

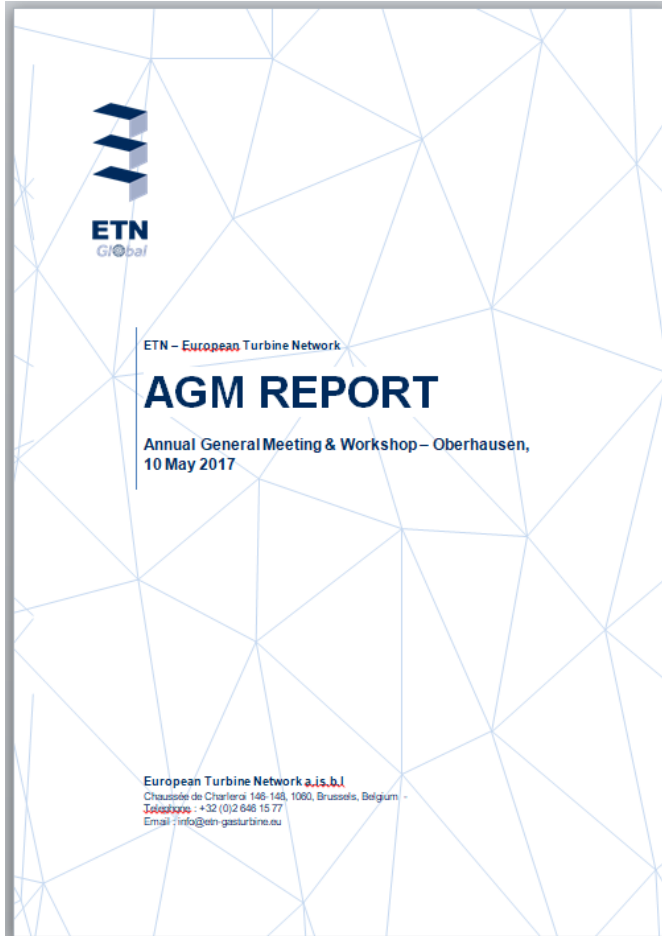


Welcome to ETN's 14th Annual General Meeting & Workshop

14-15 March 2018
Bucharest, Romania



Approval of the AGM-2017 Meeting report



Activity and strategy report

Annual General Meeting, 14 March 2018



ETN
Global



Christer Björkqvist
Managing Director
ETN Global



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The Board of Directors 2016-2018



Bernard Quoix



Catherine Goy



Niko Cornelis



Robert Rijsdijk -2016
Adri Postema 2017



Thomas Volks



Andy Williams



Gary Lock



Giovanni Cerri



Herwart Hoenen



Pericles Pilidis

Project Board

2016-2018



■ **Peter Jansohn** (chair)
Paul Scherrer Institute (PSI)
Switzerland

Technical areas:
fuel flexibility, emissions



■ **Peter Breuhaus**
International Research Institute
Stavanger (IRIS)
Norway

Technical areas:
condition monitoring, advanced cycles



■ **Dominique Orhon**
Total
France

Technical areas:
Turbomachinery, oil and gas
operations



■ **John Oakey**
Cranfield University
UK

Technical areas:
materials, CO₂ mitigation/CCS



■ **Nicola Rossi**
Enel
Italy

Technical areas:
Power Plants efficiency and flexibility



■ **Abdulnaser Sayma**
City, University of London
UK

Technical areas:
operational flexibility, efficiency



■ **Mark George**
Cullum Detuners Limited
UK

Technical areas:
Turbomachinery, noise control,
filtration, emissions reduction



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IGTC-18 Conference Advisory Board

CAB

- ❖ Rob Bastiaans, TU/e
- ❖ Pablo Bellocq, Total
- ❖ Roger Brandwood, Uniper
- ❖ Fausto Carlevaro, BHGE
- ❖ Catherine Goy, Uniper
- ❖ Peter Kutne, DLR
- ❖ Richard Marsh, Cardiff University
- ❖ Jean-Louis Meyer, EDF
- ❖ John Oakey, Cranfield University
- ❖ Nicola Rossi, Enel
- ❖ David Sánchez, University of Seville
- ❖ Jan Slagter, VBR Turbine Partners

Reviewers

- ❖ Peter Breuhaus, IRIS
- ❖ Federico Cernuschi, RSE
- ❖ Magnus Genrup, Lund University
- ❖ Jean-Pierre Keustermans, Engie Laborelec
- ❖ Jacques Maunand, ETN Emeritus Club Member
- ❖ Ward De Paepe, University of Mons
- ❖ Hatem Rashad, ADGAS



ETN Global 2018



Coverage: Gas Turbine and Turbomachinery Technology

110 member organisations

**23 countries: Europe, Middle East
Asia, North America**

**+700 persons from our member companies are
following/involved in ETN activities**

International Cooperation with associations from Japan (GTSJ);
USA (DOE, GTA and ASME); Canada (IAGT), China (NRC-GT,
Nexturbine); UAE (ME Rotating Machinery Technology &
Innovation conf.)

