EUROMOT POSITION

EU PLATFORM ON SUSTAINABLE FINANCE'S DRAFT REPORT ON 4 REMAINING ENVIRONMENTAL OBJECTIVES OF THE EU TAXONOMY – POWER SECTOR CONCERNS

23 September 2021

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1. General background

The Annex to the EU Platform on Sustainable Finance's (the "Platform") Draft report on non climate-related environmental objectives of the EU Taxonomy proposes Technical Screening Criteria (TSC) for a number of economic activities. Within the power sector, **activity 3.9 (Electricity generation from natural gas**, and related cogeneration activity **3.14**) is the most relevant to EUROMOT. Additionally, given the fact that very similar TSCs are set for many activities within the power sector, the comments made below can be extended to other activities also relevant to EUROMOT: **2.9** (Manufacture of equipment generating electricity and/or heat), **3.10** (Electricity generation from renewable non-fossil gaseous fuels, and related cogeneration activity **3.15**) **and 3.11** (Electricity generation from biogas, and related cogeneration activity **3.16**). Moreover, this paper should be taken into consideration jointly with the EUROMOT response to the Platform's public consultation on the draft report, to which this paper is attached.

In particular, five "Substantial Contribution" (SC) criteria related to the objective of "Pollution Prevention & Control" (PPC) covering life-cycle emissions are proposed. Additionally, activity-specific criteria limits have also been set in order to ensure that EU legal requirements applying to direct emissions are fulfilled. SC thresholds are said to be based on life-cycle pollution data from scientific publications and recent Environmental Product Declarations (EPDs) covering power generation using different technologies. According to the analysis conducted by the Platform on this selection of sources, the activities taken into account <u>are in principle capable of fulfilling</u> the proposed TSC. To be noted (as a general comment): <u>very few data are available (in some cases no data at</u>

all) on life-cycle pollutant emissions for many of the included activities, yet TSC for such activities are proposed.

The following SC criteria have been proposed in the Platform's Annex:

- **Acidification potential** (AP) (kg SO2eq per MWh) (conversion factors based on Hauschild & Wenzel, 1998):
    - Three alternative limit options (0.05/0.10/0.15) are proposed.
    - High performing natural gas CCGT plants with **low** upstream pollution impact from (upstream) fuel provision are said to comply **only** with the highest option value of 0.15 kg SO2eq per 1 MWh of electricity output to the power grid or to directly connected customers. Natural gas activities do not fit the two other options (according to the Platform's Annex).
- **Photochemical ozone creation potential** (POCP) (kg C2H2eq per MWh)
    - Proposed limit is 0.05 per 1 MWh of electricity output to the power grid or to directly connected customers.
    - Most natural gas CC are said to be able to comply with this (according to the Platform's Annex).
- **Eutrophication potential** (kg PO43-eq. per MWh) (conversion factors based on Heijungs et.al (1992))
    - Proposed limit is 0.05 kg PO43- eq per 1 MWh of electricity output to the power grid or to directly connected customers.
    - Partly achieved by gas CC (according to Platform's Annex).
- **PM10** (kg per MWh)
    - Proposed limit is 0.05 kg/per 1 MWh of electricity output to the power grid or to directly connected customers.
    - Statement: *Most gas* CC said to achieve this criterion (according to the Platform's Annex).
- **PM 2.5** (kg per MWh)
    - Proposed limit is 0.02 kg/per 1 MWh of electricity output to the power grid or to directly connected customers.
    - Gas CC said to be able to comply (according to the Platform's Annex).

