European Engine Power Plants Association EUGINE

EUTurbines

Taxonomy Delegated Acts - Climate Change Mitigation

Request for "transition activity" for gas power generation & cogeneration

In short:

- The screening criteria for power generation and cogeneration with gas suggested by the TEG Report are not sufficient and should be accompanied by additional criteria for "transition activity"
- Power generation / cogeneration with gas cannot meet the general 100gCO_{2e}/kWh threshold today – not because of technical limitations, but due to a limited availability of renewable gases, like hydrogen, as input
- During the transitional phase, until sufficient renewable gases are available, additional "transition activities" shall be included. This enables a fast decarbonisation, ensuring the energy system reliability and stability.
- The transition activity threshold for power generation with gas shall acknowledge the flexible operation needed to balance variable renewables. Therefore, an annual maximal amount of 876kg CO_{2e} per kW (=100gCO_{2e} per kWh emitted over full year) should be the limit.
- The transition activity threshold for cogeneration with gas shall be linked to the existing definition of "high efficiency cogeneration" in the Energy Efficiency Directive and require 20% primary energy savings compared to separate production of heat and electricity.
- Hydrogen-readiness of the equipment shall ensure that there is no carbon lock-in.
- The manufacturing of any technology that enables taxonomy-compliant economic activities shall be classified as "enabling activity" under "manufacturing of low carbon technologies" and accordingly be taxonomy-compliant

1. POWER GENERATION with GAS

Why the proposal of the TEG report is not sufficient for gas power generation:

The sustainability approach of the TEG report is not sufficient for power generation with gas as it considers only the direct individual climate mitigation impact of a single activity, disregarding the positive contribution to an overall sustainable energy system and security of supply.

The climate-neutral energy system will rely heavily on variable renewable electricity generated from wind and sun. Both are not constantly available. A reliable energy supply, which always ensures that demand from industry and consumers is met, needs to be ensured by additional flexibility solutions like storage and flexible dispatchable generation. This challenge is quickly growing along with the growing share of these variable renewables in the overall energy mix.

EUGINE
European Engine Power Plants Association
www.eugine.eu

EUTurbines
European Association of Gas and Steam Turbine Manufacturers
www.euturbines.eu

Lyoner Str. 18
60528 Frankfurt/Main
Germany
Phone +49 69 66 03-19 36
Fax +49 69 66 03-29 36
patricia.seizer@eugine.eu

Boulevard A. Reyers 80
1030 Brussels
Belgium
Phone +32 2 706-82 12
Fax +32 2 706-82 10
magdalena.kurz@euturbines.eu

Gas power plants are the flexibility source for all needs – from short imbalance periods throughout the day to long-term and seasonal gaps, where batteries are not suitable. By this, they support the fast increase in variable renewable power generation via ensuring a stable energy supply. Their role is to be available when wind turbines and PV cannot deliver.

Gas power plants are not limited to the use of natural gas but can operate with renewable gases like hydrogen or biogas/biomethane. This makes them compatible with a fully climate-neutral energy system, where they continue to provide the valuable flexibility for a stable and reliable energy system in a sustainable way.

Adding a taxonomy-compliant "transition activity"

The general climate mitigation threshold for power generation suggested by the TEG is 100g CO_{2e}/kWh. The determination of this limit in the TEG report is not convincing and the threshold not applied in a technology-neutral way to all power generation activities - however, this shall not be questioned here as criteria for "own-performance activities".

The ability for gas power plants to stay below the threshold of 100g CO_{2e}/kWh depends on the gas used by the plant. In case sufficient hydrogen, biomethane or other renewable gases are available, power generation with gas can stay below the mentioned limit. However, today, the necessary quantities are not yet available and, accordingly, most gas power plants use natural gas.

The Taxonomy Regulation foresees additionally "transition activities" and "enabling activities". Power generation with gas matches the general requirements for being a transition activity as it supports the fast transition of the energy system:

- Quickly replacing coal by gas power plants using natural gas reduces the GHG emissions by around 50% – which is a substantial contribution to climate change mitigation as greenhouse gases accumulate.
- There is no other technically and economically available alternative to this solution.
- There is no carbon lock-in as the plants can switch to hydrogen and other renewable gases whenever these become available in adequate quantities through the gas grid.

Suggested threshold and additional requirements

Declining threshold:
Power generation with gas with annual emissions lower than 876kg CO2e per kW is eligible, declining in the same way as the 100g CO_{2e}/kWh threshold for own performance activities.

Additional requirement to avoid carbon lock-in:

Gas power plants must be capable of handling at least 20% hydrogen and be retrofittable for operating with 100% hydrogen. As of 2030, all new gas power plants must be capable of operating with 100% hydrogen.

Additional requirement to ensure best available technology use:

A single cycle gas turbine or gas engine may not emit more than 500g CO_{2e}/kWh direct emissions (turbine/engine plus generator only). For smaller equipment <5MWel, a limit of 550g CO_{2e}/kWh direct emissions (turbine/engine plus generator only) applies.

A combined cycle gas turbine or gas engine may not emit more than 350g CO_{2e}/kWh direct emissions (turbines/engine plus generator only).