12 new members since last AGM



Members in 2018

110

ACTE (Belgium)
Ahlstrom-Munksjö (Finland)
AkerBP (Norway)
AST Turbo (Switzerland)
Aurelia Turbines (Finland)
BP (United Kingdom)
Capstone Turbine (USA)
CERTH (Greece)
FAIST (Germany)
HiETA Technologies (United Kingdom)
Mälardalen University (Sweden)
TNB (Malaysia)

Key focus from the power generation user community

Decarbonisation



Digitalisation



Decentralisation

Key focus from the oil & gas community

Low carbon operations



Digitalisation



RAM (CAPEX and OPEX)



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The Energy Union

« To ensure that Europe has secure, affordable and climate-friendly energy »

One of the 10 priorities of the EC 2014-2019

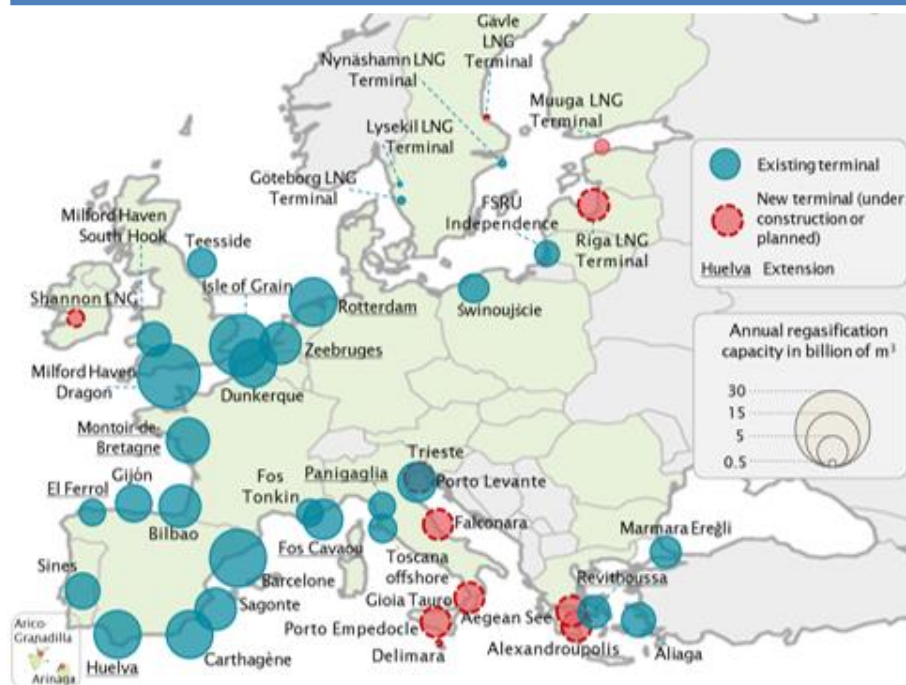
5 dimensions

- Energy security
- Energy efficiency
- Energy market
- Climate action: decarbonising economy
- Research, innovation and competitiveness
 - **Strategic Energy Technology Plan SET-Plan**



Natural Gas and LNG Outlook increasing security of supply

LNG import terminals in Europe –Existing and planned



Source : GIICNL (2017), CLE (2016)

Pipeline NG Supply Routes



Clean Energy Package

10 aspects of the Energy Union addressed

- ❖ 8 legislative proposals
- ❖ 1200 pages
- ❖ 9 to 24 months of work?
- ❖ Started in 2017

*“the proposal aspires to score a hat-trick on the three goals of achieving **global leadership in renewables**, putting **energy efficiency** first and **giving a fair deal to consumers**”.*

Vice-President Maroš Šefčovič



Clean Energy Package

Content of importance to our industry

- ❖ **Unify the European electricity market**
 - Storage solutions needed? Power to gas, etc.
 - State aid for emergency power plants
 - Pushing coal out
- ❖ **Further integration of renewables**
 - 2030 target: 27% - EP calls for 35%
- ❖ **Energy efficiency**
 - +1% gain = 2,6% reduction on gas importation
- ❖ **Energy efficiency of buildings**
 - Heating and cooling
 - Micro gas turbine technology



