

# Virtual Annual General Meeting 2021

## Strategy for a Low-Carbon Future

15 March 2021





# ETN Annual General Meeting 2021

Monday 15 March 2021 14:00 - 16:00 CET

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

**Approval of the previous AGM minutes**

**Activity report – governance, activities and strategy process**, Christer Björkqvist, Managing Director, ETN

**Financial report and adoption of accounts**, Andy Williams, ETN Treasurer / Chromalloy

**Vision and strategy input**

- **Energy and climate policy**, Christer Björkqvist, Managing Director, ETN
- **Key messages from ETN's High-Level User Meeting 2020**, Pedro Lopez, ETN President / 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

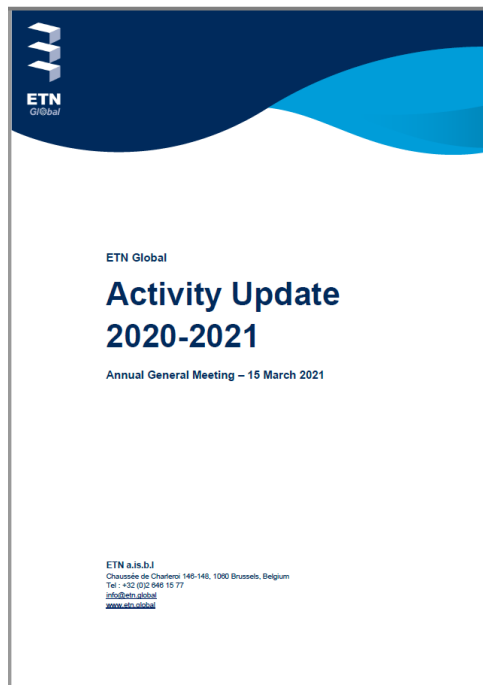




**ETN**  
Global

# AGM 2021 Activity Update

June 2020 – March 2021



Download the report from ETN's website:  
[etn.global/events/virtual-agm-workshop-week-21/](https://etn.global/events/virtual-agm-workshop-week-21/)





**ETN**  
Global

# Activity report

## Governance, activities and strategy process

June 2020 – March 2021



1. ETN 2021 and new Members
2. ETN governance
  - a) Board
  - b) Project Board
  - c) IGTC Conference Advisory Board
  - d) Structure (Working Groups, User Groups, other activities)
3. Ongoing projects
4. IGTC “bridging sessions”, webinar series and other meetings
5. Publications
6. Strategy and reorganisation process



# ETN Global 2021

## A Global Gas Turbine Association



Membership-based, non-profit association

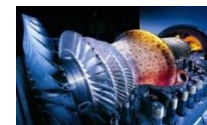
Coverage: Gas Turbine and related Turbomachinery Technology

110 Member organisations

22 countries: Europe, Asia, North America and Middle East

+800 persons from the member companies involved in different ETN activities

+1800 persons subscribed to our Quarterly Newsletter







**ETN**  
Global

# New Members

- University of South-Eastern Norway
- GE Gas Power
- Stadtwerke Münster (Germany)
- ADNOC (United Arab Emirates)
- Finno Exergy (Finland)
- Rey Juan Carlos University (Spain)
- Politecnico di Milano (Italy)





**ETN**  
Global

# ETN Board 2020-2022



**Pedro Lopez, President**  
Uniper



**Bram Van Cauwenberge**  
ENGIE



**John Oakey**  
Cranfield University



**Hege Rognø, Vice President**  
Equinor



**Mick Conway**  
RWG Repair & Overhauls



**Magnus Genrup**  
Lund University



**Andy Williams, Treasurer**  
Chromalloy



**Gary Lock**  
Frazer-Nash Consultancy



**Paul F. Browning**  
Mitsubishi Power



**Walt Steimel**  
Shell



**Manfred Aigner**  
DLR - German Aerospace Center



**Uwe Kaltwasser**  
Siemens Energy





ETN  
Global

# Project Board 2020-2022



Peter Breuhaas,  
NORCE



Peter Jansohn,  
Paul Scherrer Institute



Elisabet Syverud, University  
of South-Eastern Norway



Olaf Brekke,  
Equinor



Dominique Orhon,  
Total



Stefano Sigali,  
Enel



Peter Kutne,  
DLR



David Sánchez,  
University of Seville



Chris Dagnall,  
DNV



Tom Kavanagh,  
Uniper



Marco Ruggiero,  
Baker Hughes



Olaf Bernstrauch,  
Siemens Energy



Enrico Bianchi,  
Ansaldo Energia



Christian Haecker,  
Oerlikon AM

- ✓ Identify key research & innovation topics
- ✓ New initiatives and projects
- ✓ Coordination & progress on ongoing activities



# Conference Advisory Board

## International Gas Turbine Conference 2020 postponed to October 2021

- Fausto Carlevaro, Baker Hughes
- Jafar Alzaili, City, University of London
- Ionut Porumbel, COMOTI
- John Oakey, Cranfield University
- Jean Louis Meyer, EDF
- Sigrid Gijbels, Engie
- Pooja Suresh, Gastops
- Burak Kaplan, Mitsubishi Power
- Ian Macafee, Oxsensis
- Dan Reitz, Solar Turbines
- Pablo Bellocq, Total
- Geert Laagland, Vattenfall
- Jan Slagter, VBR Turbine Partners

[etn.global/events/igtc-21](https://etn.global/events/igtc-21)



**IGTC**  
International  
Gas Turbine Conference



# ETN Governance

## Summary



**Board of Directors:** Governance, strategy and finances

**Project Board:** Consultative forum of technical experts from the whole value chain nominated by the Board

- R&D Recommendation Report
- ETN Vision document
- Independent guidance and advice
- Coordination of the Working Groups



**Conference Advisory Board:** Members from the ETN community

- International Gas Turbine Conference programme
- Abstract and technical paper reviews



