The Pathway Forward for Gas Turbines in a Decarbonizing Europe
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About EUTurbines

The association of European gas and steam turbine manufacturers

**Energy & Climate Policy**
- Advocating for a technology-neutral approach when selecting power generation technologies
- Promoting the role of turbines in the future decarbonised energy system
- Highlighting the diversity of turbine applications

**Research Policy**
- Stressing the R&I needs for turbine-based power generation
- Favouring an industry-driven approach to energy R&I and in line with the Strategic Energy Technology Plan

**Industry Policy**
- Calling for a framework that encourages manufacturing in Europe and be globally competitive
- Supporting the activities of the #Industry4Europe coalition

**Technical Regulation**
- Ensuring ambitious as well as realistic, sustainable and cost-effective technical regulation
- Covering a wide-range of topics: emissions, network codes, gas quality...
Turbines – Converting Many Sources

- Bioenergy
- Solar
- Stored heat
- Geothermal

- Coal
- Nuclear

- Gas Turbine
- CCGT: Combined Cycle Gas Turbine

- Generating power with steam
- Generating power and heat with fuel

- Biomethane
- Liquid renewable fuels
- Waste gases
- Synthetic methane
- Hydrogen

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The 2050 Vision of Europe’s Energy System

Developed in the frame of the European Technology and Innovation Platform „Smart Networks for the Energy Transition“ (ETIP SNET)
The 2050 Vision of Europe’s Decarbonised Energy System

“A system of systems (combining gas, heat & electricity grids)

Power conversion and flexible energy storage

Seasonal storage (gas, liquids or other non-battery massive storage)

Low-cost efficient balancing energy

„Thermal power generation – mainly running with renewable energy sources – provides flexibility and ensures electricity and heat supply during times with limited or less renewable energy supply“
Mind the gap!
The challenges: Availability and Capacity

The end of the year 2019 in Germany

The RES availability challenge:
- Total RES capacities = 125 GW
  - Wind onshore = 53.4 GW
  - Wind offshore = 7.7 GW
  - PV = 49.2 GW

The storage capacity challenge:
- Battery storage today < 0.1GWh
- Pumped storage today: 38 GWh (= 30 GW for 1.3 hrs)
- E-mobility potential: ca 1.3 TWh (= 30 GW for 43 hrs)
  (= if all 44 mill cars would have batteries connected to the grid)
"... A power sector must be developed that is based largely on renewable sources, complemented by the rapid phasing out of coal and decarbonising gas. ..."
The pressure on fossil gas power

- **550 g CO₂ / kWh**
  Limit for participating in capacity mechanisms
  EU regulation on electricity markets - decided in June 2019

- **250 g CO₂ / kWh**
  Limit for funding by European Investment Bank
  EIB Energy Lending Policy – published in November 2019

- **100 g CO₂ / kWh**
  Suggested limit for sustainable electricity generation
  EU Taxonomy Technical Expert Group Report – under discussion for legislation

- ?
Investments in gas power generation are needed, but will soon need to demonstrate that they are future-proof by being „renewable-gas ready“.
Why gas power plants in the future energy system?

Decarbonisation gains via coal-to-gas switch
Flexibility and grid stability
Sector coupling: connecting gas, electricity and heat grids

Obvious immediate benefits

In a carbon-neutral system

Power and heat from green hydrogen
Utilising existing gas grid (seasonal) storage capabilities
Adapting existing assets into dispatchable renewable energy

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How much Hydrogen for Power Generation in 2050?

Source: “Gas for Climate” study by Navigant - “optimised gas scenario”

Dispatchable power generation with renewable gas = 12% of total electricity production (but 29% of capacity)
Our Commitments

**Today**
1. Providing gas turbines operating with renewable gases generated from carbon-neutral sources/synthetic fuels, such as synthetic methane.
2. Providing turbines that can operate with a mix of natural gas and 3-5% hydrogen, while ensuring safety and compliance with emission standards.

**By 2020**
3. Delivering in Europe only gas turbines that are capable of running with renewable gas for power generation purposes.
4. Providing customers with gas turbines that can handle a share of 20% hydrogen.
5. Providing retrofit solutions for existing power plants to make them fit for renewable gases.

**By 2030**
6. Meeting customer demand for gas turbines operating with 100% hydrogen.

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Future-proof solutions

**Future-proof technology**
- Retrofit solutions allow switching to renewable gases when these are available in sufficient quantities
- New plants will be capable to operate with increasing amounts of renewable gases or can be retrofitted

**Smart utilisation of existing infrastructure:**
- Meeting the energy demand during seasonal peaks or Dunkelflaute
- Providing the flexible back-up to the high share of variable renewables, ensuring the stability of the grid and security of supply
- Supporting the decarbonisation of heating via highly efficient cogeneration plants
Further information

On the commitments:
www.powertheeeu.eu

On EUTurbines:
https://www.euturbines.eu/

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Summary: the gas-plant in 2050

- Operating on renewable gases
- Fast-adapting to variable gas qualities
- Very low NOx emissions
- Batteries integrated to allow fast start
- Smaller decentral cogeneration units (mostly aeroderivatives/ recips)
- Thermal or hydrogen storage integrated for optimised operation

Few central large peaking plants - OCGTs, optimised for low operating hours and low CAPEX

Source: GE