Clean Energy negotiations

2030 Framework for Climate and Energy



Research and Innovation

ETN involvement in the EU Energy and Research Roadmap to a low carbon economy

❖ Active involvement in EU Technology and Innovation Platforms (ETIP)

- Renewable Heating and Cooling Platform - RHC
- Smart Networks for Energy Transition – SNET



❖ ETN provided comments and input to the Strategic Energy Technology Plan – SET-Plan

- Action 4 – Energy systems
- Action 5 – Energy efficiency in buildings
- Action 6 – Energy efficiency in industry
- Action 9 – CCUS



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European Technology and Innovation Platform “Smart Networks for Energy Transition”



ETIP-SNET Governing Board: ETN representative:

❖ Sigrid Gijbels (ENGiE)

Working Groups



WG1

Reliable, economic and efficient smart grid system



WG2

Storage technologies and sector interfaces



WG3

Flexible Generation



WG4

Digitisation of the electricity system and Customer participation



WG5

Innovation implementation in the business environment



NSCG

NATIONAL STAKEHOLDERS COORDINATION GROUP

ETN representatives in ETIP-SNET

WG3 Flexible Generation

- Peter Breuhaus (IRIS)
- Peter Jansohn (PSI)
- Iarno Brunetti (ENEL)

ETIP SNET Implementation Plan 2017-220

- Topic 33 - Developing the next generation of flexible thermal power generation
- Topic 34 - Adaptation and improvement of technologies to novel Power-to-Gas and Power-to-Liquid concepts

European Technology and Innovation Platform “Renewable Heating and Cooling”

ETN ETIP RHC representative in the Biomass Panel

❖ Peter Kutne (DLR)



ETN activities 2017-18

- ❖ Provided comments on the Biomass Technology Roadmap
- ❖ Provided comments on the Strategic Research Priorities for Solar Thermal Technology



Activities and Projects 2017-2018



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Meetings 2017-2018

since the AGM 2017



- ❖ High Level User meeting: 3 October 2017, Genoa, Italy
- ❖ Engine specific user Groups meetings: SGT-A35, LM2500
- ❖ October Workshop: 4-5 October 2017, Genoa, Italy
- ❖ IGTC-18 CAB meetings: 4 October and 24 January 2018, Brussels, Belgium
- ❖ Board Meetings: 6 July, 24 Oct, 19 Dec, 21 February 2018
- ❖ Project Board & TC Chair meeting: 23 January 2018, Brussels, Belgium
- ❖ Individual project meetings: Air Filtration, MGT, OMSoP, Bearing project, Hot Corrosion
- ❖ External Cooperation Conferences: NexTurbine, China; ASME IGTI, US; ME Rotating Equipment Conference, Dubai; AIGT, Canada

High Level User Meetings

3 October 2017, University of Genoa

Yearly strategic meeting for coordination of priorities and to review progress



Discussions

- ❖ Topics of strategic importance
 - Operational issues and needs for the current fleets
 - requirements for the next generation GT fleets
- ❖ Strategy to address issues of common interest and focus on the most relevant engines for the ETN user community

Engine-specific User Groups

Objectives:

- ❖ Collect and select the most critical technical issues
- ❖ Exchange experiences among the users
- ❖ Trigger dedicated responses from OEM's, ISP's and R&D community
- ❖ Identify generic issues to be discussed in technical committees to follow up on and explore potential solutions
- ❖ Explore opportunities for standardisation and best practise
- ❖ Define potential needs for educational courses



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User Group Meetings



Sitges (Barcelona) Spain,
26-27 April 2018

Issue collection (in progress)

- Reminder
- Teleconference call

SGT-A35, Sitges, 26-27 April 2018

- Reports from the issues
- Minutes



Steering committee Florence 31 January 2018

- Sort the issues
- Issues send to Siemens and ISPs
- Siemens' and ISPs answers to Users

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LM2500 UGM 2018, Berlin, 20-21 June 2018

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Berlin, Germany,
20-21 June 2018

INDUSTRIAL RB211 USER GROUP 2017 MEETING

**Now
SGT-A35**

Attendance

- ❖ 21 Users Representatives
- ❖ 14 Users Companies
- ❖ RWG
- ❖ TCT
- ❖ Siemens

Content Wise

- ❖ 45+ issues in database
- ❖ Answers from Siemens, TCT and RWG to the issues
- ❖ 14 main issues discussed
- ❖ Questions Users to Users
- ❖ Questions to Siemens
- ❖ Questions to RWG & TCT



LM2500 USER GROUP 2017 MEETING

Attendance:

- ❖ 19 Users Representatives
- ❖ 11 Users Companies
- ❖ BHGE
- ❖ United Service Sweden
- ❖ VBR Turbine Partners
- ❖ MTU