**High-Level User Meeting:** High-level representation from utilities, oil & gas and industrial user community.

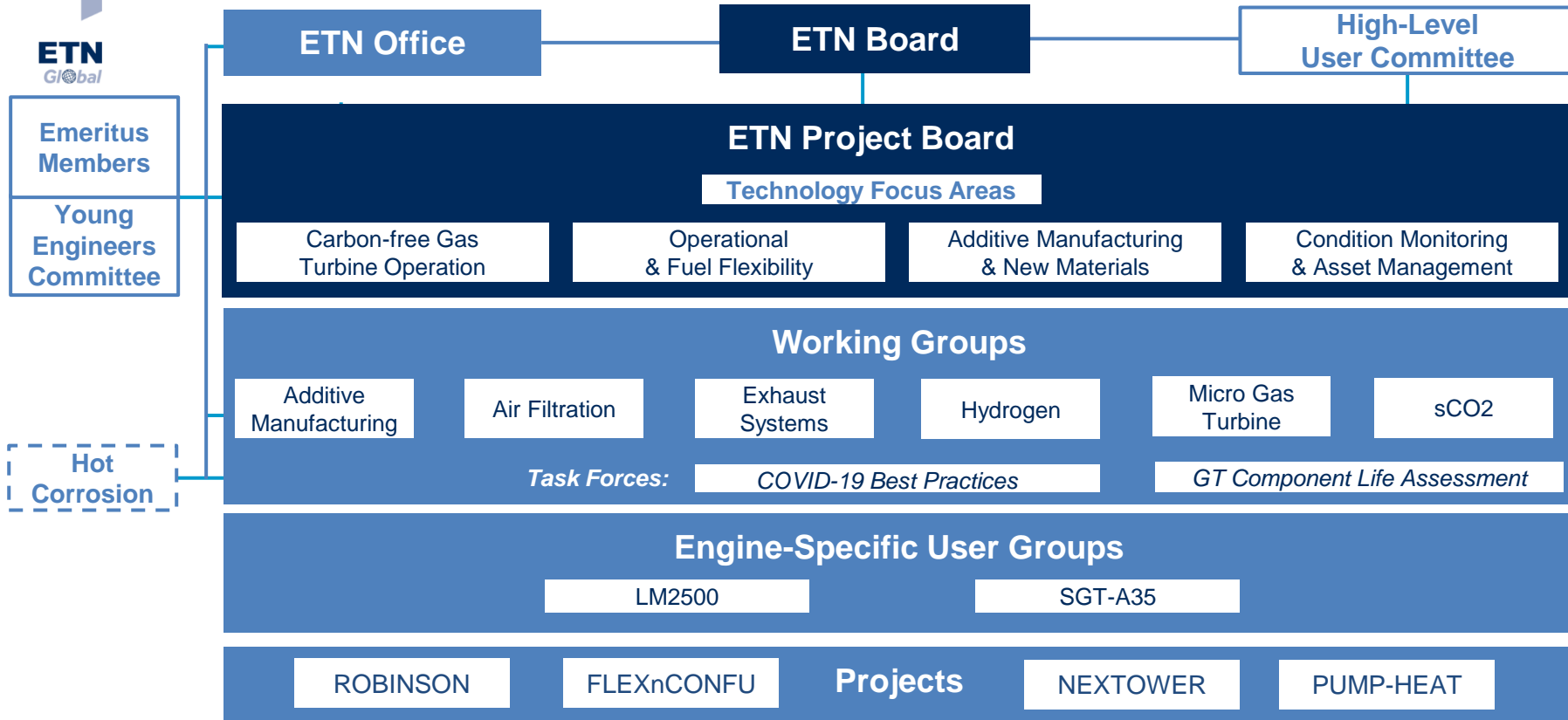
- Discuss and highlight topics of strategic importance in the energy transition and beyond





**ETN**  
Global

# Organisational Structure







ETN  
Global

# ETN's Newest Projects

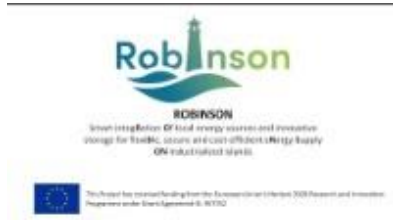
## 2020-2024



ROBINSON (GA 957752) aims to help decarbonise (industrial) islands by developing an intelligent, robust and flexible energy management system that integrates technologies across different energy vectors (electricity, heat and gas)

**Learn more!**

[www.robinson-h2020.eu](http://www.robinson-h2020.eu)



The goal of the FLEXnCONFU project (GA 884157) is to develop and demonstrate in a combined cycle (CC) power plant an innovative, economically viable and replicable power-to-X-to-power (P2X2P) solution.

**Learn more!**

[www.flexnconfu.eu](http://www.flexnconfu.eu)







ETN  
Global

# Ongoing EU projects



- 2017-2021
- ETN's role: dissemination activities, report on GTs for CSP applications



[h2020-nexttower.eu](https://h2020-nexttower.eu)



- 2017-2021
- ETN's role: dissemination activities



[pumpheat.eu](https://pumpheat.eu)



- 2020-2024
- ETN's role: dissemination and communication activities



[flexnconfu.eu](https://flexnconfu.eu)



- 2020-2024
- ETN's role: coordination, dissemination and communication activities



[robinson-h2020.eu](https://robinson-h2020.eu)



These projects have received funding from the European Union's Horizon 2020 research and innovation programme:  
NEXTOWER: GA 721045; PUMP-HEAT: GA 764706; FLEXnCONFU: GA 884157; ROBINSON: GA 957752





ETN  
Global

# IGTC “bridging sessions”, webinar series and other meetings

## IGTC “bridging sessions”:

- *“Technology needs and developments for a low-carbon society”*
- *“Gas turbines in a carbon-neutral society”*



**IGTC**  
International  
Gas Turbine Conference

## Flexible Power Generation webinar series



- 1<sup>st</sup> episode: Opening of the webinar series
- 2<sup>nd</sup> episode: FLEXnCONFU project
- 3<sup>rd</sup> episode: HYFLEXPOWER project
- 4<sup>th</sup> episode: PUMP-HEAT project
- 5<sup>th</sup> episode: sCO2-flex project
- 6<sup>th</sup> episode: TURBO-REFLEX project

All ETN meetings and events: [etn.global/events/etn-meetings-events-2021](https://etn.global/events/etn-meetings-events-2021)

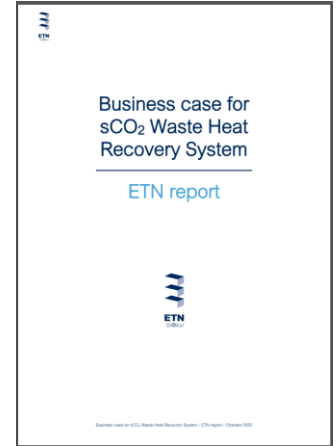
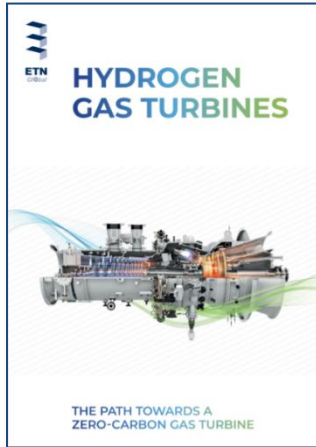




ETN  
Global

# Publications

All publications: [etn.global/research-innovation/rd-reports](https://etn.global/research-innovation/rd-reports)



ISO 21905 – Gas turbine applications – Requirements for exhaust and heat recovery unit



