Supercritical CO_2 Working Group

Chair: Marco Ruggiero, Baker Hughes
Co-Chairs: David Sánchez, University of Seville
Albannie Cagnac, EDF

Objective

Develop, enable and optimise the use of supercritical CO_2 power cycles by:

- Highlighting potential use, applications and benefits
- Addressing operational issues/effects on components (turbomachinery, heat exchangers and combustion systems) related to the use of sCO_2
- Assessing and addressing operational safety aspects of sCO_2-cycles based power plants
- Creating a database of European open test beds
- Exploring market opportunities
- Exploring strategic alliances internationally to gain economies of scale worldwide
- Paving the way for funding opportunities by highlighting the research needs on sCO_2 based power cycles, to contribute to their deployment in the future energy system

Working Group

Business case for sCO_2 Waste Heat Recovery System
Published in October 2020

Download at
etn.global/sco2-whrs-case

Supercritical CO_2 Working Group

Chair: Marco Ruggiero, Baker Hughes
Co-Chairs: David Sánchez, University of Seville
Albannie Cagnac, EDF

Activities

- Meetings
- Business case for sCO_2 Waste Heat Recovery System
  - Investigating the technical and economic feasibility of a sCO_2 waste heat recovery system for power generation in heavy industry
  - Published in October 2020
- ETN white paper highlighting a development roadmap of sCO_2 power cycle technologies
  - sCO_2 state-of-the-art inventory
  - Collaborative review of applications and challenges
- Bilateral meetings ETN-USA to exchange experience in sCO_2 development

Working Group

Business case for sCO_2 Waste Heat Recovery System
Published in October 2020

Download at
etn.global/sco2-whrs-case

Air Filtration Working Group

Chair: Olaf Brekke, Equinor
Co-Chair: Dominique Orhon, Total

Objective

Improve the quality and flexibility of Air Filtration systems by:

- Allowing the users to have a single point of reference for state-of-the-art filtration technology
- Addressing air filtration issues through projects of common interest

Air Filtration Working Group

Chair: Olaf Brekke, Equinor
Co-Chair: Dominique Orhon, Total

Activities

- ETN liaison member of the ISO/TC142
  - ETN's "*Water/Salt test procedure for Gas Turbine/Compressor Air Inlet Filter Systems*" was successfully submitted to the ISO/TC 142 WG 9

New Work Item
ISO 29461-4. Air intake filter systems for rotary machinery – Part 4: Test methods for static filter systems in marine and offshore environments

  - Feedback on the revision of *ISO29461-1. Air intake filter systems for rotary machinery – Test methods – Part 1: Static filter elements*
- Contribution to the European Chemicals Agency (ECHA) public consultation on the PFHxA Restriction Proposal (many gas turbine air filters rely on C6-based hydrophobic treatment)

Testing Activities

- Aging effect of the filters
- Performance of the single filter in a multi-stage system
- Independent air filtration test on a model-scale test rig Test of filters in close-to-real GT operation conditions

Hydrogen Working Group

Chair: Peter Kutne, DLR
Co-Chair: Geert Laagland, Vattenfall

Working Group

Objective

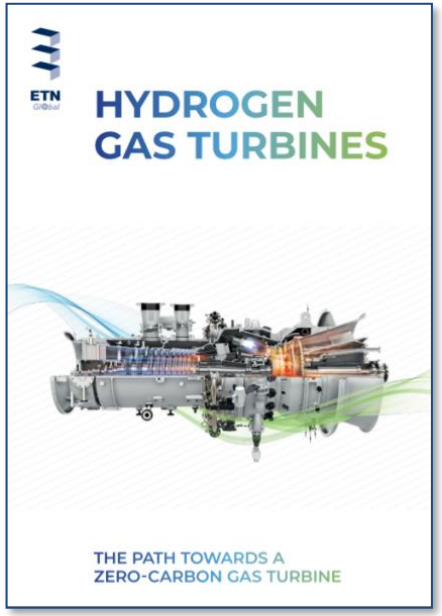
Accelerating the development and use of hydrogen-based gas turbine technology by:

- Identifying potential barriers, and exploring:

Economic aspects & business cases	**Demonstration projects**	**Operational issues/effects on GT components**
Retrofit solutions for high hydrogen-content fuel	**Safety aspects**	**Research needs**

- Exploring cooperation opportunities to ensure safe, reliable and cost-efficient solutions for existing and future fleets

The path towards a
Zero-Carbon Gas Turbine
Published in January 2020



Download at
etn.global/hydrogen-report

Working Group

Hydrogen Working Group

Chair: Peter Kutne, DLR
Co-Chair: Geert Laagland, Vattenfall

Activities

- Meetings
- Dedicated subgroups:

Hydrogen Combustion Challenges

Collaborative position paper to:

- Review the state of the art of combustion of natural gas / hydrogen mixtures, with focus on NOx emissions
- Suggest appropriate policy adaptations
- Recommend R&D areas