Content Wise

- ✓ 70+ issues in database
- ✓ Answers from GE
- ✓ 10 main issues discussed
- ✓ individual reports for each top issue
- ✓ Questions from Users to GE



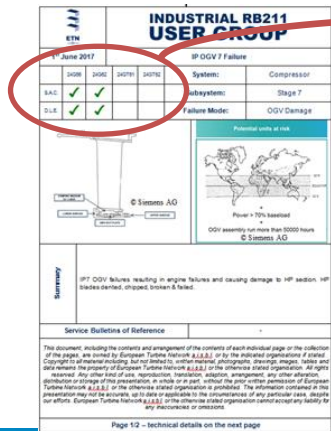
INDUSTRIAL RB211 USER GROUP 2017 MEETING



Issue database and summary report of top issues: Review and updated.

New:

- June 2017: Specific detailed reports for each top issue with pictures /drawings for LM2500 User Group
- July 2017: reports for SGT-A30-35 also available



	24G56	24G62	24GT61	24GT62
S.A.C.	✓	✓		
D.L.E.	✓	✓		



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October Workshop 2017

- ❖ **4-5 October 2017 in Genoa, Italy, hosted by Ansaldo Energia**
- ❖ **120 participants**
- ❖ **Several side meetings:**
 - High Level User meeting, hosted by University of Genoa
 - IGTC-18 Conference Advisory Board meeting
 - Micro Gas Turbine standardisation meeting
 - ETN-UK-US Department of Energy collaboration meeting
 - Air Filtration Working Group meeting



ETN's Industrial Emission Directive (IED) Committee

❖ IED Forum Member

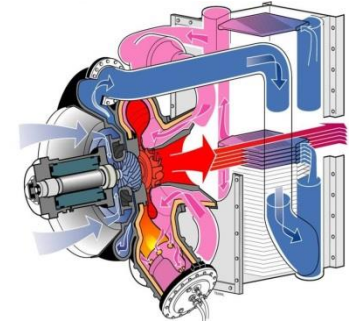
ETN is a recognised member of the IED Forum and a collection point for inputs from the User Community

- **Large Combustion Plant Directive BREF**
- **Medium Combustion Plant Directive**

❖ CEN Sector Forum Gas Working Group on Gas Quality

ETN is monitoring developments within the CEN Sector Forum Gas WG on gas quality (SFGas WG GQS)

Micro Gas Turbine Working Group



Objectives

- ❖ **Explore markets opportunities and solutions;**
- ❖ **Implement cooperation projects** in order to reduce cost and increase the Technology Readiness Level (TRL) of individual components and systems;
- ❖ Set-up conferences and workshops to **facilitate cooperation** in both horizontal and vertical projects;
- ❖ **Pave the way for funding opportunities** by highlighting the importance of the MGT technology development, contributing to the achievement of the 2030 climate and energy targets set by the European Commission.

Activities

- ❖ MGT Technology Summary
- ❖ ISO 19372 - Microturbines applications – Safety

Technology Summary
Micro Gas Turbine

Micro Gas Turbine
Technology
Research and
Development
for European
Collaboration

Technology Summary

EUROPEAN
TURBINE
NETWORK

Preparations for IGTC-18 Call for Papers

Submitted abstracts in total: 69

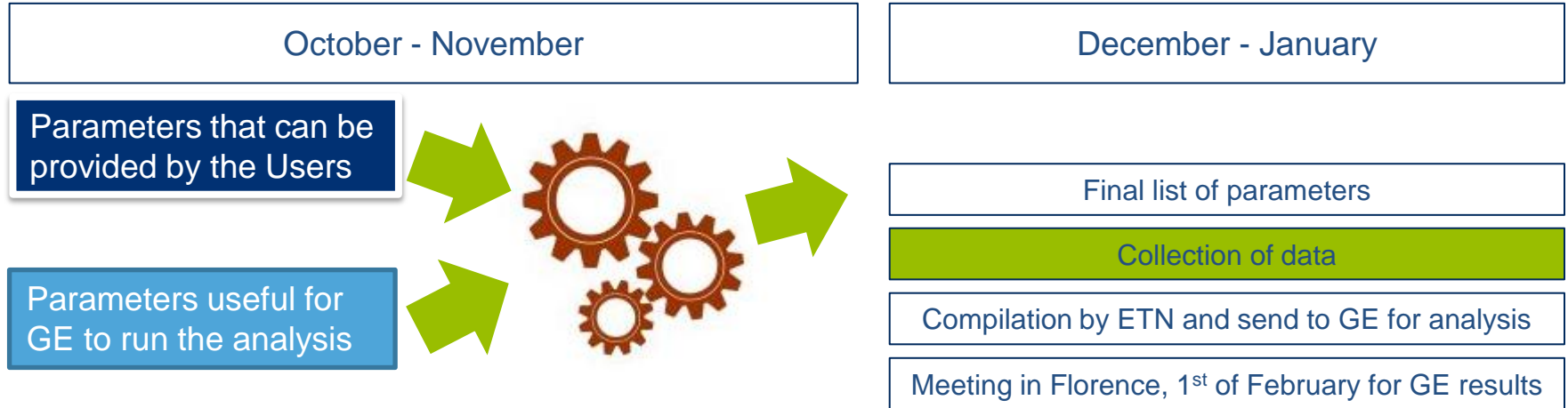
- a) Operations & Maintenance: 28
- b) Manufacturing and Repair: 5
- c) New Component Developments: 20
- d) Next Generation Technologies: 16

