



# ETN'S VIRTUAL AGM & WORKSHOP WEEK PROGRAMME 15-22 March 2021

*Please note that all times are in Central European Time (CET)*

<b>Monday 15 March 14:00 - 16:00 (CET)</b>	<b>Annual General Meeting (AGM) 2021: “<i>Strategy for a low-carbon future</i>”</b>
<b>Tuesday 16 March 14:00 - 16:00 (CET)</b>	<b>Technical Committee 1: Low-carbon GT technologies - “<i>Expanding the solutions portfolio of new energy systems</i>”</b>
<b>Wednesday 17 March 14:00 - 16:00 (CET)</b>	<b>Technical Committee 2: Operational and fuel flexibility - “<i>Analysing new technological solutions in respect of market opportunities</i>”</b>
<b>Thursday 18 March 14:00 - 16:00 (CET)</b>	<b>Technical Committee 3: Materials degradation, repair technologies &amp; manufacturing – “<i>Expected materials impacts and new technology opportunities to overcome challenges in the energy transition</i>”</b>
<b>Friday 19 March 14:00 - 16:00 (CET)</b>	<b>Technical Committee 4: Condition monitoring and asset management - “<i>Implications of introducing 5% to 30% hydrogen into the grid</i>”</b>
<b>Monday 22 March 14:00 - 16:00 (CET)</b>	<b>Closing session: “<i>ETN strategy implementation and transition roadmap</i>”</b>

*The objective of the Technical Committee (TC) sessions is to highlight technical topics of importance to address to accelerate the fulfilment of ETN's vision and objectives and to provide visibility for work within our Working Groups (WGs) and projects.*

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## MONDAY 15 MARCH Annual General Meeting (AGM) *"Strategy for a low-carbon future"*

14:00 – 16:00  
(CET)

**Opening and President's speech**, Pedro Lopez, ETN President / Uniper

**Approval of the previous AGM minutes**

**Activity report**, Christer Björkqvist, Managing Director, ETN

- **Governance, activities and strategy process**

**Financial report**, Andy Williams, ETN Treasurer / Chromalloy

**Adoption of accounts**

**Vision and strategy introduction**

- **Energy and climate policy**, Christer Björkqvist, ETN
- **Key messages from ETN's High-Level User Meeting 2020**, Pedro Lopez, Uniper
- **Views of the stakeholders:** utility (Pedro Lopez, Uniper), oil & gas (Hege Rognø, Equinor), OEM (Uwe Kaltwasser, Siemens Energy), service provider (Mick Conway, RWG), R&D (Manfred Aigner, DLR) and consultancy (Gary Lock, Frazer-Nash Consultancy)

**Proposed vision and mission**, John Oakey, ETN Board member / Cranfield University

**ETN strategy and roadmap: what is new?** Walt Steimel, ETN Board member / Shell

**Q&A on proposed strategy and way forward**, ETN Board

**Adoption of strategy**

**AGM closing remarks**, Pedro Lopez, ETN President / Uniper

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**TUESDAY 16 MARCH**

## **TC1: Low carbon GT technologies - "Expanding the solutions portfolio of new energy systems"**

Chaired by Marco Ruggiero, External Funding & Technology Development, Baker Hughes & David Sánchez, Professor of Energy Systems and Turbomachinery, University of Seville

14:00 – 16:00  
(CET)

*In the near future we will see a variety of tools used to reduce or eliminate the carbon footprint of energy production. Some of these are technologies that will enhance existing energy conversion systems, while others represent new cycles getting ready to become commercially viable. During the session we will highlight, for a selected number of technologies, state-of-the-art and opportunities from research, market and policy points of view.*

**Introduction: Technology review for low-carbon technologies**, Marco Ruggiero, External Funding & Technology Development, Baker Hughes, & David Sánchez, Professor of Energy Systems and Turbomachinery, University of Seville

**Low-Carbon Resources Initiative: introduction, users' needs, promising technology solutions**, Jeffery Preece, Senior Program Manager, LCRI/EPRI

- **Cooperation opportunities and Q&A**

**Pressure gain combustion: a new engine concept to enhance the fuel economy of gas turbines**

- **Novel pressure gain combustion technology for low carbon GT operation: technology description and experimental result**, Fabio Ciccateri, CFD Specialist, Finno Exergy
- **Pressure gain combustion technology development for gas turbine engines**, Don Ferguson, Research Engineer, US Department of Energy - National Energy Technology Laboratory

