Additional input to the LVIC BREF Kick-off meeting

Brussels, 20 October 2022

1. Hydrogen as an inorganic chemical

1.1. Pure chemistry

Although the boundaries of organic chemistry are often blurred,[1] it is beyond doubt that organic chemistry requires the presence of a carbon atom. Hence, hydrogen is doubtlessly an inorganic substance.

1.2. The IED's Annex I

The scope of the IED also correctly identifies hydrogen as an inorganic chemical, in section 4.2., where it is listed among other inorganic industrial gases, and as an independent chemical.

> 4.2. Production of inorganic chemicals, such as:
>
> (a) gases, such as ammonia, chlorine or hydrogen chloride, fluorine or hydrogen fluoride, carbon oxides, sulphur compounds, nitrogen oxides, hydrogen, sulphur dioxide, carbonyl chloride;

2. Hydrogen production in other BREFs

Numerous other BREFs also deal with hydrogen production in one way or another. In this analysis, we **limit ourselves to provisions on hydrogen production within the relevant BAT-C**.

2.1. CAK

Hydrogen is included in the scope of the CAK BAT-C as being a chlor-alkali chemical, and notably the process of "cooling, purification, compression, storage and handling of hydrogen".

> SCOPE
>
> These BAT conclusions cover certain industrial activities specified in Sections 4.2(a) and 4.2(c) of Annex I to Directive 2010/75/EU, namely the production of chlor-alkali chemicals (chlorine, hydrogen, potassium hydroxide and sodium hydroxide) by the electrolysis of brine.

It is important to note that the CAK BAT-C (rather logically) only cover electrolysis *from brine* to produce hydrogen; however, typical electrolysis to produce hydrogen (from water, resulting in oxygen production at the other electrode) is not included.

The CAK BAT-C only contain a single BAT conclusion on "use of [...] hydrogen [...] as a chemical reagent or fuel" (BAT 6). No aspects regarding emissions, efficiency or energy use are covered.

2.2. FDM

Although hydrogen is used e.g. in hydrogenation of unsaturated fats, the FDM BAT-C contains no BAT conclusions on hydrogen production (or use).

[1] Not least linked to this BREF. Ammonia is doubtlessly an inorganic substances, although it is produced by living beings. Its derivative urea, which can be of living origin, is regarded as inorganic by the LVIC BREF. However, the chemist Friedrich Wöhler is regarded as the first *organic* chemist for synthesising, well yes, urea.

2.3. LVOC

The LVOC BREF does not explicitly address any aspects of *production* of hydrogen, but it deals with aspects to use excess hydrogen (i.e. remaining reagent from a hydrogenation reaction) or hydrogen generated in dehydrogenation of ethylbenzene (i.e. in the manufacture of styrene). In the first case (BAT 8a), hydrogen is used as a reagent, produced in a process not in the scope of the LVOC BREF and not addressed by any BAT conclusions in the LVOC BREF. In the second case (BAT 28, 38 and 39), hydrogen is a by-product of a petrochemical reaction. It is meaningful to address the use of this valuable by-product, but it is important to stress that the LVOC BREF does not cover production of hydrogen as such, nor does it set any requirements for emission or environmental performance levels.

2.4. REF

The REF BREF scope includes hydrogen production and the different processes of partial oxidation, steam reforming, gas heated reforming and hydrogen purification; the REF BREF also refers to the LVIC-AAF for the processes of steam reforming and purification.

The REF BAT-C limits itself to the use of hydrogen in processes to purify the materials e.g. fuel oil (BAT 25-26, BAT 34-36 (and some descriptive sections in the BREF)) and to abate emissions from those processes (BAT 22iv and BAT 24.II.ii).

2.5. WGC[2]

The WGC BAT-C covers all chemical industry activities in Annex I, but clearly allows other BREFs to define further conditions. In other words, the implicit inclusion of hydrogen production in the WGC BREF must not be interpreted as a reason not to include hydrogen production in the LVIC BREF.

> **SCOPE**
> These BAT conclusions concern the following activity specified in Annex I to Directive 2010/75/EU: 4. Chemical industry (i.e. all production processes included in the categories of activities listed in points 4.1 to 4.6 of Annex I, unless specified otherwise).

It should be noted that the WGC BAT-C, being a horizontal document, contains no BAT conclusions impacting hydrogen production directly.

3. Proposed handling of hydrogen production in the LVIC BREF

The Background document to the KoM of the LVIC BREF review proposes the following in proposal 2 to the scope of the LVIC BREF (p. 12):

> To complement the original EIPPCB proposal as follows:
>
> - To include in the scope of the LVIC BREF hydrogen production (e.g. by steam reforming, partial oxidation or electrolysis) directly associated with the production of ammonia.
> - To organise a workshop to gather information and track advances on projects on renewable and low-carbon hydrogen technology planned and/or under construction with the aim of adding a descriptive section in the LVIC BREF.