→ 30 abstracts were selected

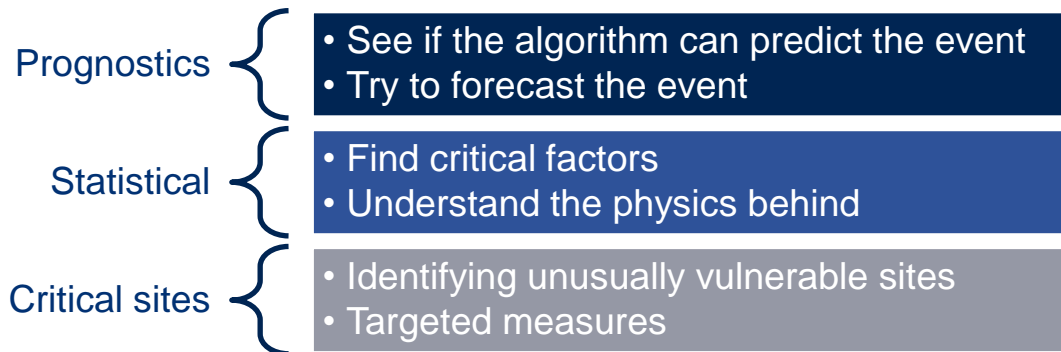


IGTC
International
Gas Turbine Conference

LM2500 Bearing project



GE Analysis: 3 types





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Air Filtration Project



Objectives

Improvements of quality and flexibility of Air Filtration system

26 organisations

ETN liaison member of the ISO/TC142

- ❖ Comments on ISO 29461 - Particulate Air Filters intake systems for rotary machinery
- ❖ Drafting of a “Water/Salt test procedure for Gas Turbine/Compressor Air Inlet Filter Systems” to be part of ISO 29461

Testing activities:

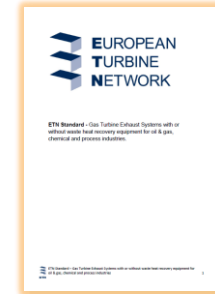
- ❖ To evaluate the aging effect of the filters
- ❖ To evaluate the performance of the single filter in a multi-stage system
- ❖ To perform an independent air filtration test on a model scale test rig to test filters in close-to-real GT operation conditions



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Exhaust System – WHRES Project

- ❖ 19 organisations
- ❖ ETN liaison member of ISO/TC192
- ❖ ETN WHRES standard submitted to ISO/TC192 in February 2016



Activities

- ❖ New Work Item in ISO/TC 192 to draft an ISO standard scheduled to be published in 2019.
- ❖ 3 ETN members actively involved in the ISO/TC 192 Working Group
- ❖ ETN Exhaust System WG members will be involved to submit comments on the draft ISO standard.

The OMSOP Project

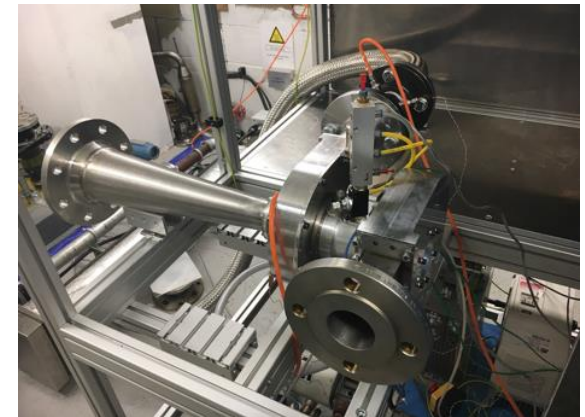
Optimised Micro Turbine Solar Power

Completed in Autumn 2017



Demonstration of concentrated solar power technology using a parabolic dish system powering a micro-gas turbine