# Strategy and Reorganisation Process



**ETN**  
*Global*



**ETN**  
*Global*





**ETN**  
Global

# ETN Strategy Process Roadmap

## Governance Objectives 2020/ 2021

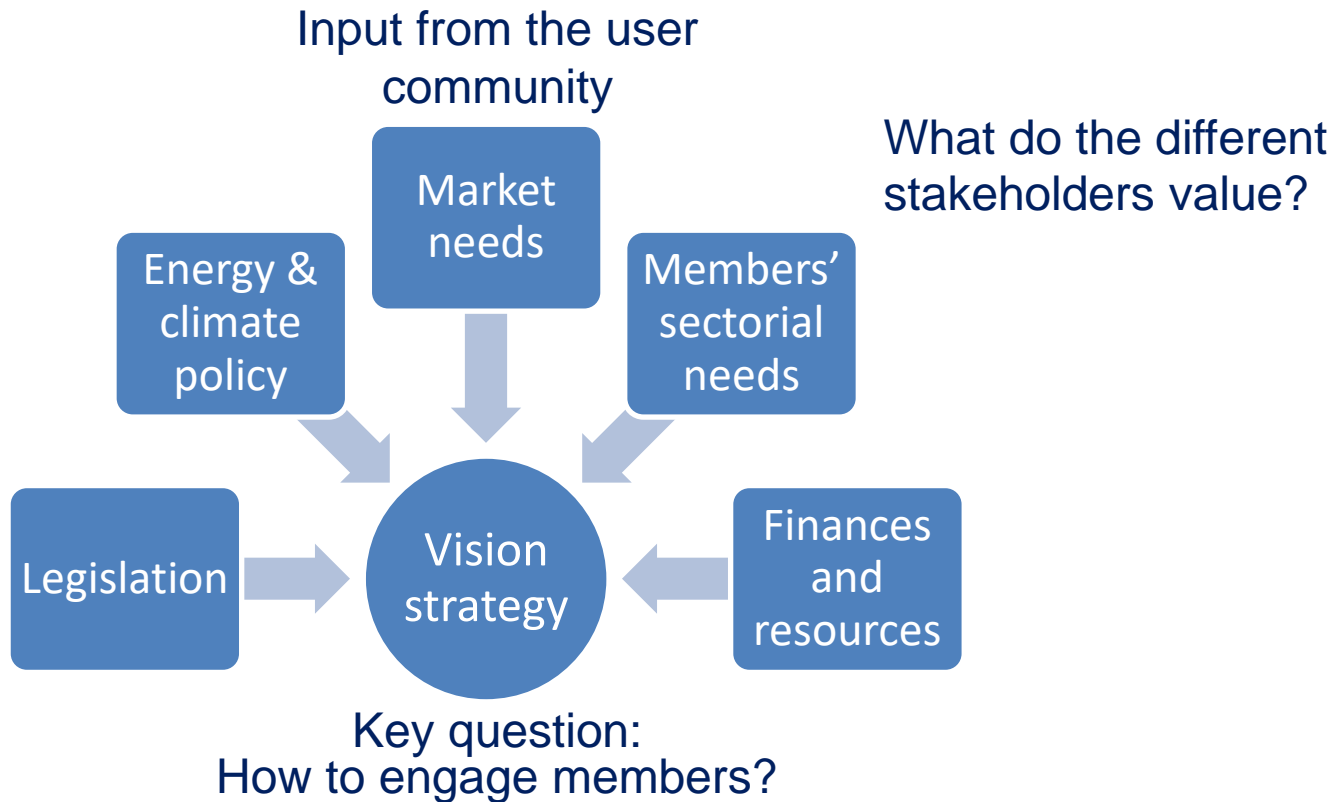
1. Review and define a **2030 Vision and Strategy**
2. Strategic **focus areas and objectives**
3. Produce a **R&D Recommendation Report and Vision document**
4. Develop an internal and external **governance, growth and implementation plan**
  - Activities and governance of WGs
  - Organisational chart, coordination and responsibilities
  - Resources & finances
5. Develop a **Communication Plan**
  - Internal (General Assembly, committees & Working Groups, ETN office)
  - External (governments, press, social media)
6. Review **External Cooperation** opportunities





**ETN**  
Global

# Strategy Process Map







# ETN FINANCES

## 2020 financial result and budget 2021

## ANDY WILLIAMS, TREASURER





# Financial Situation

## Summary of results

As a result of the COVID pandemic the income budget was reduced in March 2020 by 26% and the expense budget reduced by 24%

Two new EU-funded projects started in 2020  
One additional will start in June 2021

**Reserves 1 Jan 2020: +332.405**

**Final year-end result: - 4.059**

**Reserves 31 Dec 2020: +328.346**



# Budget and Result 2020

INCOME	BUDGET	BUDGET post COVID	YEAR-END	EXPENSES	BUDGET T	BUDGET Post COVID	YEAR-END
Membership fees	418.550	413.300	398.150	Personnel	431.000	431.000	442.897
IGTC-20	140.000	0	0	Office costs	60.000	58.000	57.976
EU projects	80.000	74.500	115.400	IGTC-20	80.000	400	381
Workshop, user group meetings	76.000	16.000	18.200	Meetings & travel	84.000	9.400	7.641
Project development	15.000	3.000	3.000	External services (PR, dissemination, IT, accountant, legal fees)	33.000	27.300	32.163
Minor income (interest, exceptional income)	2.000	1.000	497	External costs (education, taxes, leasing, and bank fees etc.)	26.000	21.300	22.917
Provision from previous year	0	29.788	29.788	Project development	15.000	3.000	5.119
<b>Subtotal</b>	<b>731.550</b>	<b>537.588</b>	<b>565.035</b>		<b>729.000</b>	<b>550.400</b>	<b>569.094</b>
				<b>Exp. Result 2020</b>	<b>2.550</b>	<b>-12.812</b>	<b>-4.059</b>

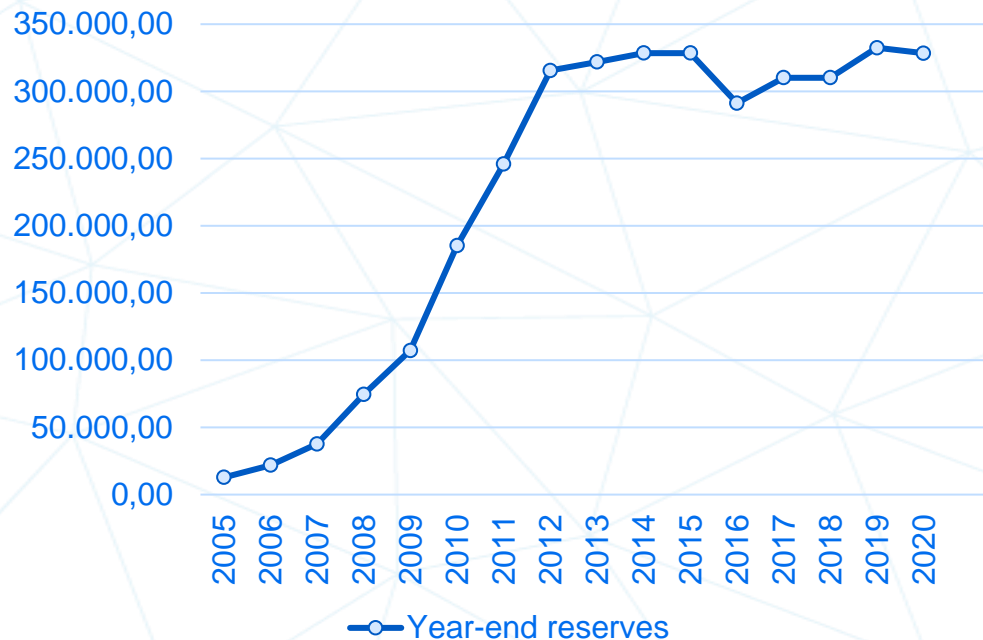


# Budget 2021

INCOME	BUDGET COVID-19 12 month	EXPENSES	BUDGET COVID-19 12 month
Membership fees	402.350	Personnel	543.000
EU projects	228.000	IGTC (90.000)	5.000
User groups meetings (60.000)	18.000	Office cost	61.000
IGTC (140.000)	45.000	Meetings & Travel (84.000)	10.000
Provisions	5.000	PR & Dissemination cost	31.000
		External services: IT, accountant, legal fees	20.000
		External costs: education, taxes, leasing and bank fees etc.)	22.500
		Project development	5.000
<b>Subtotal</b>	<b>698.350</b>		<b>697.500</b>
		<b>Exp. Result 2021</b>	<b>+850</b>