[2] In the wording of the BAT-C submitted to and approved by the Art. 75 Committee in September and October 2022, respectively.

This proposal contains four important conceptual elements, highlighted in four different colours, to which we will refer to in the following (notably section 3) using the colours of the highlighting.

4. Discussion

The following sections refer to the passages highlighted in the screenshot in section 3.

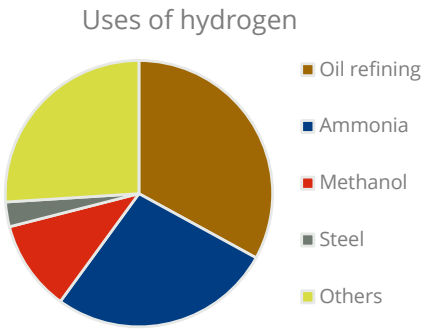
4.1. Blue: list of production processes

The Bureau's proposal correctly applies the principles of the BREF guidance (section 2.3.7) by including the different production processes to produce hydrogen.

In line with the elements displayed in sections 2.1 and 2.3 on the CAK and LVOC BREFs, respectively, it appears justified not to mention those processes where hydrogen is generated as a by-product.

4.2. Orange: association with ammonia production

According to the IEA,[3] large volumes of the hydrogen produced are used in oil refining (notably for desulphurisation and other purification processes), in methanol production and in other processes (such as hydrogenation or hydroformylation processes). It can be expected that the different processes involved in hydrogen production (the "blue" passage) are associated to varying, but substantial degrees with the different end-uses. **Data should be collected to shed light on hydrogen production – hydrogen being an inorganic substance – irrespective of its downstream use**.



A legal void would be created by excluding hydrogen production via the same processes in the "blue" sentence from the scope of the LVIC BREF, as hydrogen production associated with chemicals other than ammonia would be left without a BREF.

EEB regards the artificial limitation to the association with ammonia production as contrary to the spirit, objective and wording to the IED and as inconsistent with other BREFs.

4.3. Yellow: workshop on renewable and low-carbon hydrogen technology

The **differentiation between expected BAT candidates and techniques for discussion in the workshop appears premature and impractical**, and it appears to partially contradict the "blue" sentence.

As an example, "renewable [...] hydrogen technology" poses such a conceptual problem. A hypothetical steam reforming process fed on biomethane is easy to imagine and would run in much the same way as the same process when run on natural (non-renewable) gas. It would also lead to similar emissions. Therefore, it appears odd to exclude the process running on one input material from the BAT process while including the same process when running on another input material of identical chemical properties.

[3] IEA 2019 *The Future of Hydrogen*, esp. p. 89, available here. These data relate to a worldwide pattern of use of hydrogen; the European situation may look different in terms of percentages, but the overall pattern will be the same.

Likewise, the concept of "low-carbon hydrogen technology" may refer to an electrolysis process run on low-carbon electricity. Such a process would be excluded from BAT according to the "yellow" sentence, but included according to the "blue" sentence. Where the same process runs on electricity generated from fossil fuels, it would be included anyway. This differentiation between the input electricity appears of no relevance for the process description and for inclusion or exclusion for BAT, unless any TWG can advance credible legal justification for such a differentiation.

In the spirit of the IED, and in line with the BREF guidance[4], information should be collected first; the decision to include a technique or its feedstock or energy source should be made after data collection, not before.

The environmental, especially the climate footprint of the electricity used is of course relevant for the determination of BAT. Although Art. 9(1) of the IED still precludes setting of ELVs in permit, the wording of this article may not be used to exclude the relevance of climate aspects – after all, Art. 1 of the IED aims t protecting "the environment taken as a whole".

This principle has already been agreed and applied by the TWG in the FMP BREF, final draft in BATs 20, 21 and 22, which regard the use of "electricity generated form fossil-free sources" as one way to achieve BAT.

4.4. Grey: descriptive section in the LVIC BREF

In addition to the points mentioned in section 4.3, it would be odd to make such a decision upfront. Quite clearly, where the technical or economic maturity, or worldwide market penetration of a technique or process is insufficient, no BAT conclusion may be derived. However, precluding any such possibility before the start of data collection is premature and potentially inconsistent with section 2.2.7 of the BP.

5. Conclusion and proposal

Based on the arguments displayed in the previous sections, EEB proposes to amend the EIPPCB proposal 2 as follows (changes bolded):

To complement **and amend** the original EIPPCB proposal as follows

- To include in the scope of the LVIC BREF hydrogen production (e.g. by steam reforming, partial oxidation or electrolysis) **not covered by other BREFs**.
- To organise a workshop to **analyse the collected data and information**. **Techniques that do not allow BAT conclusions should be added in** a descriptive section in the LVIC BREF.

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[4] Notably section 2.3.7.1, which calls "to include as much information as needed in order to assess whether or not the technique may qualify, [...] as a BAT".