Demo facilities still operational at ENEA's facilities in Rome Italy



Dissemination Activities by ETN

- ❖ OMSoP website
 - ✓ Regularly Updated Public Website
 - ✓ Members-Only SharePoint

- ❖ Printed Publications
 - ✓ Project Leaflet
 - ✓ Banner
 - ✓ Demonstration Site Poster
 - ✓ Two page project Update

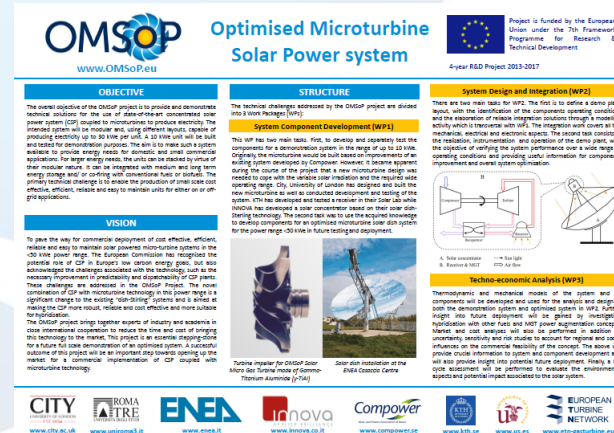
- ❖ Electronic Updates

- ❖ Press releases

- ❖ Article in Industry Magazines

- ❖ Meetings and events

- ❖ OMSoP video





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PUMP-HEAT



Objective

Demonstration of an innovative concept based on the coupling of a fast-cycling highly efficient heat pump (HP) with Combined Cycles.

The integrated system features thermal storage and advanced control concept for smart scheduling.



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NEXTOWER

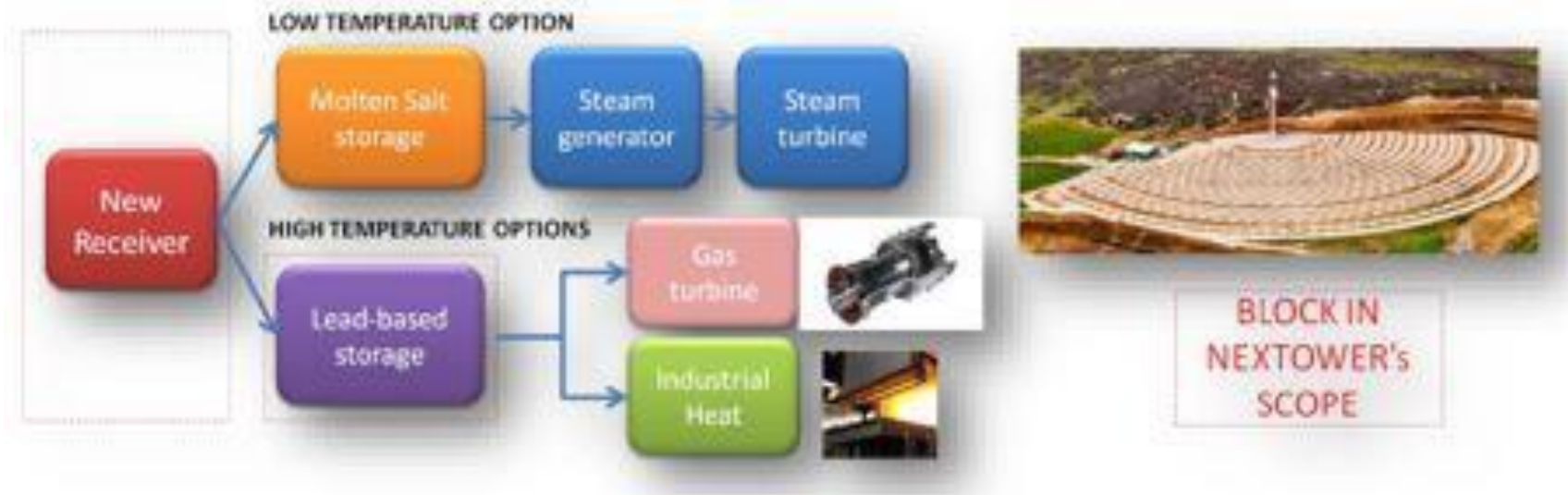


projects



Objective

Demonstration of high-performance durable materials for the next generation of concentrated solar power (CSP) air-based tower systems, making them commercially competitive in the energy market beyond 2020.





Hot Corrosion Project



Objective

The objective is to run gas turbine at their expected life duration with sour gas containing Hydrogen Sulphide in salty environment.