The results of the data **analysis on AP** (of Activity 3.9) is summarized in a **chart at page 490** of the Platform's Annex. Concerning the **other proposed criteria, no background information** is provided that would help the reader assess the rationale of the proposed limit values. **EUROMOT tried to assess** the AP chart (as well as the proposed limit values for the other criteria) based on the sources quoted in the Platform's Annex and on additional material found on the Internet. This was **already very challenging, as in many cases said sources in the Platform's Annex are not freely publicly available: one has to purchase them, which could further undermine taxonomy usability**. EUROMOT's assessment reveals the following (further details in next paragraphs of this paper):

- **Equivalent factors** for SC criteria on Acidification potential and Eutrophication potential, based on the (scarce) given information, are **very difficult to find.** For the proposed SC criteria on Photochemical ozone creation potential, PM10 and PM2.5 **no information** is provided about the methodology to be applied. See further discussion below.
- **No information** is provided on the background data for the proposed limit values on the Eutrophication potential, Photochemical ozone creation potential, PM10 and PM2.5.
- All proposed SC thresholds are expressed in "*…eq per 1 MWh of electricity output to the power grid or to directly connected customers*". EUROMOT believes that such a measurement of SC criteria is unclear for the downstream sectors and could be improved. In

2017 LCP BREF (https://eippcb.jrc.ec.europa.eu/sites/default/files/2019-11/JRC_107769_LCPBref_2017.pdf), page 730, chapter 10, table "*Definitions*", "*Net electrical efficiency (combustion unit and IGCC)*" is defined as "*Ratio between the net electrical output (electricity produced on the high-voltage side of the main transformer minus the imported energy – e.g. for auxiliary systems' consumption) and the fuel/feedstock energy input (as the fuel/feedstock lower heating value) at the combustion unit boundary over a given period of time*". On this basis, the abovementioned text in the Platform's Annex should be changed to ".. *per 1 MWh of electricity output (of the high-voltage side of the main transformer if installed) to the power grid or to directly connected customers*", for the sake of clarity.

In below text the proposed SC criteria are discussed in more detail.

2. Acidification potential (AP)

At page 490 of the Platform's Annex the results of the analysis for acidification potential (AP) are shown in a chart. A review of the scientific publications referred to as the basis for said chart shows the following:

- Annex of the Platform draft report says that the acidification potential should be calculated based on conversion factors to be found in «***Hauschild & Wenzel 1998***». However, this source (article title) is never actually quoted in the Platform's Annex => **for a Taxonomy user, it is almost impossible to make right calculations (based on correct factors) and properly evaluate the acidification potential**.
- **EUROMOT still tried to calculate natural gas engines' acidification potential based on this quoted source, which actually contains tables (included as an Annex to this paper) with acidification potential equivalence factors.**
- In the abovementioned chart at page 490 of the Annex to the Platform's Draft report, the grey bar estimates (based on this source – said to be based on 23 case studies for natural gas) acidification potentials of natural gas CC plants. If we look at said source, it indeed contains at page 10 overall estimations (fuel provision included) for NOx (0.2 – 1.3 kg/MWh) and SO2 (0.01 – 0.32 kg/MWh) for **natural gas CC** plants. Using the abovementioned acidification equivalent factors (in Annex 1 of this paper) we get a range of **0.15 – 1.23 kg SO2eq/MWh**. Two comments:
  - On **Data presentation:** Grey chart bar (at abovementioned page 490) has to be extended upwards in order to correctly represent data (upper end of the bar stops at 0.4)!
  - On actual estimations of acidification potential: Typical fuel provision part is reported (in the above mentioned source) as 0.1 – 0.5 kg/MWh for NOx and **might contribute 80 – 90 % of the overall SO2 emission, I.e. the upstream gas fuel acidification potential factor could typically be in range of about 0.08 … 0.64 kg SO2eq/MWh! This needs to be carefully taken into account when setting acidification potential limits for power generation, in a worldwide market where low-pollution (upstream) fuel provisions might be still far away from large-scale availability**.

This is even more crucial as the EU Taxonomy has the ambition to act as a worldwide reference in terms of Sustainable Finance.

- Moreover, it should be noted that the same source states that abovementioned figures **do not include NOx and SO2 impact from commissioning and decommissioning of the plant**, which means that:
  - **The principle of full LCA (ISO 14040) is not fulfilled.**
  - Should such impact from commissioning and decommissioning be taken into account, the lower end of the range would probably be higher than 0.15 SO2eq/MWh => None of the 3 threshold options (0.05, 0.10 and 0.15) proposed by the platform would probably be reachable even by the best performing plants (unlike what the Platform's rationale says at page 490).