**New solutions to reduce the total cost of ownership of combined cycle gas turbines in a low-capacity factor scenario**

- **Business case for sCO<sub>2</sub> Waste Heat Recovery System**, Ambra Giovannelli, Assistant Professor of Fluid Machinery & Energy Conversion Systems, University of Roma Tre
- **Supercritical CO<sub>2</sub> STEP 10 MW demo plant**, Markus Lesemann, Director, Business Development, Gas Technology Institute

**Carbon capture, utilisation and storage (CCUS) projects and global cooperation**, Juho Lipponen, Coordinator, Clean Energy Ministerial CCUS Initiative

**Way forward: actions and follow-up meetings**

# ETN'S VIRTUAL AGM & WORKSHOP WEEK PROGRAMME 15-22 March 2021

**WEDNESDAY 17 MARCH**

**TC2: Operational and fuel flexibility –**

***“Analysing new technological solutions in respect of market opportunities”***

Chaired by Peter Kutne, Head of Department Gas Turbine, DLR

14:00 – 16:00  
(CET)

*Because of its operational and fuel flexibility, gas turbine technology offers a broad variety of solutions for a future energy system. Furthermore, the integration of gas turbines with other technologies can open up new markets. But what are the necessary steps to make these technologies available, and which boundary conditions are necessary to make such flexible solutions economically feasible? The presentations and discussion in this TC will throw some light on it.*

**Introduction**, Peter Kutne, Head of Department Gas Turbine, DLR

#### **Hydrogen**

- **ETN Hydrogen Working Group: H<sub>2</sub> combustion position paper**, Peter Jansohn, Head Energy System Integration, Paul Scherrer Institute
- **ETN Hydrogen Working Group: H<sub>2</sub> deployment in centralised power generation study**, Daria Bellotti, PostDoc Researcher, University of Genoa & Serena Gabriele, Gas Turbine Configuration Management, Baker Hughes & Jon Runyon, Gas Turbine Combustion Engineer, Uniper
- **Discussion**

#### **Operational flexibility**

- **Hybrid solutions - combining the GT with X**, Peter Kutne, Head of Department Gas Turbine, DLR
- **Flexibility solutions for cogenerative combined cycles: assessment of electric ancillary service market and technology market readiness**, Stefano Barberis, Project Manager, RINA-C & Alberto Vannoni, PhD student, University of Genoa
- **Discussion**

#### **Ammonia**

- **Techno-economic analysis on enhancing combined cycle flexibility via power-to-ammonia solutions – preliminary results from FLEXnCONFU project**, Rafael Guédez, Senior Researcher, KTH Energy Department & Jose García, PhD candidate, KTH Energy Department
- **Discussion**

**Way forward: actions and follow-up meetings**

# ETN'S VIRTUAL AGM & WORKSHOP WEEK PROGRAMME 15-22 March 2021

## THURSDAY 18 MARCH

### TC3: Materials degradation, repair technologies & manufacturing - "Expected materials impacts and new technology opportunities to overcome challenges in the energy transition"

Chaired by John Oakey, Professor of Energy Technology, Cranfield University

14:00 – 16:00  
(CET)

*What are the expected impacts on hot gas path materials in the energy transition towards carbon-neutrality while providing affordable, reliable and flexible solutions? How can new material technologies help us to find improved solutions, mitigate the impacts and provide new repair opportunities?*

**Introduction**, John Oakey, Professor of Energy Technology, Cranfield University

#### 1. Expected impacts on materials

**Overview of expected impacts on materials**, Ferenc Pankotai, Manager, Combustion Engineering and Additive Manufacturing, Solar Turbines

- **Effects from the increased use of hydrogen and sustainable fuels – in retrofit and purpose-designed turbomachinery**
- **Materials requirements for advanced cycles, including oxy-fired sCO<sub>2</sub> cycles**

**Hydrogen GT operations experiences within Shell**, Walt Steimel, Rotating Equipment Global Discipline Lead, Shell

**Approach for hydrogen-fired utility projects: retrofit and new utility installations**, Brian Allen, VP Product Line Management, Mitsubishi Power