Acting mainly as reliable back-up for variable power generation, these gas power plants will not operate constantly, but jump in, when wind and PV do not sufficiently deliver. This may be for a few hours per day during peak demand or it may be during several weeks in winter with little sun and wind but high energy demand, e.g. for heating. This results in a limited number of operating hours per year and accordingly the plants will not emit GHG constantly but only in periods when the energy system has no alternative. While the concept of emissions per kWh targets a constant generation, setting an annual threshold for the amount of emissions would better mirror the flexible operating mode.

According to the general threshold suggested in the TEG report, any type of power generation operating every day around the clock would be fully taxonomy-compliant as long as it emits less than 100g CO_{2e}/kWh. Calculating this for a full year, would allow a maximum emission of 876kg CO_{2e} per annum per kW, while being fully taxonomy-compliant.

It is therefore suggested to limit the operation of these dispatchable power plants to exactly the same amount per year. This would avoid any additional burden for the climate but allow the flexible operation, needed to ensure security of supply.

The advantages of the proposal:

- The overall GHG emission to the atmosphere stays limited to what is regarded anyhow as taxonomy-compliant
- The planned reduction of the 100g CO_{2e}/kWh threshold every 5 years can be easily transferred to the transition activity threshold
- There is an automatic incentive for investing in low-emitting plants as these could operate more hours without reaching the annual limit
- The annual amount covers short-term peak power supply as well as seasonal operation
- A growing decarbonisation of gas supply reduces the emissions

Relating to transition activities the TEG report requires additional safeguards for avoiding carbon lock-in and ensuring the best performance in industry. Therefore, the following additional requirements are suggested:

<u>Avoiding carbon lock-in by being hydrogen-ready:</u>

A carbon lock-in can be avoided if the components used in the production of electricity with gas can not only operate with natural gas but are capable of switching to hydrogen and other renewable gases whenever these are available. This shall be ensured by the technology's "hydrogen-readiness".

As soon as the transition of the gas supply to renewable gas progresses, power generation can use these gases instead of natural gas – and fit accordingly into a climate-neutral energy system.

- Gas power plants must be capable of handling at least 20% hydrogen and be retrofittable for operating with 100% hydrogen
- As of 2030, all new gas power plants must be capable of operating with 100% hydrogen

<u>Ensuring best available technology</u>:

This shall ensure that the annual limit is not used by inefficient highly polluting technology and that state-of-the-art core technology is used in the power plants. This does not refer to the full gas chain but focuses on the main power plant technology: turbines or engines and generators.

- A single cycle gas turbine or gas engine may not emit
    - more than 500g CO_{2e}/kWh direct emissions (turbine/engine plus generator only) if ≥5MW
    - more than 550g CO_{2e}/kWh direct emissions (turbine/engine plus generator only) if <5MW

- A combined cycle gas turbine or gas engine may not emit more than 350g CO_{2e}/kWh direct emissions (turbines/engine plus generator only)

The differentiation is suggested as single cycle and combined cycle power plants have different efficiencies and flexibilities, as well as different investment costs and application purposes. Additionally, the smaller engines, used mainly in decentral applications, have a different efficiency for technical reasons.

Fulfilling these requirements ensures that not more GHG are emitted to the atmosphere than when falling under the own-performance criteria, but would allow gas power generation to support the massive integration of more variable renewable energy, without compromising the supply of sufficient flexible energy to match demand at all times. With the growing availability of hydrogen and renewable gases, a decarbonisation of the electricity production with gas will take place, reducing the need for this additional requirement – the typical nature of a "transitional" activity.

2. COGENERATION with GAS

Why the proposal of the TEG report is not sufficient for cogeneration with gas:

Cogeneration, the simultaneous generation of electricity and heat or cold is the most efficient energy technology. It reaches efficiency levels up to 95%. The EU, therefore, recognises cogeneration as a core technology to reach the EU climate targets and explicitly lists the solution in the Energy Efficiency Directive.

This technology will be very valuable in the upcoming challenge of decarbonising the heating sector, which is dominated by far less efficient boiler-oriented solutions providing only heat.

The dominating primary energy source in many existing large cogeneration units is still coal. During recent years, the phasing out of these coal cogeneration plants started – often leading to a cut in GHG emissions by around 50% through the replacement by gas cogeneration units. This is an ongoing process. At the same time, the use of small cogeneration plants with gas is growing in decentral applications and larger buildings, replacing the inefficient separate generation.

When evaluating cogeneration plants and their GHG emissions, it is important to not evaluate them only by their contribution to the electricity supply, but also by their contribution to providing heat or cold. For that, GHG emissions have to be attributed with the right share to power and heat/cold.

The proposal made by the TEG report fails to adequately do so and also does not recognise the contribution of cogeneration for a successful decarbonisation of the heat supply for buildings and industrial processes.

Adding a taxonomy-compliant "transition activity"

The general criteria for power generation suggested by the TEG, the 100g CO_{2e}/kWh threshold, was developed for electricity generation and does not fit for the combined provision of heat and power.