H_2 Deployment in Centralised Power Generation

Techno-economic case study:

- Lead by members of the ETN Young Engineers Committee
- Evaluating the technical feasibility and economics of hydrogen utilisation for large-scale, centralised power generation
- To deliver a business case to WG members
- To inform EC hydrogen strategies

Working Group

Additive Manufacturing Working Group

Chair: Christian Haecker, Oerlikon

Objective

Strengthen the cooperation between stakeholders of the turbomachinery value chain on additive manufacturing (AM) topics by:

- Exchanging knowledge and experiences focusing on the added value of AM
- Cooperating on AM practices for applications in the energy sector

AM Best Practices
Published in 2019

Download at
etn.global/ETN-AM-Best-Practices

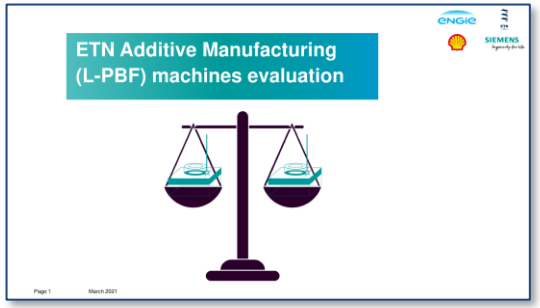
Working Group

Additive Manufacturing Working Group

Chair: Christian Haecker, Oerlikon

Activities

- Meetings
- Equipment and Suppliers database – beta online, under review
- ETN AM Equipment Evaluation project
  - Initiative of ETN Members to investigate L-PBF technology through an evaluation of market-available machines
  - Focus on productivity of the equipment and quality aspects for energy-related components
- Prioritisation of collaborative best practices topics to be developed within ETN



Micro Gas Turbine Working Group

Working Group

Objective

Support the cooperation across the whole MGT value chain by:

- Exploring markets opportunities and solutions
- Paving 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
- Initiating R&D projects

Activities

- ❑ MGT Technology Summary
- ❑ ISO 19372 – Microturbines applications – Safety
  - ➢ No revision planned before 2022

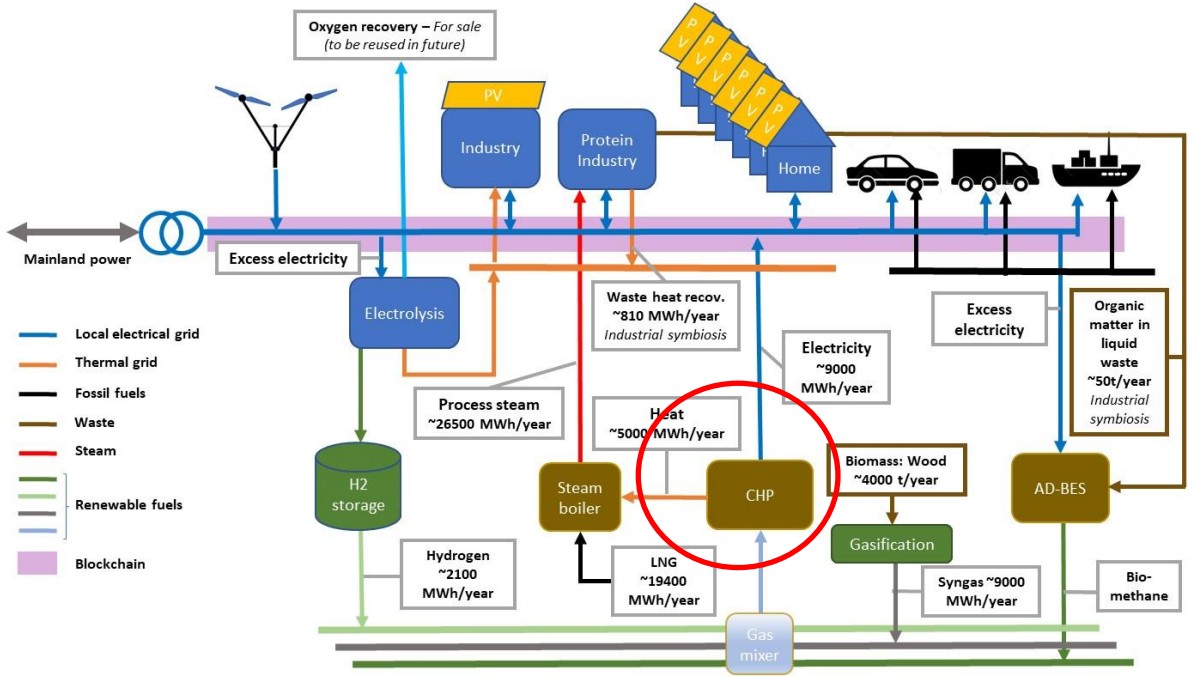
Micro Gas Turbine Technology Summary

Download at
etn.global/mgt-summary

Micro Gas Turbine Working Group

Current Situation

- Reduced number of programs supporting GT/MGT development
- Systems integration higher on the agenda
  - Various energy sources
  - Integration and interaction with storage
- Decentralised energy systems
  - Energy communities / energy islands (geographical and virtual)