- This source does not contain any acidification potential (AP) data as claimed.
- Chart source indicated as [7] in the chart at page 490 is missing in the sources list at page 494 of the Platform's Annex.
- Source indicated as [8] in the page 490 chart (this article) is a complete EPD of a CCGT (2*380 MWe) plant. Power plant receives natural gas from the Italian gas grid through an about 300 m long connecting pipeline inside the plant property area. I.e. plant has optimal logistics - reported upstream Acidification Potential is only 0.084 kg/MWh! Note: **Given the exception circumstances (very low gas provision impact (upstream pollution) – see above 2nd sub-bullet point), it cannot be considered as representative to set Acidification Potential thresholds.** Despite the low upstream pollution (fuel provision) impact, the reference reported anyway a value of 0.17, higher than the proposed 0.15 limit!
- Source indicated as [10] (OMV) in the page 490 chart (Romanian 860 MWe CCGT plant, to be found just below the 0.15 value) is said to be based on measured NOx/SOx stack emission monitoring plant data and calculated pollution data from upstream gas field operation. EUROMOT calculations based on data in table 2 in source https://www.ebrd.com/english/pages/project/eia/39974.pdf , show that the upstream impact for this plant is indeed in the lower end of the typical range shown in above 2nd sub-bullet point (0.08 … 0.64 kg SO2eq/MWh). However, impacts from materials extraction and component manufacturing stages (as well as impact of commissioning and decommissioning of the plant) are still missing => once again, **this is not in keeping with a full LCA ISO 14040 principle!** (and if such a principle is applied, total values would probably be higher).

Conclusions on acidification potential

- In general, **analysis does not seem to be robust nor transparent enough to set a threshold (i.e. not based on Scientific criteria!)**:
  - **Sources used in the analysis are difficult to find, and it is difficult to understand what equivalence factors have been used and how**.
  - **Few gas-fired power plants were included in the quoted sources, and for some of these the presented Acidification Potential data is not LCA-complete** (building/decommissioning phases or impact from material extraction not taken into account, etc,) thus analysis is not robust. All background data used in the analysis is not shown in the Annex and thus the approach is not fully transparent.
- Even when EUROMOT tries to calculate acidification potential based on the few (and not fully clear) quoted sources (see above), it seems that **none of the 3 proposed threshold options for the Acidification Potential are representative for the gas power plants sector (probably even the best performing ones cannot achieve the least strict of the 3 thresholds if a full LCA is done).**
- **Impact of upstream emissions: the likely scarce worldwide availability of «low upstream pollution» natural gases needs to be taken into account**. **The risk with**

setting unachievable thresholds (with the current gas market composition) is that finance will be diverted from the power generation sector altogether, making more difficult the unleashing of the "greening" potential of this sector (same as for its decarbonization potential).

3. Eutrophication potential (EP)

Proposed limit is **0.05 kg PO43- eq per 1 MWh** of electricity output to the power grid or to directly connected customers. According to the draft report's Annex, gas CC should be able to partly comply with this threshold.

No background information for the analysis resulting in above conclusion is provided.

In the text below EUROMOT has reviewed two scientific sources and one EPD for a NGCC in natural gas operation, quoted in the Platform's Annex:

- EUROMOT calculation based on this article and on the equivalence factors reported in the Annex to this paper: 0.0054 kg Peq per MWh = **0.0165** kg PO4-3eq per MWh
- Data from this article, and equivalence factors reported in the Annex to this paper are applied:
  - **0.06** kg PO4-3eq per MWh for CC (- 21.01 g/MWh for transmission + distribution if excluded)
  - **0.15 kg** PO4-3eq per MWh for CHP gas engine (- 21.01 g/MWh for transmission + distribution if excluded)
- Data from this EPD : **0.025** kg PO4 -3eq per MWh

Conclusions on Eutrophication potential

Only 3 reference publications were found/available. Two out of these three (i.e. "partly achieved") sources indicate that the CC gas plant would fulfil the proposed criterion ("partly achieved"). However, is to be noted that the abovementioned EPD is a special case: the plant is said to be equipped with a "zero liquid discharge" system allowing reuse of the entire water intake used during the process and thereby eliminating the need for external drainage. Moreover, the value found in the second of the three sources listed above (breaching proposed limit value) seems too low, as reported transmission/distribution network impact is very low, whereas copper used in cables is reported to have a high impact (see page 11 of this source). Are the values reported in this source too low/reliable?