# Development of Reserves



**Year-end reserves 2020: 328.346 Euro**





**ETN**  
Global

# Attestation of the Accounts

<i>B &amp; D</i> bvba		Accounting - Tax Management
Av. Jean Sobieski 48 1020 Brussels (Belgium)		
Tel : 32-2-474.15.90 Fax : 32-2-474.15.99		ETN - European Turbine Network Chée de Charleroi 146-148/20 1060 BRUXELLES
Brussels, 8 <sup>th</sup> March 2021		
Concerning : E.T.N. Accounts O/Ref. : 2020		
Dear Sirs,		
We have drawn up the annual accounts of the accounting year that ended on the 31 <sup>st</sup> December 2020, which have been prepared in compliance with the Belgian legal and regulatory requirements.		
We can state that the annual accounts present fairly the financial position of the association as of 31 <sup>st</sup> December 2020, and the results of its operations for the year then ended is adequate.		
We certify that, without prejudice to certain formal aspects of minor importance, the accounting records are maintained in accordance with the Belgian legal and regulatory requirements.		
We remain at your disposal for any information or explanation you could need.		
We wish you a good receipt of this letter and in the meantime we remain,		
Yours faithfully,		
 Jacques DEGRAEVE Tax accountant ITAA n° 10.372.229		
BCE 430.416.187	VAT BE 0430.516.187	Bank 210-0296390-10



# Any Questions?





# Energy and Climate Policy



**ETN**  
*Global*



**ETN**  
*Global*





**COVID-19**

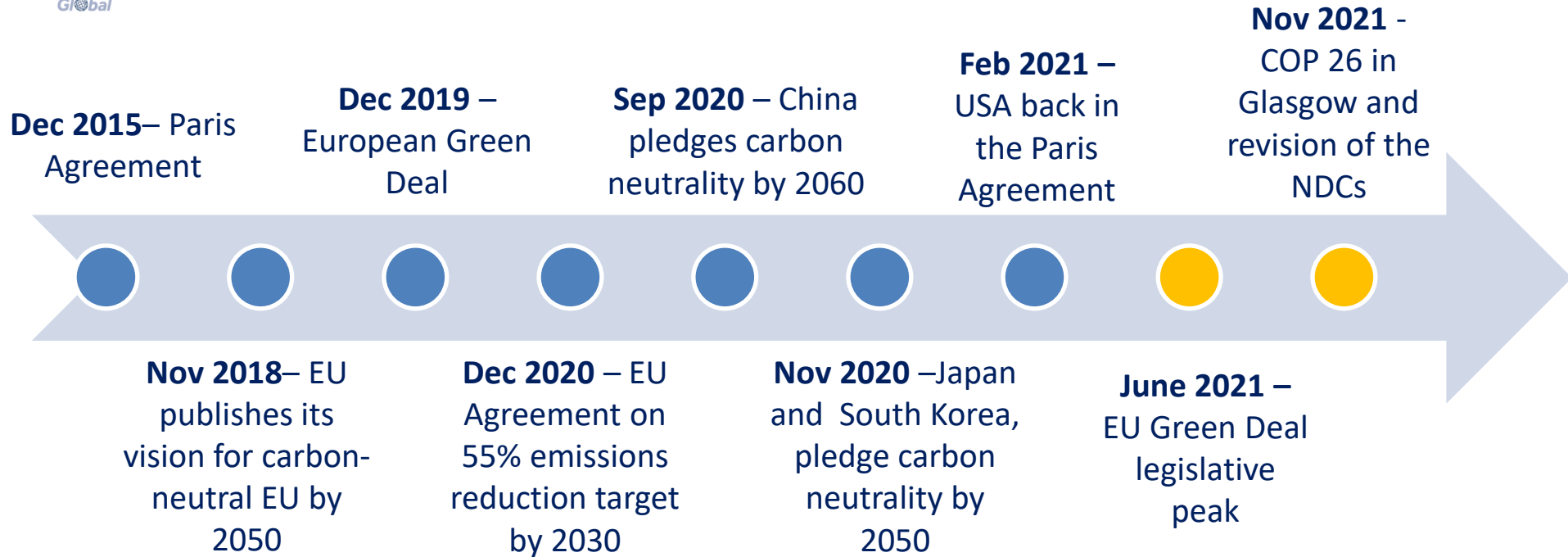
**A Transition Wave to a Global  
Low-Carbon Society is building up**





**ETN**  
Global

# A carbon neutral world







ETN  
Global

# European “Green Deal”

## Towards a net-zero EU by 2050

The “**European Green Deal**” is the EU’s strategy for sustainable growth, encompassing all the economic sectors.



**A European Green Deal**

Striving to be the first climate-neutral continent



### GOAL

- ✓ carbon-neutrality by 2050

### Mid-term goal

- ✓ reduce GHG emissions by 55% by 2030 (vs. 1990)

### Some relevant initiatives

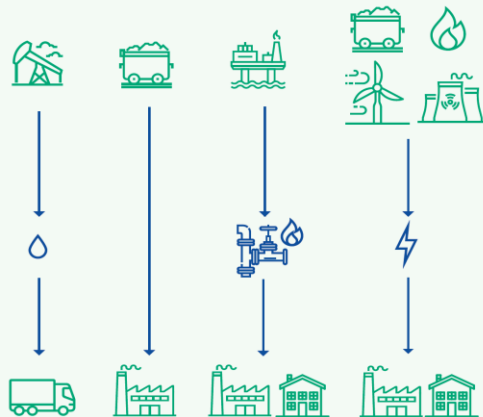
- ✓ Carbon Border Adjustment Mechanism
- ✓ Reducing methane emissions in the energy sector
- ✓ Hydrogen and System integration strategies
- ✓ Revision of the EU ETS
- ✓ European Climate Law
- ✓ Sustainable Finance
- ✓ Amendment to Renewable Energy Directive



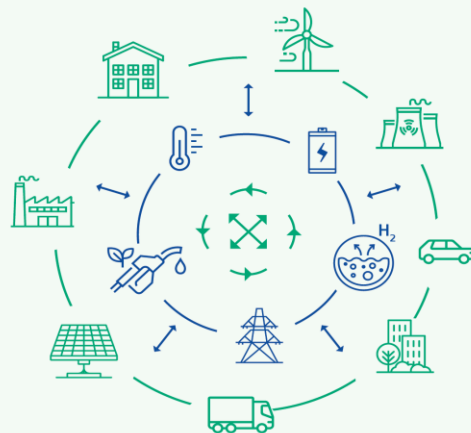


# Future EU integrated energy system

**The energy system today :** linear and wasteful flows of energy, in one direction only



**Future EU integrated energy system :** energy flows between users and producers, reducing wasted resources and money



## Key aspects

- Low-carbon & renewable fuels;
- CCUS;
- Energy Efficiency;
- Re-use of waste heat;
- Biogas & biofuels;
- Renewable electricity;
- Adaptation of energy market & infrastructure;
- Equal treatment for all energy carriers

