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BACKGROUND PAPER (BP) FOR THE KICK-OFF MEETING

FOR THE DRAWING UP OF THE

BEST AVAILABLE TECHNIQUES (BAT) REFERENCE DOCUMENT FOR THE PRODUCTION OF LARGE VOLUME INORGANIC CHEMICALS (LVIC BREF)

SEVILLE

October 2022 (Second half – tentatively)

INTRODUCTION

The Industrial Emissions Directive (IED) (2010/75/EU), through its Chapters I and II, lays down a framework requiring Member States to issue operating permits for certain installations carrying out industrial activities described in its Annex I, including the chemical industry.

The Directive stipulates that permits must contain conditions based on **Best Available Techniques** (BAT) as defined in Article 3(10) of the Directive, to achieve a high level of protection of the environment as a whole.

The BAT conclusions of the BAT reference documents (BREFs) serve as the reference for the competent authorities when setting permit conditions for installations. BREFs are also used by the industry concerned in preparing applications for operating permits. Additionally, BREFs are a source of information for other parties (including outside the EU) interested in ways to minimise the environmental impacts of industry.

BAT is a dynamic concept because new techniques may emerge; science and technologies are continuously developing, and new environmental processes are being successfully introduced in industry. Since the elements of BAT change over time, BREFs have to be reviewed and updated as appropriate. In addition, with the entry into force of the IED, the existing BREFs, which were adopted under the former IPPC Directive (i.e. Directive 96/61/EC, which was repealed by Directive 2008/1/EC), need to be reviewed and, where necessary, updated.

The purpose of this BP is to provide TWG members with an outline of the matters that are proposed to be discussed at the Kick-off Meeting (KoM). The BP also addresses some issues that were covered by the call for initial positions, but that are not proposed for discussion at the KoM.

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The KoM will determine/clarify the process for the drawing up of the Best Available Techniques (BAT) Reference Document for the production of Large Volume Inorganic Chemicals (LVIC BREF), so that TWG members are aware of the specific tasks needed to deliver a high-quality BREF according to the agreed timetable.

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ACRONYMS USED IN THIS BACKGROUND PAPER

General acronyms – Definitions

Acronym	Meaning
AN	Ammonium nitrate
AOX	Adsorbable organically bound halogens
BAT	Best Available Techniques (as defined in Article 3(10) of the IED)
BAT-AEL	Emission level associated with the BAT (as defined in Article 13(3) of the IED)
BAT-AEPL	BAT-associated environmental performance level (as described in Section 3.3 of Commission Implementing Decision 2012/119/EU). BAT-AEPLs include BAT-AELs.
BATC	Best Available Techniques conclusion(s)
BATIS	BAT information system, accessible at https://eippcb.jrc.ec.europa.eu/batis/
BP	Background Paper (i.e. this document)
BREF	BAT Reference Document (as defined in Article 3(11) of the IED)
BREF Guidance	Commission Implementing Decision 2012/119/EU laying down rules concerning guidance on the collection of data and on the drawing up of BAT reference documents and on their quality assurance
CAK BREF	BAT Reference Document for the Production of Chlor-alkali (2014)
CAN	Calcium ammonium nitrate
CBI	Confidential Business Information
CLP	Classification, Labelling and Packaging (of substances and mixtures) Regulation (EC) No 1272/2008
CN	Calcium nitrate
COD	Chemical oxygen demand
COM	European Commission
CWW BREF	BAT Reference Document for Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector (2016)
D1	First draft
DCP	Dicalcium phosphate
ECHA	European Chemicals Agency
EEA	European Environment Agency
EFS BREF	BAT Reference Document on Emissions from Storage (2006)
EIEP	European Industrial Emissions Portal
EIPPCB	European IPPC Bureau within Directorate B of the Commission's Joint Research Centre
ELV	Emission limit value
EN	European Standard adopted by CEN (European Committee for Standardisation, from its French name Comité Européen de Normalisation)
ENE BREF	BAT Reference Document for Energy Efficiency (2009)
E-PRTR	European Pollutant Release and Transfer Register
ETS	Emission trading scheme (established under Directive 2003/87/EC)
EU	European Union
GHG	Greenhouse gas
GLS BREF	BAT Reference Document for the Manufacture of Glass (2013)