Especially in cases with long transmission lines, the set threshold would probably be unreasonably too low and higher limit values should be set.

4. Photochemical ozone creation potential (POCP)

Proposed limit is **0.05 kg C2H2 eq per 1 MWh of electricity** output to the power grid or to directly connected customers. Criteria is **said to be achieved by most gas CC** according to Platform Annex.

No background information for the analysis resulting in above conclusion is provided.

In the text below EUROMOT has reviewed two scientific sources and one EPD for a NGCC in natural gas operation, quoted in the Platform's Annex:

- EUROMOT calculation based on this article and on the equivalence factor reported in the Annex to this paper: 0.617 kg NMVOC per MWh = about **0.257** kg C2H2eq per MWh
- Data based on this article and on the same equivalence factor reported in the Annex to this paper:
  - **0.031** kg C2H2eq per MWh for CC (- 0.00088 kg per MWh for transmission + distribution if excluded)
- Data based on CCGT plant in this EPD and on the same equivalence factor reported in the Annex to this paper : **0.062** kg C2H2eq per MWh

Conclusion on POCP

Only 3 reference publications were found/available. **Only one** out of these three ("achieved by most ??") sources indicates that the CC gas plants would fulfil the criterion. To be noted is that the "optimized" CCGT plant in the 3rd of the sources listed above is not fulfilling the proposed limit, as the **upstream natural gas production and the gas drying processes contribute significantly (said to be main sources) to the NMVOC emission**. Based on this, how reliable is the reported impact in the second of the sources listed above?

Moreover, it should be noted that **the table in the Annex to this paper does not contain equivalence factors for NOx, but the Platform's Annex mentions NOx as a key parameter for POCP**.

For these reasons **EUROMOT believes that:**

- **the proposal on POCP is not robust enough – too few and unclear references used as background for the proposed limit. More references need to be gathered and analysed before setting the limit**.
- **from the scarce data and sources that are available, it does seem that the proposed POCP criteria cannot be fulfilled by the big majority of gas burning plants (not even by the best performing ones)**

5. PM 10 / PM 2.5

Proposed limits are **0.05 kg PM10 and 0.02 kg PM2.5 per MWh of electricity** output to the power grid or to directly connected customers. PM10 criteria is said to be achieved by most -, PM2.5 achieved by gas CC according to Platform Annex. In the text below EUROMOT has reviewed one scientific source and one EPD for a NGCC in natural gas operation, quoted in the Platform's Annex:

- Data based on this article: **0.757 kg PM10eq** per MWh
- Data based on CCGT plant in this EPD :
  - **0.0041 kg PM10** per MWh
  - **0.011 kg PM2.5** per MWh

Conclusion on PM 10 / PM 2.5

PM 10: Only 2 reference publications were found/available, one out of these 2 ("achieved by most??") sources indicate that the CC gas plant would fulfil the criteria. According to the first of the two sources, quote: "***Natural gas extraction operations contribute more than 90% of total***

particulate matter formation impacts". In the second source (above EPD) **reported PM 10 emission is lower than reported PM 2.5 emission for e.g. the "core process operation"**. PM 2.5 emission is part of PM 10 and thus an error (?) is in the reported material. How correct are reported figures in this source? For these reasons EUROMOT believes that **the proposal on PM10 is not robust enough** – too few and unclear references used as background for the proposed limit. More references need to be gathered and analysed before setting the limit.

