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. Through the co-operative 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.



Christer Björkqvist Managing Director

FUTURE

TECHNOLOG

S TURBINE

The roadmap for a decarbonised Europe by 2050

For 2050, EU leaders have endorsed the objective of reducing Europe's greenhouse gas emissions by 80-95% compared to 1990 levels. Energy decarbonisation is one of the biggest challenges Europe is confronted with today. On one hand we are fighting against climate change and on the other hand, Europe's economic competitiveness fully depends on flexible and reliable energy supplies at affordable prices.

How the power generation market is going to develop in the future depends to a great extent on how investment

risks are reduced in terms of policy frameworks and incentives for technical developments and demonstrations.

The Energy Roadmap 2050, published in 2011, aims to address these issues by outlining different scenarios for reaching an 80% emission reduction compared to 1990. The purpose of the roadmap is not to support one pathway over another, but rather to identify common elements that are required to trigger long-term investments to achieve decarbonisation of the EU energy system. Thus the Energy Roadmap 2050 should be seen as an open platform that provides all stakeholders the opportunity to debate on the most feasible way forward.

The next step for the European Commission in the upcoming year is to find an agreement on milestones, incentive programmes and the policy framework for 2030. This is vital given that the industry needs clear directions and a level playing field to commit to the required investments.

European Commissioner for Energy, Günther Oettinger, stated in September that "transformation of the energy system is technically and economically feasible – if we make the right choices".

It is therefore important that the gas turbine industry not sit back and hope for the right decisions to be taken, but actively participate in this debate. I believe that the upcoming ETN dinner debate in the European Parliament, as well as the "6th International Gas Turbine Conference - The Future of Gas Turbine Technology" will contribute to the debate and final proposal by highlighting the key role of the gas turbine industry, as well as its requirements for a future successful market position.

I am pleased to announce that our programme for the IGTC-12 has now been finalised and can be downloaded on the ETN's conference website. I can assure that it will be an event worthwhile attending with many interesting presentation and panel discussions as well as excellent networking opportunities. I look forward to welcome you to the conference.

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Registration for the International Gas Turbine Conference 2012 is still possible. To view the programme and to register please <u>*click here*</u>.

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6th International Gas Turbine Conference The Future of Gas Turbine Technology

(Brussels 17-18 October 2012):

The European Turbine Network is proud to invite you to this year's International Gas Turbine Conference – The Future of Gas Turbine Technology (IGTC-12).

This is a biennial conference, which in 2010 welcomed 175 gas turbine professionals from 27 different countries, from Europe, America, the Middle East, Japan and India, will be held on 17-18 October 2012 in Brussels, Belgium.

IGTC-12 will focus on commence with keynote sessions discussing the political, market and technical short and longer term outlook for the gas turbine industry. Keynote speakers will include high-level political representatives from the European Commission, the American Department of Energy and the International Energy Agency.

Once the keynote sessions have outlined the policy and commercial expectations of the future, there will be parallel sessions discussing gas turbine technologies of tomorrow. There will be review sessions on:

- Flexible operation & fuel flexibility
- Plant & system integration
- Conditions based maintenance for gas turbines
- Core gas turbine engine component and process innovation

As well as technical sessions on:

- Advanced sensors & controls
- Materials
- Combustion
- Turbomachinery & system analysis

The Conference strives for optimal networking opportunities, by limiting the number of participants to 180, and through a small EXPO to showcase some important suppliers in the gas turbine industry.

For more information, and to register, please *click here*.

We look forward to welcoming you at the International Gas Turbine Conference in October 2012!

Speakers at IGTC-12

We are pleased to announce the following high-level speakers:

- Philip Lowe (European Commission)
- Bernard Quoix (Total, ETN President)
- Catherine Goy (E.ON, ETN Vice President)
- Steve Heinen (International Energy Agency)
- Robert Steele (Electric Power Research Institute)
- Sauro Pasini (Enel)
- Heikki Oltedal (Statoil)
- Ichiro Fukue (Mitsubishi Heavy Industries)
- Michael Ladwig (Alstom)
- Dirk Goldschmidt (Siemens)
- Manfred Aigner (DLR)
- Matthias Oeschner (TU Darmstadt)
- Mark Johnston (WWF)
- Wolfram Münch (EnBW)
- Tomás Alvarez (Endesa Generacion)
- Chaoonsooi Tan (MIT)
- Jean-Louis Vignolo (General Electric)
- Dick Tuthill (Pratt & Whitney)
- Colin Etheridge (Solar Turbines)

Feedback from the 5th International Gas Turbine Conference in 2010

I thought the conference was an excellent event and certainly provided food for thought.

Andy Williams, VP Engineering Wood Group GTS

Looking forward for the next conference in two years.

Dr. Michael Flouros, MTU Aero Engines GmbH

Congratulations on a very successful event; well done! Junior Isles, Editor-in-Chief,The Energy Industry Times

Thanks for a well-organised and interesting conference. It was great to meet so many new and interesting people.