Micro Gas Turbine Working Group

Decentralised Energy Systems Working Group

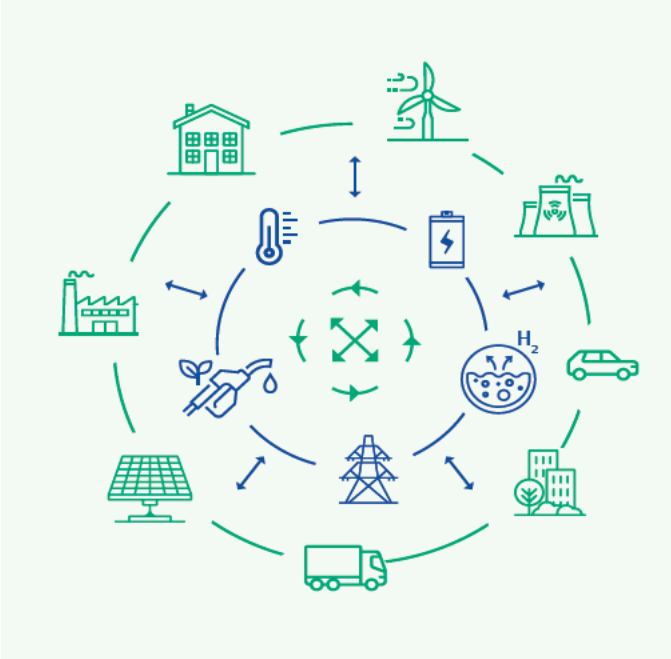
Proposal of the ETN Project Board

Widen the scope of the MGT Working Group by:

- Covering Micro GTs and Small GTs
- Aligning with the user community needs

Way forward

- ❑ Support of ETN Members
- ❑ Project Board to suggest an initial planning of activities



Source: EU strategy on energy system integration, July 2020

Engine-specific User Groups

LM2500 & SGT-A35

Objective

Develop strong, independent and knowledgeable user communities, by:

- Providing a **continuous and focused dialog** between the user community, OEMs, service providers and suppliers
- Sharing **user experience at site**.
- Defining, developing and implementing solutions in order to **improve gas turbine operations**.
- Bringing together and coordinating the **user's voice community**.

Engine-specific User Groups

LM2500 & SGT-A35

Process

- **Collect** issues and requirements reported by the user community
- **Exchange** experiences among the users and **prioritise** topics based on frequency and economic impact
- **Meet** at the annual user group meeting, where solutions & developments are being presented and discussed with technical experts from the OEM and the invited ISPs
- **Trigger** dedicated response from OEMs, ISPs and R&D community, and follow-up on implemented recommendations and proposed solutions

Young Engineers Committee (YEC)

Vision

Bring together the future generation of engineers and leaders of ETN members and the wider energy sector, who are able to sketch pathways for a successful energy transition towards a carbon-neutral society.

Objectives

- Develop future leaders in the turbomachinery field by enabling cross-sector collaboration and knowledge sharing
- Ensure continuity of involvement in ETN
- Pass on experience in cooperation with ETN's Emeritus Members
- Provide valuable contributions in collaboration with ETN's Working Groups and Technical Committees
- Promote low-carbon technologies

Current member organisations

Baker Hughes, uniper, Infosys, Università di Genova, FRAZER-NASH CONSULTANCY, Solar Turbines A Caterpillar Company, SESTA LAB, POLITECNICO MILANO 1863, Heatric, DNV, DLR, equinor

ETN contact
Valentin Moens (vm@etn.global)

LinkedIn
ETN Young Engineers Committee

Young Engineers Committee (YEC)

Current member organisations

Activities

- Inauguration at ETN's virtual AGM in June 2020
  - Panel session in July 2020:
    Turbomachinery's role in the energy transition – Combined perspectives from ETN's Emeritus Members and ETN's Young Engineers Committee
- Regular meetings
- Strategic Paper – Shaping the YEC
  - Part 1 – *Generation Green: The Future of Low-Carbon Turbomachinery in the Transition to Net-Zero*
  - Part 2 – *Impactful Advances in Turbomachinery*
- Sub-group work in collaboration with ETN's Hydrogen WG
  - *Techno-economic study on H_2 Deployment in Centralised Power Generation*
- ETN YEC LinkedIn Articles
  - *ETN Young Engineers contribute to FLEXnCONFU project to develop and demonstrate low-carbon hydrogen and ammonia gas turbines*
  - *Preparing for Launch – ETN's Young Engineers Committee gathers momentum ahead of first official meeting*