnaires and end user conferences of which some are organised by us. We value security, and therefore we have taken special security measures to prevent unauthorised access and enable high quality sharing of information between end users. This is also beneficial for OEMs as sensitive technical discussions are only accessible to real end users and not to third parties. The service contains groups for different types of gas turbine models to keep the

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discussion turbine specific. Each group has its own pages including an online discussion FORUM with different technical categories, complete plant database, conference page for conference information and registration, questionnaires and documents for important files like conference materials. The latest feature is a Quality Issues database. The aim of the database is to obtain metrics regarding quality incidents and identify fleet issues that can then be raised with the OEM concerned at an end user conference or on other occasions.

You organise also several end user conferences. How does this work?

We organises end user conferences, when end user groups ask us to do so. All conferences are organised in close cooperation with the group's steering committee and with OEMs. The GTUsers.com Web service can also be used as an information source for conference preparation, including tailored Web questionnaires, and we can plan conference agendas and technical topics to be discussed. All conference presentations are available for end users through the GTUsers.com Web service after the conference.

Join GTUsers.com

We welcome all gas turbine end users to join our service at www.gtusers.com. GTUsers.com currently hosts the following independent user groups: GE turbines: Frame 6FA, Frame 9FA/FB, Frame 9E, Frame 6B, LM6000, LM2500. Alstom turbines: GT26, GT13E2. Siemens turbines: SGT5-4000F (V94.3A), SGT5-2000E (V94.2). Rolls Royce turbines: RB211, Trent. If your gas turbine type is not listed, we can create a new group for it.

Users Groups News: LM2500 Database Available

GTUsers.com has now completed the set-up of an LM2500 database. If you are a LM2500 user and would like to fill in data in order to have access to the database, please contact GTUsers.com for registration to their platform (free of charge). You can also contact the ETN office for more information. ■

EU Policy News

Maximise cooperation opportunities to face the current market environment

Following four years of stability, oil prices fell abruptly in the second half of 2014. In June 2014, the price of Brent crude was around $115 per barrel and as of January 2015, it had fallen by more than half, down to $49 a barrel. The gas price has also fallen substantially during the last 4 months. The low oil and gas price, the rise in oil and gas supply, the diversification of the energy mix, and the decline in consumption have now changed the global energy landscape worldwide.

The weak European gas turbine market and a potentially prolonged period of low oil and gas prices is likely to have significant implications on the gas turbine industry, thus the importance of cooperation between the different stakeholders in order to cut costs and increase profitability.

At the upcoming ETN's Annual General Meeting in Dublin on 21 April, a panel discussion on how to maximize cooperation opportunities to face the current market environment will take place, with panelists coming from oil & gas and utility companies. At this meeting, cooperation opportunities that could contribute to cost cutting in the current market situation will be discussed with a focus on:

- coordinated information and prioritisation approach to identify the key technical issues and requirements from the user community,
- technical developments that can reduce cost of operations, increase lifetime and reduce price of spare parts,
- exchanging best practices & development of new standards to ensure the most reliable, safe and cost-efficient solutions,
- exploring cooperation that can reduce manufacturing cost like, additive manufacturing, sharing of equipment, demonstration facilities etc.,
- commonly pushing for fulfilment of the expected quality requirements,
- ensuring a high competiveness among suppliers and service providers,
- benchmarking,
- cooperation related to the submission of technical input related to EU legislation.

The European Commission publishes its strategy on an Energy Union

On 25 February, the European Commission (EC) published an Energy Union Strategy communication aiming to build an interconnected and competitive EU energy market that will solve Europe's pressing energy issues. The EC stated that the European Union has energy rules set at the European level, but that in practice it has 28 national regulatory frameworks, hence the need for this new strategy.

Divided into three long-established objectives, namely security of supply, sustainability and competitiveness, the strategy proposed by the EC focuses on five mutually supportive dimensions:

1) Energy security

As the EC shows in its Communication, the EU imports 53% of the energy it consumes, which makes it the largest energy importer in the world. Six Member States (Bulgaria, Estonia, Finland, Latvia, Lithuania and Slovakia) also depend on a single external supplier for their entire gas imports. The EC intends to explore new supply regions for fuels and new technologies, to further develop indigenous resources and to improve infrastructure to access new sources of supply. The EC will also develop a resilience and diversification package for gas, which will include a revision of the Security of Gas Supply regulation.

2) Internal energy market

In order to meet the current challenges of the electricity market, the EC proposes to enhance rules for cross-border energy trade and proposes measures to encourage renewable energy producers to better integrate in the wider electricity market. The EC will also consider how to strengthen the European energy regulatory framework so it can better govern the integrated European energy system and considers that EU-wide regulation of the single market should be strengthened through a significant reinforcement of the powers and independence of the Agency for the Cooperation of Energy Regulators (ACER).