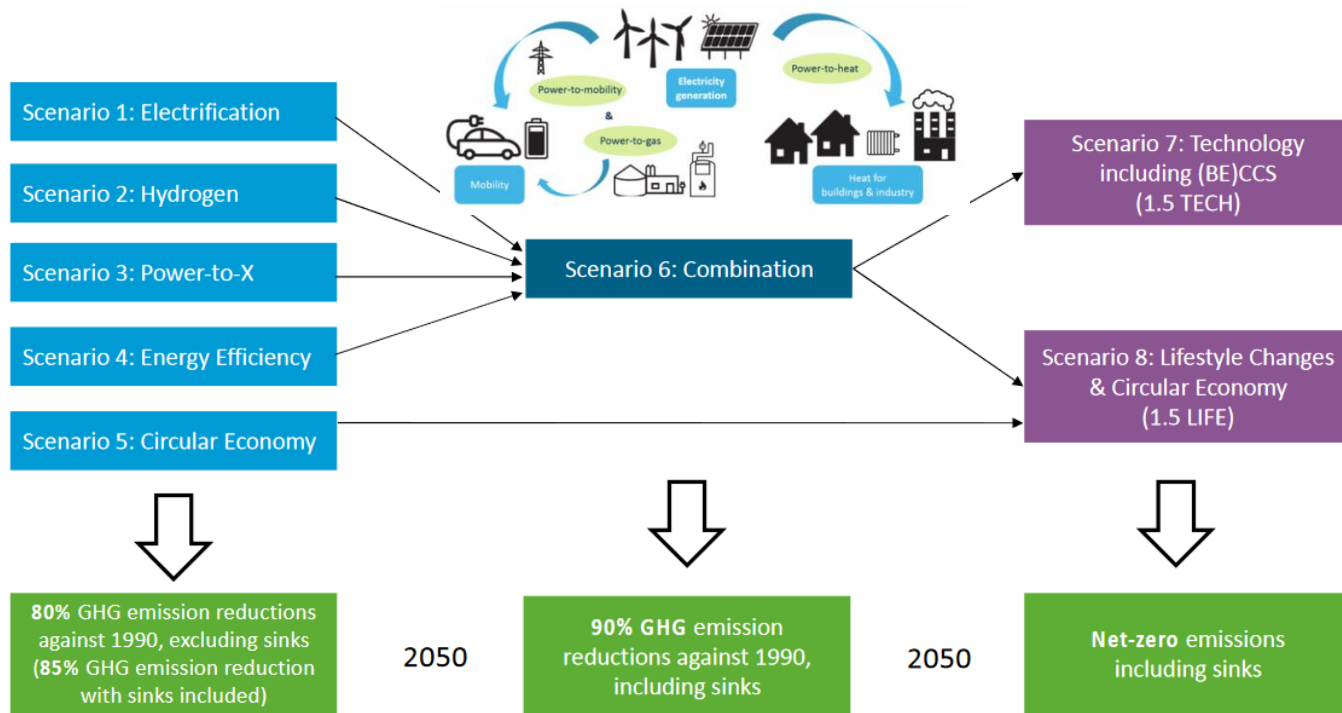
Source: 2020, EU Energy System Integration Strategy





ETN  
Global

# EC 2050 Net-Zero Strategy Proposal



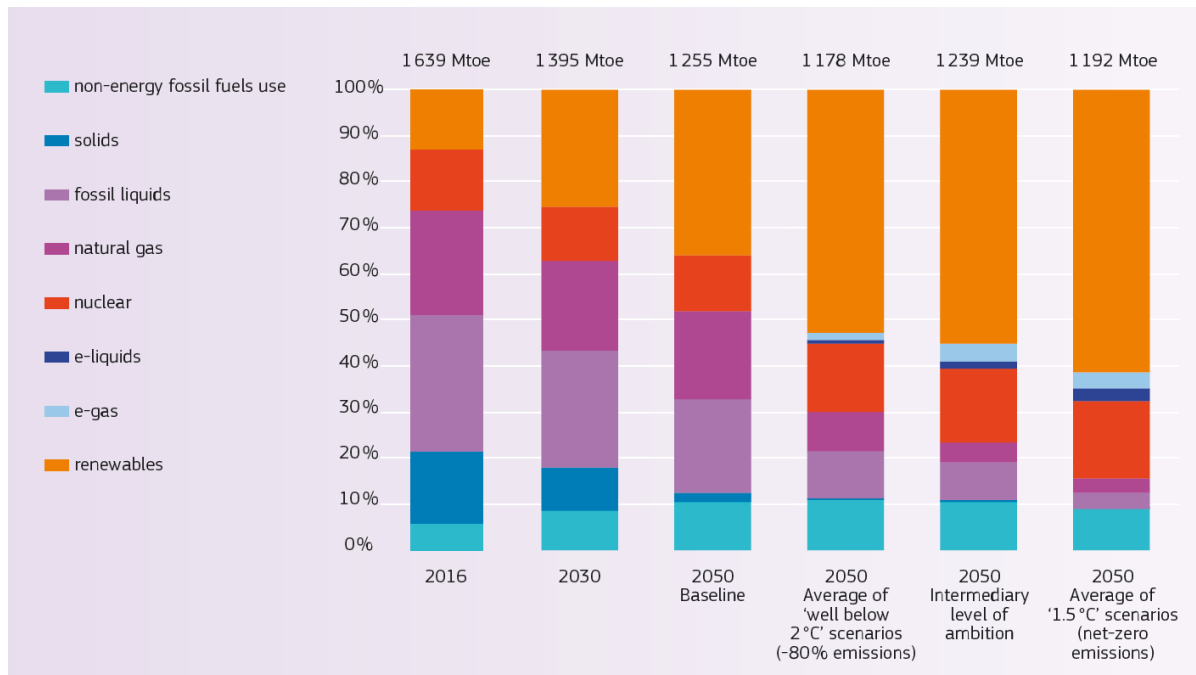
Source: visualization by Ecologic Institute, drawing on the EC In-Depth Analysis document