Main GT Users' costs due to hot corrosion on hot gas path components:

- Gas treatment equipment
- Down time inducing production losses overhauls
- Numerous additional spare parts
- Logistic cost

Collection of parts

Survey 1:
Find Users with Hot Corrosion issues

Survey 2:
Collection of details on their issues
(Type of engine, Location, fuel,...)

Hot Corrosion meeting (AGM)

Analysis of the damaged parts

Investigation for solutions

Cooperation Conferences

Middle East Rotating Machinery Technology & Innovation
10-12 October 2017, Dubai UAE



Bernard Quoix, ETN President delivered a keynote opening speech and highlighted:

- Most important topics for rotating machinery in the Oil & Gas and power generation industry.
- Key requirements in terms of technology and innovation.
- ETN and our activities, and invited the local user community to join our Network.





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Cooperation Conferences

NexTurbine 2017
17-18 May 2017, Wuxi, China



- ❖ ETN keynote speech
- ❖ ETN stand at the conference
- ❖ Opportunity to connect with the Chinese user community and to explain about ETN's activities



Cooperation Conferences

ASME Turbo Expo, 26-30 June 2017

 TURBO EXPO Turbomachinery Technical Conference & Exposition	 POWER & ENERGY Conference & Exhibition	 ICOPE International Conference on Power Engineering  
CONFERENCE JUNE 26–30, 2017	EXHIBITION JUNE 27–29, 2017	Charlotte Convention Center, Charlotte, NC, USA

IAGT Symposium 2017

23-25 October 2017



IAGT 17
SYMPOSIUM

Gas Turbine Systems –
Powering a Cleaner Future

Fairmont Banff Springs Hotel
Banff, Alberta • Oct 23- 25, 2017

ETN Best Practise Award

- ❖ Opportunity for members to improve their expertise through interactions with other peers.
- ❖ Starting with two major areas
 - ✓ EHS: Environment, Health and Safety
 - ✓ Workforce development
- ❖ Award and recognition to the winners



Communications

New www.etn.global website

- ❖ Main communications platform and database for member information
- ❖ New feature: event registration

Social media

- ❖ ETN accounts on Twitter ([@etngasturbine](https://twitter.com/etngasturbine)) and LinkedIn (ETN – European Turbine Network)

ETN publications

- ❖ Monthly News Summary: distributed internally to ETN members every month
- ❖ Quarterly Newsletter: sent to more than 1500 contacts (members and external contacts) four times a year



Upcoming Meetings



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User Group Meetings



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NexTurbine 2018

“Fight a good fight, for the blue-sky”

The 7th Annual Summit

24-25 May 2018

Crown Plaza in Kunshan, Jiangsu, China

23rd (PM) Inlet Air Filtration & Cooling Workshop
24th Plenary
25th GT O&M Track || Gas-powered DE Track || GT R&D Track



20 Exhibitors

54 Speakers

Middle East RoTIC

“Achieving Asset Integrity & Reliability Excellence”



2nd Annual
MIDDLE EAST ROTATING MACHINERY
TECHNOLOGY AND INNOVATION
CONFERENCE & SHOWCASE

25-27 September 2018

Dubai, United Arab Emirates

Call for papers open

26 Exhibitors

Registrations open (by invitation only)

IGTC-18

“The Future of Gas Turbine Technology”

The 9th International Gas Turbine Conference

10-11 October 2018,

Le Plaza Hotel in Brussels, Belgium



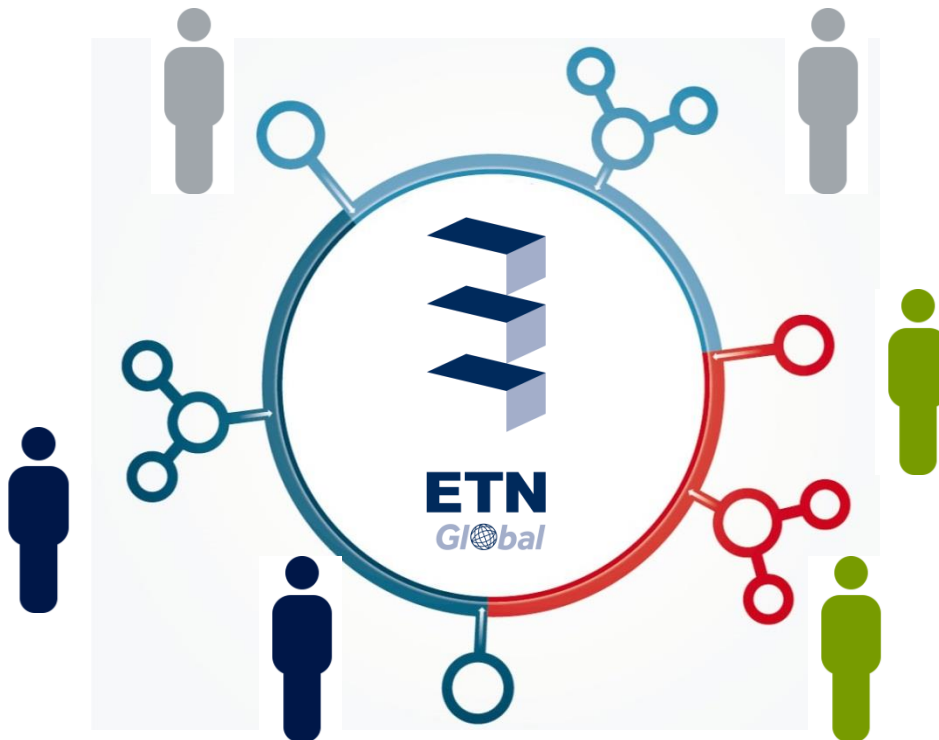
4 keynote sessions: speakers from the European Commission, International Energy Agency, US DoE