At the same time, the emission intensity of this solution depends again on the availability of renewable gases. While massive efforts are being made by policy makers to ramp up the availability of renewable gases in the gas grid, this is not yet achieved. While cogeneration technology may be ready for a carbon-neutral future, the speed of transformation depends on

the speed of political and legislative processes to change the gas supply. This could be mirrored by introducing cogeneration with gas as a "transition activity".

Suggested threshold and additional requirements

Threshold:
Cogeneration with gas shall be eligible, if it provides primary energy savings of at least 20% compared to the separate production of electricity and heat, following the method described in the Energy Efficiency Directive (2012/27/EU) (Annex II)

Additional requirement for avoiding carbon lock-in:

Cogeneration plants must be capable of handling at least 20% hydrogen and be retrofittable for operating with 100% hydrogen. As of 2030, all new plants must be capable of operating with 100% hydrogen.

According to article 19 of the Taxonomy Regulation, the technical screening criteria should "take into account any relevant existing Union legislation" to evaluate the sustainability of an economic activity. The Energy Efficiency Directive (EED 2012/27/EU) defines "the application of high-efficiency cogeneration" that shall be promoted by Member States.

The positive impact of cogeneration is measured by comparing it to the separate production of heat and electricity.

The taxonomy screening criteria should be based on this already existing definition but could raise the level of ambition. It is therefore suggested to require primary energy savings of at least 20% as threshold – compared to savings of 10% requested by the EED – to ensure the use of the best available technology.

Avoiding carbon lock-in by being hydrogen-ready:

A carbon lock-in can be avoided, if the components used in the joint production of electricity and heat from gas can not only operate with natural gas but are capable of switching to hydrogen and other renewable gases whenever they are available. This shall be ensured by the technology's "hydrogen-readiness".

As soon as the transition of the gas supply to renewable gas progresses, cogeneration can use these gases instead of natural gas – and accordingly fit into a carbon-neutral energy system.

- Cogeneration plants must be capable of handling at least 20% hydrogen and be retrofittable for operating with 100% hydrogen
- As of 2030, all new plants must be capable of operating with 100% hydrogen

Applying this approach ensures that the benefits of cogeneration in reducing primary energy consumption and thus GHG emissions can contribute to climate mitigation. This transition activity can be phased out in line with the growing availability of hydrogen and renewable gases for the operation of cogeneration plants.

3. Manufacturing of "LOW CARBON TECHNOLOGIES"

Why the proposal of the TEG report is not adequate:

The proposal by the TEG report does not provide a technology-neutral approach for point 1 “manufacture of products, key components and machinery that are essential for eligible renewable technologies”. Instead, it hand-selects – without clear criteria – a number of technologies.

Furthermore, the approach does not define which components of the mentioned technologies would be regarded as essential nor it clarifies how to address the components that may be used in both taxonomy and non-taxonomy compliant applications. For example: Concentrated Solar Power (CSP) is among the technologies for which the manufacturing of products should be taxonomy-compliant. A CSP plant does not only consist of mirrors and needs a steam turbine to transform the collected heat via steam into electricity. The steam turbine should therefore be included, even if in other applications steam turbines might be used in non-compliant activities.

While green hydrogen and hydrogen electrolysis installation are mentioned, the manufacturing of equipment that can operate with clean hydrogen, and by this also contribute to considerable climate mitigation when replacing the use of natural gas, is not mentioned. Biogas engines, fuel cells, hydrogen turbines and engines should also be considered.

Alternative proposal for a “threshold” for energy technologies:

> Manufacture of low carbon technologies – threshold for point 1:
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> Manufacture of products, key components and machinery that are essential for eligible renewable technologies:
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> The manufacturing of all products, key components and machinery that are used in “own performance” or “transition” activities defined by the taxonomy regulation and delegated acts.

This approach follows the “enabling activity” concept of the taxonomy. When an economic activity contributes to climate mitigation via own performance or as transition activity, then the manufacturing of all products necessary to perform this taxonomy-compliant activity shall be regarded as an “enabling activity” and by this be taxonomy-compliant itself.

By this, a technology-open approach is created that supports the manufacturing of products necessary to make the energy transition a reality. There is no need to each time update the list as soon as a new technology has been evaluated positively or whenever requirements change for the climate mitigation activities.

About EUGINE and EUTurbines:

EUGINE is the voice of the European engine power plants industry, representing the leading European manufacturers of this flexible, efficient, reliable and environmentally sound technology. Engine power plants are an optimal solution for both backing-up and generating renewable energy (e.g. with biogas). Cogeneration, the combined generation of power and heat/cold, is a typical engine power plant application providing highest efficiency. For more information please see www.eugine.eu

EUTurbines is the only association of European gas and steam turbine manufacturers. Its members are Ansaldo Energia, Baker Hughes, Doosan Skoda Power, GE Power, MAN Energy Solutions, Mitsubishi Hitachi Power Systems, Siemens Gas and Power and Solar Turbines. EUTurbines advocates an economic and legislative environment for European turbine manufacturers to develop and grow R&I and manufacturing in Europe and promotes the role of turbine-based power generation in a sustainable, decarbonised European and global energy mix. For more information please see www.euturbines.eu