# EU Energy Mix Scenarios

## 2030 and 2050 (different levels of ambitions)



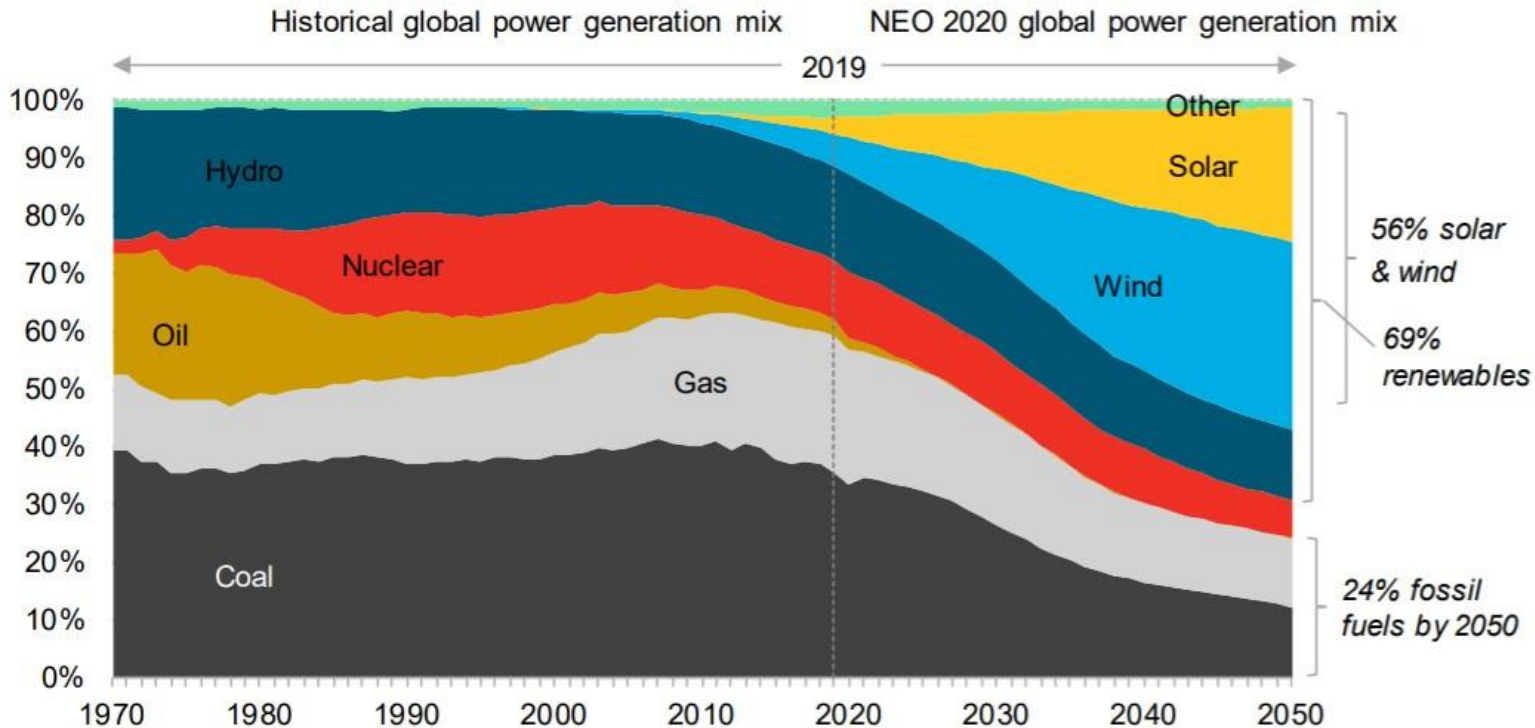
Source: Going Climate-neutral by 2050, European Commission, 2019





ETN  
Global

# Global electricity generation mix



Source: BloombergNEF



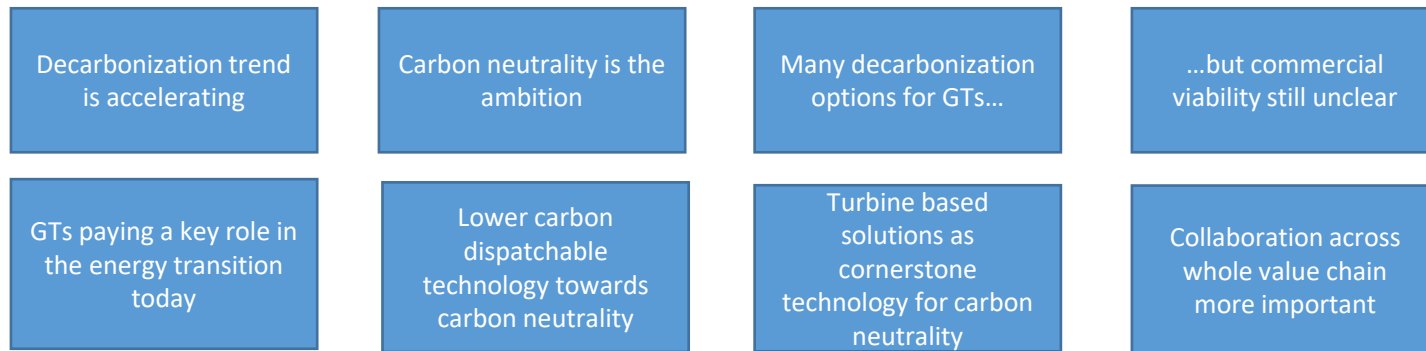


**ETN**  
Global

## ETN's High-Level User Meeting 2020

*"Operational optimisation and technology development needs for the transition to a carbon-neutral society"*

### Key messages from ETN Users



*Users call OEMs and the R&D community to join forces, contribute and continue enabling cost-efficient operations of the current asset base, while investing in solutions to respond to the decarbonization challenge – ETN as Key Enabler*

### Key inputs into ETN strategy from ETN users





# Views of the stakeholders

## Voices from the ETN Board

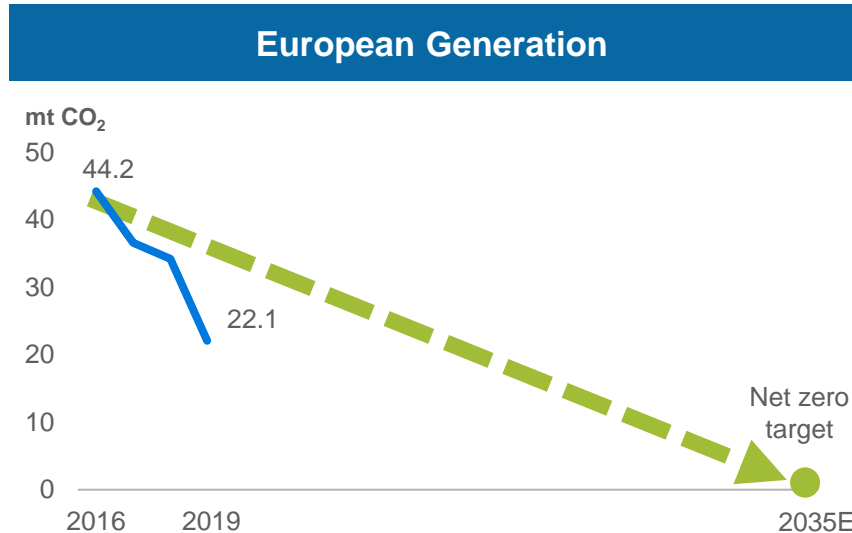
*Your organisation's commitment / goals in the energy transition?*

*How could ETN help, and what would be the most important areas that ETN should focus on?*

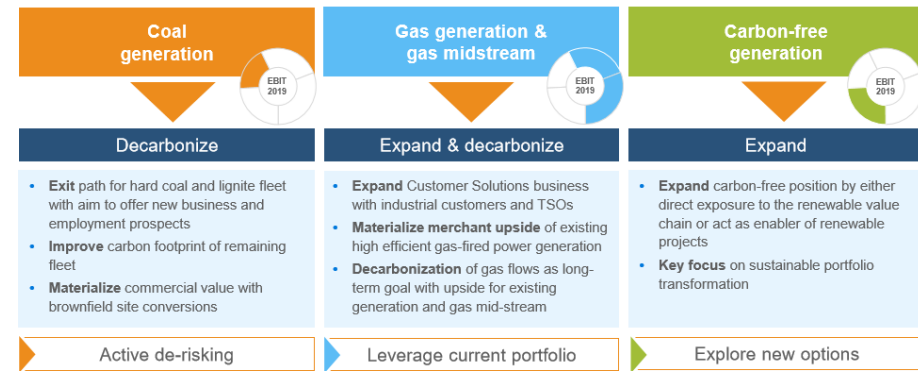
- ✓ Utility (Pedro Lopez, Uniper)
- ✓ Oil & gas (Hege Rognø, Equinor)
- ✓ OEM (Uwe Kaltwasser, Siemens Energy)
- ✓ Service provider (Mick Conway, RWG)
- ✓ R&D (Manfred Aigner, DLR)
- ✓ Consultancy (Gary Lock, Frazer-Nash Consultancy)