Simon Raymond, Volvo Aero Corporation

Sincerely thank you for the perfect organization of IGTC 2010.

Bernard Quoix, Total

The conference was one of the best organized I have ever visited, thank you.

Petr Krejčí, CEZ

I thoroughly enjoyed the atmosphere and the presentations and networking. One of the great advantages of this event is that it's all in one place and there is no need for people to 'escape' elsewhere e.g. for accommodation or dinners, so it's a great opportunity for networking and getting to know each other.

Thanks again for a great event.

Stefan Geisse, STF Energy

It has been a very pleasant, lively and rich congress! See you in 2012!

Michel Moliere, GE

It was my pleasure to chair the session at the recent conference. This year's conference I particularly found the EU member debate interesting and the brain storming session by Peter Childs very useful, and of course the presentations, networking opportunities and last but not least the quality of the chocolate cakes!

Chris Dagnall, Cogsys Limited

You can still register for the IGTC-12!

The available spaces are almost filled, so if you wish to attend please register today by *clicking here*. Please note that this is a particularly busy period in Brussels, so we recommend that you book hotel accommodation as soon as possible.

THE FUTURE OF GAS TURBINE TECHNOLOGY

6TH INTERNATIONAL GAS TURBINE CONFERENCE

17-18 October 2012 • Brussels, Belgium

GOLD SPONSOR SILVER SPONSORS MTU GE Oil & Gas SIEMENS camfil VATTENFALL COOPERATING SOCIETIES AND PROJECTS CONFERENCE EXHIBITORS Wood Group GTS C Polytec MEGGITT H IGCC POWER-GEN MEDIA PARTNERS THE ENERGY INDUSTRY Gas to Power TURBO EXPO GAS TURBINE TECHNOLO World

Conference proceedings from ETN's biennial International Gas Turbine Conference are available for purchase. For more information please contact the ETN Office.



SPECIAL for ETN Members – You are eligible for the discounted ASME Member rate!

Workshops and Webinars

Training workshops and Webinars are available to meet the needs of turbomachinery industry professionals.

Technical Papers-Access to the Best in Turbine Technology

IGTI's archive houses a unique and extensive collection of published gas turbine and related research. Technical paper reprints dating from 1956 to the most recent TURBO EXPO are available for purchase.

Self-Directed Study Courses:

- The Design of Gas Turbine Engines -Thermodynamics & Aerodynamics, 2nd Edition
- Gas Turbine Applications & Economics
- Basic Gas Turbine Engine Technology Online Self-Study Course 3rd Edition

Books

The History of Aircraft Gas Turbine Engine Development in the United States: A Tradition of Excellence, Hardcover - This absorbing, anecdotal history of gas turbine aircraft engine development in the United States was ten years in the making.

For more details on all IGTI Publications, visit: http://igti.asme. org/Publications/IGTI_Products_Store.cfm

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POWER-GEN FLOWING 4 - 6 June 201 EUROPE 4 - 6 June 201 Messe Wien, Vienna, Austri

MAJOR DISCOUNTS FOR ETN MEMBERS ON POWER-GEN EUROPE CONFERENCE PROCEEDINGS AND FULL DELEGATE RATES

Offer ends 31 October 2012

Europe's largest event dedicated to electric power generation, POWER-GEN Europe comes to Vienna in June 2013. Over three days the POWER-GEN Europe exhibition and multi-track conference will feature the cream of the power industry in one central location demonstrating and sharing the latest innovations in their respective fields.

SAVE 15% ON THE 2012 CONFERENCE PROCEEDINGS

To provide a flavour of the forthcoming POWER-GEN Europe conference and in recognition of the European Turbine Network's support, PennWell is pleased to offer ETN members the opportunity to purchase the 2012 conference proceedings at a worthwhile discount.

Please contact the ETN office for the promotional code.

For information on exhibiting and sponsorship opportunities at POWER-GEN Europe in Vienna please visit www.powergeneurope.com

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Reflections on an Expert Panel of ASME Turbo EXPO 2012

Powerplant Modelling to Support Environmental, Operational and Economic Decisions

By Pericles Pilidis, ETN Board Member Head of Department of Power & Propulsion School of Engineering, Cranfield University, UK

The American Society of Mechanical Engineers (ASME) invited the author as a member of the Cycle Innovations Committee to co-organise, with the Aircraft Engine Committee, an expert panel on the topic of the importance of the use of simulation to influence the technical, economic and environmental choices that engineers make. The panel was co-chaired by Andrew Nix representing the Aircraft Engine Committee and the author representing the Cycle Innovations Committee. There were eight panellists representing a wide range of countries, disciplines and organisations. The panellists were chosen because of their expertise in simulation, or because they are senior staffs who use simulation results to support management decisions. They included:

- M. Goulain Clean Sky Project (EU)
- H. Hönen European Turbine Network (EU)
- C. Meher-Homji Bechtel and ASME Fellow (US)
- V. Pachidis Cranfield University (UK)
- J. Feng AVIC (China)
- R. Del Rosario NASA (US)
- G. Tsatsaronis TU Berlin (Germany)
- S. Yang Kari (S. Korea)

The general consensus was that simulation offers great benefits in all the facets of the life cycle of a gas turbine engine. Three broad areas of attention emerged. These were, the importance of validation, the need for continuous development, the need for education to enable good interpretation.