**Discussion**

#### 2. Mitigations solutions and technology development opportunities

**Additive Manufacturing**

- **Introduction - current applications and future opportunities**, Anand Kulkarni, Principal Key Expert, Siemens Energy
- **Material qualifications**, Mikkel Pedersen, Head of AM R&D, Oerlikon
- **ETN AM Equipment Evaluation initiative**, Jan de Roos, Senior Rotating Equipment Engineer, Shell & Ulli Klenk, Principal Key Expert Additive Manufacturing, Siemens Energy & Steve Nardone, Lab Manager Metal Additive Manufacturing, Engie & Valentin Moëns, Technical Project Officer, ETN
- **Discussion**

#### 3. Future TC3 materials topics (e.g. application of advanced manufacturing controls (AI, robotics, etc.), component repair, coating developments, ceramics/composites)

**Way forward: actions and follow-up meetings**

# ETN'S VIRTUAL AGM & WORKSHOP WEEK PROGRAMME 15-22 March 2021

## FRIDAY 19 MARCH

### TC4: Condition monitoring and asset management – “Implications of introducing 5% to 30% hydrogen into the grid”

Chaired by Chris Dagnall, General Manager, Rotating Machinery Solutions, DNV

14:00 – 16:00  
(CET)

*Technology and safety: Identifying potential implications, solutions or mitigation opportunities*

- *Safety aspect recap from the previous TC4 session (AGM & Workshop 2020)*
- *Operation, combustion, emissions, leak detection, enclosure design, exhaust systems, heat recovery boilers, start-up and control*
- *Maintenance, inspection intervals, lifing issues, reliability, associated costs*
- *Instrumentation and monitoring requirements, combustion control, sensor requirements*

**Introduction**, Chris Dagnall, General Manager, Rotating Machinery Solutions, DNV

**Hydrogen operation assessment**, Tom Kavanagh, Head of Asset Improvement & Making Net Zero Possible, Uniper

**Hydrogen Usage in Gas Turbines – Impact on Enclosure Safety**, Irfan Siddiqui, CFD Consultant, Frazer-Nash Consultancy

**Technology aspect**, Marc Vignal, EAME Marketing Lead, Solar Turbines

**Panel discussion**

- Tom Kavanagh, Head of Asset Improvement & Making Net Zero Possible, Uniper
- Irfan Siddiqui, CFD Consultant, Frazer-Nash Consultancy
- Marc Vignal, EAME Marketing Lead, Solar Turbines
- Walt Steimel, Rotating Equipment Global Discipline Lead, Shell

**Topics for discussion**

- *Discuss from an asset management perspective the current and near future position with introduction of 5% to 30% hydrogen*
- *What is the end user position and readiness?*
- *What would a hydrogen readiness roadmap look like?*
- *Are new data, new sensors, and different control system required?*
- *Asset management and condition monitoring challenges and investment consideration*

**Way forward: actions and follow-up meetings**

# ETN'S VIRTUAL AGM & WORKSHOP WEEK PROGRAMME 15-22 March 2021

## MONDAY 22 MARCH

### Closing session:

### *“ETN strategy implementation and transition roadmap”*

14:00 – 16:00  
(CET)

**Opening and short introduction**, Hege Rognø, ETN Vice President / Equinor

**ETN R&D Recommendation Report**, Peter Breuhaus, Chair of ETN Project Board / NORCE

**ETN's involvement in EU research and innovation activities**, Ugo Simeoni, ETN

#### **Report from the Technical Committee and Working Group Chairs**

- **Outcome of previous week's TC sessions and follow-up actions**
  - **TC1:** Marco Ruggiero, Baker Hughes
  - **TC2:** Peter Kutne, DLR
  - **TC3:** John Oakey, Cranfield University
  - **TC4:** Chris Dagnall, DNV
- **ETN Working Groups: objectives and outcomes**
  - **Supercritical CO<sub>2</sub> WG:** David Sánchez, University of Seville
  - **Air Filtration WG:** Olaf Brekke, Equinor
  - **Micro Gas Turbine WG:** Peter Breuhaus, NORCE
  - **Hydrogen WG:** Geert Laagland, Vattenfall
  - **Additive Manufacturing WG:** Christian Haecker, Oerlikon

**ETN User Groups: objectives and outcomes**, Dominique Orhon, Total

**ETN Young Engineers Committee**, Jon Runyon, Uniper

**International Gas Turbine Conference 2021 and other upcoming meetings**, Christer Björkqvist, ETN

**Closing remarks**, Pedro Lopez, ETN President / Uniper