# Empower energy evolution – Towards carbon neutrality



**Carbon neutral by 2035**



## ETN potential supporting activities

**Shaping policy** - Coordinated gas positioning papers for our gas turbine industry and influencing EU taxonomy for considering gas and green gases power generation

**Technology R&D** – demonstration pilot projects on innovative solutions for decarbonization gas turbines and carbon free grid stability services

**Increased Awareness** - Dissemination on gas technology and the role and potential of green gases in the power generation and for other industries



# Net-zero by 2050 – collaboration is required



## Blue/Green Hydrogen

- Hydrogen for industry
- Hydrogen to power
- Scope 1 & 3



- The sharpened climate targets
- Gas Turbines key technology
- Cost effective, low carbon GT solutions
- ETN Global - key enabler for collaboration & deployment



An abstract graphic on the left side of the slide. It features a central white circle with a bright cyan glow. Several white and cyan lines orbit this central point in various elliptical paths. Some lines have small white dots at their ends, and there are small cyan and purple dots scattered around the orbits.

# SIEMENS energy

## We energize society

We are...

- Committed to climate neutrality in own operations by 2030
- Prepared to be 100% Hydrogen-ready by 2030
- Committed to the Energy Transition



### *RWG's Commitment Goals in the energy transition?*

- ❑ RWG is committed to helping operators of Siemens aeroderivative gas generators adapt to changes in the regulatory framework and impact this has on operational duty, performance and lifecycle costs.

### *How could ETN help, and what would be the most important areas that ETN should focus on?*

- ❑ Inform policymakers to ensure there is a clear understanding of the vital role gas generators play in the transition to a carbon neutral environment
- ❑ Facilitate collaboration with all stakeholders in our industry to foster research and development and product innovation to deliver greater fuel flexibility and efficiency improvements
- ❑ Ensure equal consideration is given to retrofit of legacy equipment, maximising utilisation of the installed operating base and safeguarding the existing supply chain





# Manfred Aigner on behalf of German Aerospace Center (DLR) Institute of Combustion Technology (DLR-VT)

- Your company's/organization's commitment/goals in the energy transition?
  - *Development of load-flexible, fuel flexible, low emission decentralized systems (MGT, CHP, ...)*
  - *Development of load-flexible, fuel flexible, low emissions combustion systems for high efficient, large GT*
  - *Innovative cycles for high efficient applications*
  - *Sustainable Fuels: production, characterization and optimization for different applications in energy supply, aviation, transport*
- How could ETN help, and what would be the most important areas that ETN should focus on?
  - *Network for all stakeholders worldwide for exchange of experience, technical information, ....*
  - *Platform to form project consortia, ETN acting as project coordinator and to find partners for European projects*
  - *Lobby for European support for R&D for future GT*
  - *Lobby for regulations supporting transition of the energy system*





## 2021 – A Consultancy View – What our clients are asking for?

- ▶ **Asset Management** (Aligns with TC 4 & TC 5)
  - ▶ GT users concerned with extending the hours of existing equipment
  - ▶ Re-lifing for alternate fuels including bio and hydrogen
  - ▶ The use of digital twins to predict remnant life in real time
  - ▶ Trying to improve efficiency whilst avoiding hot corrosion
- ▶ **Safety** (Aligns with TC 2 & TC 4)
  - ▶ The release of hydrogen within enclosures
  - ▶ The consequences of a 'flame-out' when using hydrogen rich fuels
  - ▶ The safe transportation of hydrogen - compression and leakage
- ▶ **New Initiatives** (Aligns with TC 2)
  - ▶ Reuse / Repurposing of turbomachinery
  - ▶ Turbomachinery in Energy Storage (e.g. Molten Salt & Liquid Air)
  - ▶ Development of bio-fuel technology
- ▶ We need ETN to provide the links to the whole GT community
- ▶ We want to help direct the R&D strategy and direction of TC's







**ETN**  
Global

# Vision

Safe, secure and affordable carbon-neutral energy solutions by 2030, implemented globally by 2050



# Mission

- ✓ To encourage and facilitate information exchange about carbon-neutral solutions
- ✓ To bring together and to foster cooperation among the stakeholders of the gas turbine industry, its associated equipment providers and users
- ✓ To accelerate research, development, and demonstration of solutions in line with our vision
- ✓ To influence policy and legislative issues relevant to the gas turbine industry



2021

2030

2050



# Goal 2030

To identify and demonstrate safe, affordable, carbon-neutral dispatchable energy solutions



## Key focus areas:

- ✓ Hybridisation of gas turbines with renewables and energy storage to provide flexible and dynamic solutions
- ✓ Increased energy efficiency and performance
- ✓ Increased operational flexibility within emissions regulations
- ✓ Retrofit solutions for 0 to 100 vol.% of hydrogen blends and other sustainable fuels
- ✓ Reduced carbon footprint of existing assets
- ✓ Support for the improvement and deployment of CCUS solutions
- ✓ Demonstration of cost-competitive carbon-neutral systems



2021

2030





**ETN**  
Global

# Strategy and Objectives

Key pillars

supported by ETN Working Groups and projects



Market Trends,  
Policy, Legislation



Optimised Operations



Research and  
Development



Working Groups and Projects



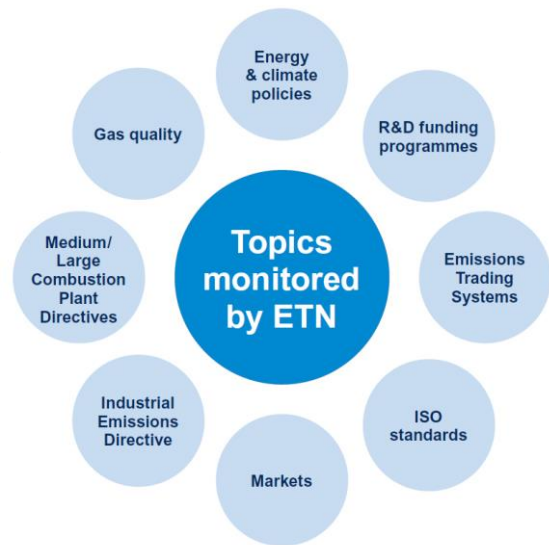


**ETN**  
Global

# Key Objectives Pillar 1

## Market Trends, Policy, Legislation

- Promotion of net-zero gas turbine energy solutions for future energy and industrial markets
- Influence energy, climate and research policy and legislative issues relevant to the gas turbine industry
- Monitor and inform on market trends





# Key Objectives Pillar 2

## Optimised operations, maintenance and retrofit-solutions

- To reduce carbon footprint and emissions of existing assets
- Digitalisation/ condition monitoring/ life assessment
- Risk mitigation and technical retrofit solutions
- Exchange of best practices
- Standardisation
- Education