The importance of validation:

The great benefits of simulation can only be accrued if those that use it have confidence in the results provided by the algorithms. This requires comprehensive evaluation exercises where the simulations are validated against a range of benchmark results or known cases and match the outcomes. These validation exercises need to be representative in terms of circumstances and complexity to give the right level of confidence.

Simulation techniques can be used in clarification and predictive modes. In the clarification role, simulation is used to highlight details that perhaps could not be achieved by experimentation or this would be expensive or impractical. In this case validation of the system under investigation is needed at some scale to give confidence in the particular aspect being examined. In the predictive mode validation is needed in relation to systems as similar as possible to the concepts being examined to reduce the uncertainties of the prediction.

The need for continuous development:

The gas turbine industry continuously makes large investments in technology, to achieve more powerful, more efficient and more environmentally friendly gas turbines. Improvements are expected to continue in the future culminating in novel cycles, new and advanced components and improvements in equipment and processes. Simulation tools have to follow these developments with better interpretation of physical processes, more faithful representation of components and their interactions and the ability to model a wider range of novel and complex power plants.

The panel gave ample evidence that industry and academia, and specialist organisations are working together towards these objectives. The improvements are taking place at many levels, offering more detailed results and the ability to link models for interdisciplinary simulations.

Organisational collaboration is a very useful ingredient in simulation development. It offers a sound representation of the physical processes through theoretical rigour and applicability to key industrial issues.

The need for education:

The benefit of simulation is accrued when appropriate models are used and a proper interpretation of the results is carried out. Both require very specialised skills. Model developers need the physical, engineering and mathematical background to be able to offer good representations of relevant problems in a mathematically appropriate way. They can be individuals or teams. Engineering skills encompass both the characteristics of the application and the IT knowledge needed to apply algorithms through hardware.

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Reflections on an Expert Panel of ASME Turbo EXPO 2012

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The fruit of the simulation is through a proper interpretation of the results. The recipients of simulation outputs require a deep understanding of the problem at hand plus a clear perception of the strengths, weaknesses and the range of validity of the algorithms being deployed. With the increasing power of computer hardware more detailed and complex models are being developed. So the challenge of educating to the appropriate level the developers of algorithms and the recipients of the outputs becomes deeper.

Conclusion

There was widespread agreement of the extensive added value that simulation could add to engineering decisions within a commercial and environmental context. There were some pre-conditions, in particular confidence in the results and their correct interpretation; associated with the development and use of modelling methods. To deal in a satisfactory manner with these preconditions, a solid base is needed. This base can be fostered through appropriate fora that enable a close and collaborative dialogue between the stakeholders. These include model developers, government and certification agencies, manufacturers and users of gas turbine equipment. This dialogue is already taking place and it must continue to be effective to secure the fruits of the deployment of advanced simulation techniques. In this context the contribution of fora that bring these communities together is very large.

Acknowledgements

I wish to thank Professor Dilip Ballal, Chairman, Board of Directors of ASME International Gas Turbine Institute and von Ohain Professor in the University of Dayton for recommending the organisation of this panel. I am also grateful to Dr Andrew Nix of West Virginia University for co-organising and co-chairing the panel and to. Christer Björkqvist Managing Director of the European Turbine Network - ETN for suggesting the preparation of this paper.

ETN members can receive the full report (free of charge) by contacting the ETN Office.



Onera (France)



Two ETN project proposals have received the initial positive evaluation by the European Commission (EC). Both projects focus on hybridization of gas turbines with Concentrated Solar Power, one addresses microturbines and the other larger applications

The Sussex University led Optimised Microturbine Solar Power system (OMSoP) Project, which aims to provide and demonstrate technical solutions for the use of state-of-the-art concentrated solar power system coupled to micro-gas turbines to produce electricity, has been approved by the European Commission to proceed to negotiations. This is a 4-year project, with a proposed budget of 5.5 million euro (EU funding 3,9 million euro).

The ETN led Hybrid Gas Turbines for the Efficient Use of Concentrated Solar Energy (HYCOSOL) Project aims to provide and demonstrate technical solutions which will allow the efficient use of concentrated solar energy through the use of a 50 MW hybrid solar gas turbine power plants. The project is proposed to run for 3 years, with a budget of 10.5 million (EU funding 7.2 million euro). Although the project proposal was positively evaluated by the EC, it is now on a waiting list, due to EC budget constraints.



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