3) Energy efficiency as a contribution to the moderation of energy demand

In October 2014, the European Council set an indicative target at the EU level of at least 27% for improving energy efficiency

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in 2030. The EC suggests carrying out a review of the Energy Efficiency by 2020, having in mind an EU level of 30% and to review the Energy Performance of Buildings Directives to create the right framework for further progress in delivering energy efficiency in buildings.

4) Emission Reductions

The domestic emission reduction target of at least 40% for 2030 compared to 1990 has been proposed by the EC and endorsed by EU leaders in October 2014. In order to achieve this, the EC stated that it would require emission reductions for the sectors in the carbon market (EU's Emission Trading System) of 43% and 30% for the non-ETS sectors compared to 2005 and to be achieved by 2030. This 40% target will also serve the EU as a basis for its input to the international negotiations on a new climate agreement in Paris in December 2015.

5) Research, innovation and competitiveness

The EC states that a vital contribution to the objectives of the Energy Union will come from the implementation of Horizon 2020, the EU Framework Programme for Research and Innovation.

Next Steps

The European Parliament and the European Council have started to discuss the proposal in their meeting in March. It was agreed in the European council that the construction of an Energy Union is one of Europe's top priorities for the next five years.

Many stakeholders have pointed out that the published communication does not outline a detailed plan to meet its objectives, nor does it mention any timetable.

Maroš Šefčovič, Vice President of Energy Union, European Commission has stated that the objective of the European Commission is to finalise a detailed Energy Union Strategy proposal by November 2015. ■

The European Parliament's vote on the Market Stability Reserve

On 22 January 2014, to make the EU Emission Trading Scheme (ETS) more robust, the European Commission (EC) has proposed to reform the system by establishing a Market Stability Reserve (MSR) at the beginning of the next ETS trading period in 2021. The reserve would both address the surplus of emission allowances that has built up in recent years and improve the system's resilience to major shocks by automatically adjusting the supply of allowances to be auctioned.

In a vote on 24 February, Members of the European Parliament's Environment Committee approved the dossier on the MSR for the EU ETS. They are requesting the implementation of the MSR by December 2018 at the latest – two years before the date proposed by the European Commission.

The mechanism would see excess allowances permanently removed from the scheme and placed into a reserve, if increases in the carbon price prove disproportionate. Members of Parliament were pleased with the outcome, as they believe this will correct the current malfunctioning of the EU ETS.

Furthermore, the correction of the EU ETS should also enhance the EU's position in the UNFCCC climate meeting in Paris in December 2015. Commissioner for Energy and Climate Action, Arias Cañete explained that the EU wants to pave the way in the international negotiations in Paris. An improvement of the EU ETS, the biggest greenhouse gas emissions trading scheme in the world, would help the EU become the leader it aspires to be. Negotiations with the Council on this dossier are due to start shortly. ■

Upcoming meetings and events

ETN Meeting/Event	Date	Location
User conference on 6FA engine *(organised by GTUsers.com)*	14-16 April 2015	Valencia, Spain
ETN Board Meeting*	21 April 2015	Dublin, Ireland
Annual General Meeting and Workshop*	21-22 April 2015	Dublin, Ireland
Turbine Forum 2015	22-24 April 2015	Nice, France
OMSoP Consortium Meeting*	27-28 April 2015	Rome, Italy
Exhaust Systems Meeting*	27-28 April 2015	Brussels, Belgium (location tbc)
Air Filtration Workshop*	6 May 2015	Brussels, Belgium
Micro Gas Turbine (MGT) Meeting*	11-12 May 2015	London, UK
European HRSG Forum	11-13 May 2015	Munich, Germany
Power-Gen Europe *(ETN members are entitled to a special discount)*	9-11 June 2015	Amsterdam, The Netherlands
ASME Turbo Expo *(ETN members are entitled to a special discount)*	15-19 June 2015	Montreal, Canada
EU Sustainable Energy Week	15-19 June 2015	Brussels, Belgium
Combined Heat and Power (CHP) Course	22 June 2015	Cranfield, UK
ETN Board Meeting*	1 July 2015	Brussels, Belgium
IAGT 2015 Symposium	19-21 October 2015	Banff, Canada
ETN October Workshop*	21-22 October 2015	Location to be announced
International Gas Turbine Congress *(ETN members are entitled to a special discount)*	15-20 November 2015	Tokyo, Japan
ETN Project Board and TC Chairs Meeting*	26-27 November 2015	Brussels, Belgium

** Event open exclusively to ETN members*

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