PM 2.5: Only 1 reference publication was found/available, ("achieved ??"), which indicates that the CC gas plant would fulfil the limit. The proposal on PM2.5 **is not robust enough** – too few and unclear references used as background for the proposed limit. More references need to be gathered and analysed before setting any limit. Moreover, considering the high level of accuracy needed to measure such small particulate matter and low emission values, it can be questioned how reliable full LCA emission estimations can be (from well to plant).

6. General conclusions

As explained above and in the EUROMOT response to the questionnaire, it is difficult to evaluate whether the proposed criteria represent state-of-the-art because of **lack of clarity and easy understanding of the criteria themselves and of their rationale, as well as because of lack of actual data**. However, based on some of the scientific sources quoted in the Platform's Annex, EUROMOT tried to estimate the proposed criteria for natural gas plants. In some cases (**Acidification potential (AP), POCP, PM2.5**) **they don't seem to reflect state-of-the-art – e.g. AP in some cases is not based on a full LCA assessment**. In other words, these proposed criteria cannot be fulfilled by the big majority of gas burning plants (not even by the best performing ones). In other cases (especially for other criteria than AP)**, the Platform's analysis is based on too few evidence/sources, and upstream emissions (most notably for POCP and PM) seem to be the most impactful**. Like for the Acidification Potential criteria, such thresholds should also be reassessed.

Moreover, EUROMOT believes that **a distinction needs to be made between "base-load" plants and "grid-stabilizing" plants**. The latter, enabling the fast penetration of low-emissions intermittent renewable electricity in the grid, should be considered as Taxonomy-compliant. See also the EUROMOT reply to the questionnaire.

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Annex 1 (based on this quoted source)

Acidification potential equivalent factors [29].

Emission	SO_2 equivalent factor
1 kg SO_x as SO_2	1 kg eq SO_2
1 kg NO_x as NO_2	0.7 kg eq SO_2
1 kg NH_3	1.88 kg eq SO_2
1 kg H_2S	1.88 kg eq SO_2
1 kg HF	1.6 kg eq SO_2
1 kg HCl	0.88 kg eq SO_2
1 kg SO_3	0.8 kg eq SO_2
1 kg NO	1.07 kg eq SO_2
1 kg H_2SO_4	0.65 kg eq SO_2
1 kg HNO_3	0.51 kg eq SO_2
1 kg H_3PO_4	0.98 kg eq SO_2

Eutrophication potential equivalent factors [30].

Emission	PO_4^{3-} equivalent factor
1 kg PO_4^{3-}	1 kg eq PO_4^{3-}
1 kg COD (Chemical O_2 Demand)	0.022 kg eq PO_4^{3-}
1 kg NO_x as NO_2	0.13 kg eq PO_4^{3-}
1 kg NH_3	0.35 kg eq PO_4^{3-}
1 kg NO_3^-	0.1 kg eq PO_4^{3-}
1 kg NH_4^+	0.33 kg eq PO_4^{3-}
1 kg N	0.42 kg eq PO_4^{3-}
1 kg P	3.06 kg eq PO_4^{3-}

Photochemical ozone creation potential equivalent factors [32].

Emission	C_2H_4 equivalent factor
Alkane	0.398 kg eq C_2H_4
Alkene	0.906 kg eq C_2H_4
Butane	0.363 kg eq C_2H_4
CH_4	0.007 kg eq C_2H_4
CO	0.036 kg eq C_2H_4
Ethane	0.082 kg eq C_2H_4
Ethylene	1 kg eq C_2H_4
Ethylbenzol	0.593 kg eq C_2H_4
Formaldehyde	0.421 kg eq C_2H_4
Heptane	0.529 kg eq C_2H_4
Hexane	0.421 kg eq C_2H_4
NMVOC	0.416 kg eq C_2H_4
Pentane	0.352 kg eq C_2H_4
Propane	0.42 kg eq C_2H_4
Propene	1.03 kg eq C_2H_4
Toluol	0.563 kg eq C_2H_4
Xyloles	0.849 kg eq C_2H_4
Aromatic CHs	0.761 kg eq C_2H_4

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