6 technical sessions: 30 technical papers to be presented

Registrations will open 1 May 2018

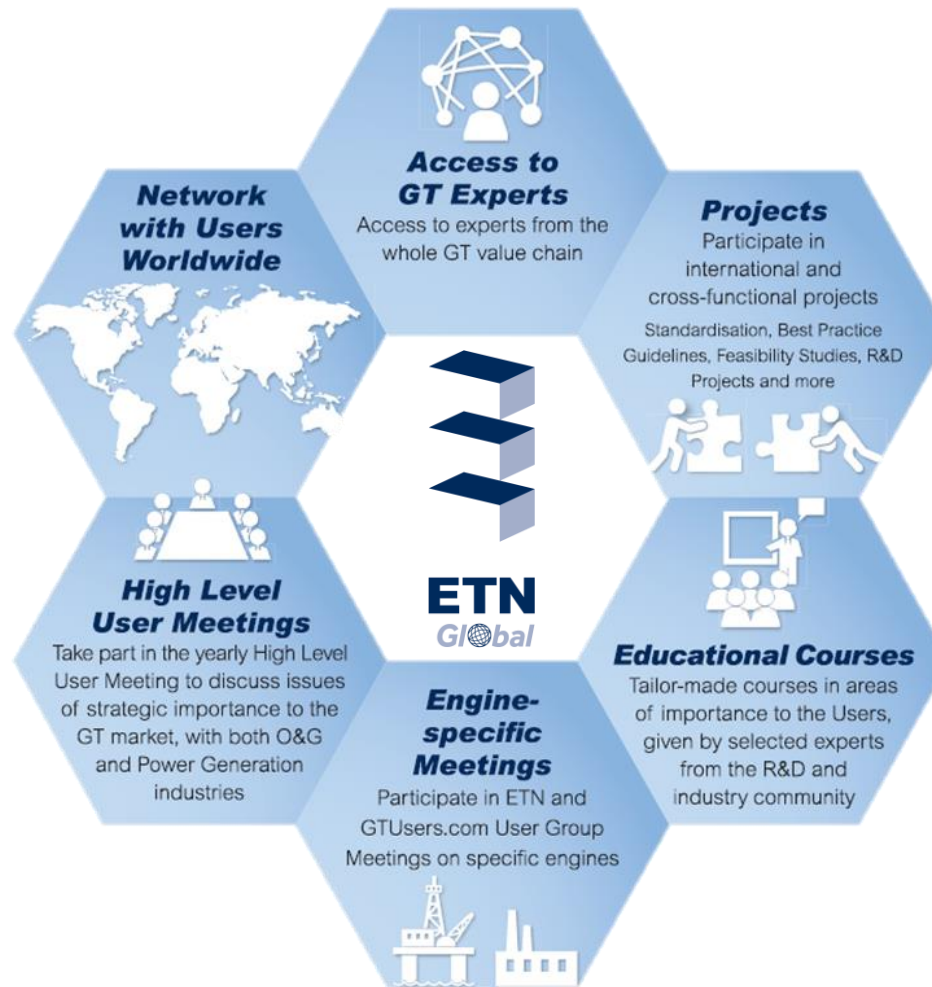
Education/Training Platform

Involvement of the ETN community



**ETN is collecting
Turbomachinery related
educational courses
from Members**

**Please send us relevant
courses with a short
description and link to be
displayed on our website**



Questions?

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Tel: +32 (0)2 646 15 77, info@etn-gasturbine.eu