**ETN**  
Global

# Key Objectives Pillar 3

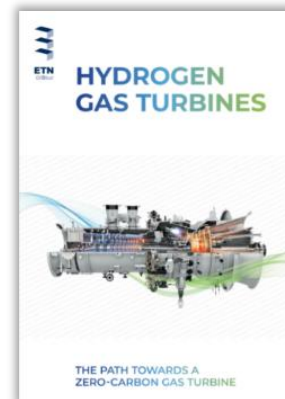
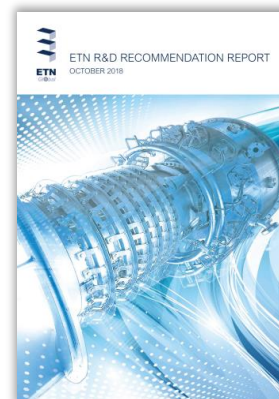
## Research and Technology Development



Development of gas turbine system solutions to meet future energy demand, in a safe, secure and carbon-neutral way

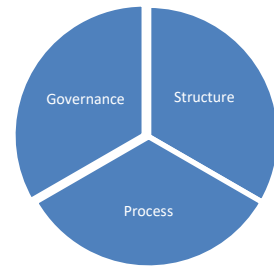
- Fuel flexibility: hydrogen, ammonia, full operability of different fuel compositions
- Carbon mitigation: CCUS, advanced cycles
- Storage solutions
- Digitalisation, additive manufacturing
- Advanced monitoring, component life management

***Details in ETN's R&D Recommendation Report and ETN Hydrogen Report***





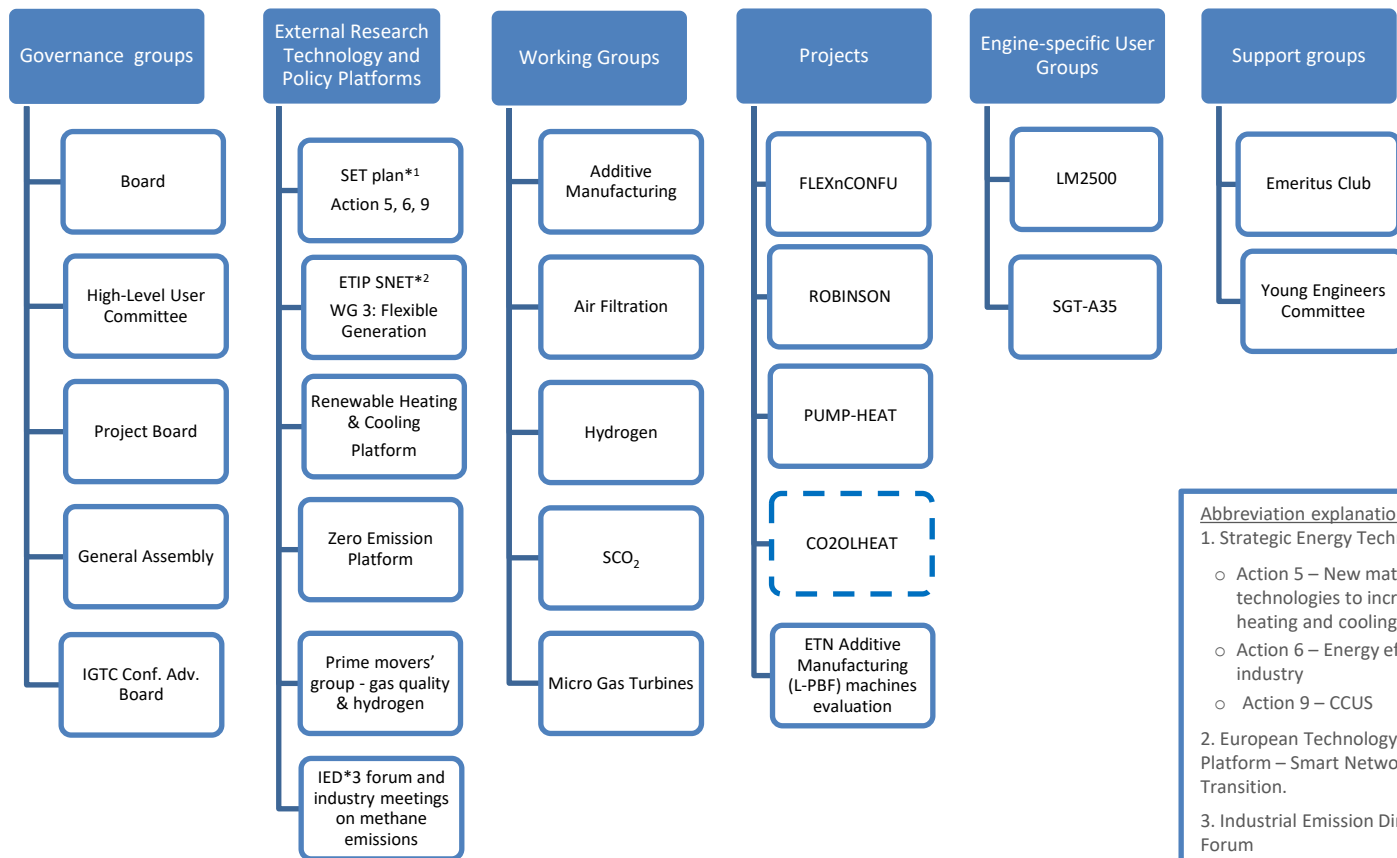
# What is new?



- Strategy and a management structure in place that will aim for a
  - balance between the three pillars
  - representation of all stakeholders in Board, Project Board and Conference Advisory Board
  - more focused approach with clear goals and objectives in all activities
  - higher engagement of our members to ensure that we focus on the right topics
- A virtual meeting platform to increase involvement and global participation
- Development of a new communication strategy to improve visibility
- Connect and cooperate with external organisations that can help us achieve our targets
- Enhanced ETN office



# Structure of ETN activities 2021



## Abbreviation explanations:

### 1. Strategic Energy Technology Plan:

- Action 5 – New materials and technologies to increase efficiency of heating and cooling for buildings.
- Action 6 – Energy efficiency for industry
- Action 9 – CCUS

### 2. European Technology and Innovation Platform – Smart Networks for Energy Transition.

### 3. Industrial Emission Directive (IED) Forum



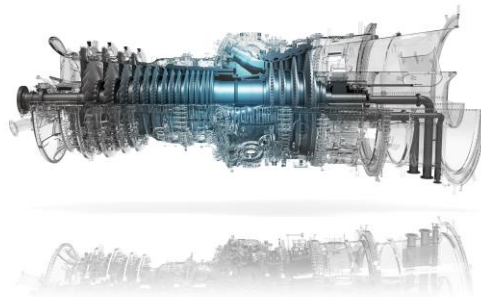
# Roadmap 2030

## Engage, coordinate, impact

- Recognition and numerical increase of membership on a global base
- Numerical increase of the global gas turbine user community (utilities, oil & gas and industrial users) with members from all continents
- Strong and coordinated “Voice” that will help us to achieve our vision
- Coordinate and highlight R&D needs and lobby for new project opportunities
- Become the global dissemination platform for gas turbine related research and demo projects
- To become an umbrella or interconnecting organisation (with other associations)



# Summary



We have a unique organisation with representation from the whole value chain.

It is now up to us how we use ETN and empower it to create further value and benefits that will help us all in the energy transition.

**Any Questions?**