ICS BREF	BAT Reference Document on Industrial Cooling Systems (2001)
IED	Industrial Emissions Directive (2010/75/EU)
IP(s)	Initial position(s)
IPPC	Integrated Pollution Prevention and Control
IPPC Directive	Integrated Pollution Prevention and Control Directive 2008/1/EC (repealed and replaced by the IED)
IS BREF	BAT Reference Document for Iron and Steel Production (2013)
ISO	International Organisation for Standardisation. Also international standard adopted by this organisation.
KEI	Key environmental issue (for this BREF drawing up process)
KoM	Kick-off Meeting
LCP BREF	BAT Reference Document for Large Combustion Plants (2017)
LVIC	Production of Large Volume Inorganic Chemicals
LVIC-AAF BREF	BAT Reference Document for the Manufacture of Large Volume Inorganic Chemicals – Ammonia, Acids and Fertilisers (August 2007, adopted under the IPPC Directive)
LVIC-S BREF	BAT Reference Document for the Manufacture of Large Volume Inorganic Chemicals – Solids and Others Industry (August 2007, adopted under the IPPC Directive)
LVOC BREF	BAT Reference Document for the Large Volume Organic Chemical Industry (2017)
MCP Directive	Medium Combustion Plants Directive (2015/2193/EU)
MS	Member State (of the European Union)
N_{inorg}	Total inorganic nitrogen
NFM	Non-Ferrous Metals
NO_X	The sum of nitrogen monoxide (NO) and nitrogen dioxide (NO_2), expressed as NO_2
NPK	Nitrogen-, phosphorus- or potassium-based fertilisers
OGI	Optical gas imaging
OTNOC	Other than normal operating conditions
PCC	Precipitated calcium carbonate
PM	Particulate matter
PM_{10}	Particulate matter which passes through a size-selective inlet with a 50 % efficiency cut-off at an aerodynamic diameter of 10 µm
$PM_{2.5}$	Particulate matter which passes through a size-selective inlet with a 50 % efficiency cut-off at an aerodynamic diameter of 2.5 µm
REACH	Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals, administered by ECHA
REF BREF	BAT Reference Document for the Refining of Mineral Oil and Gas (2015)
Reference plant	Example plant where a technique to consider in the determination of BAT ('BAT candidate') is applied
ROM	JRC Reference Report on Monitoring of Emissions to Air and Water from IED Installations (2018)
SCR	Selective catalytic reduction
SNCR	Selective non-catalytic reduction
SO_X	The sum of sulphur dioxide (SO_2), sulphur trioxide (SO_3), and sulphuric acid aerosols, expressed as SO_2
SIC BREF	BAT Reference Document for the Production of Speciality Inorganic Chemicals (August 2007, adopted under the IPPC Directive)
STPP	Sodium tripolyphosphate

SVHC	Substance of very high concern
TBD	To be defined
TOC	Total organic carbon
Total N	Total nitrogen
TSS	Total suspended solids
TWG	Technical Working Group
UAN	Urea ammonium nitrate
WFD	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
WGC BREF	BAT Reference Document for Common Waste Gas Management and Treatment Systems in the Chemical Sector (currently being finalised)
WI BREF	BAT Reference Document for Waste Incineration (2018)

Chemical formulas

As	Arsenic
Ca	Calcium
CaC_2	Calcium carbide
$CaCl_2$	Calcium chloride
Cd	Cadmium
CH_4	Methane
Cl_2	Chlorine
CO_2	Carbon dioxide
Cr	Chromium
Cu	Copper
$FeCl_2$	Ferrous chloride
H_2S	Hydrogen sulphide
H_2SO_4	Sulphuric acid
HCl	Hydrogen chloride
HF	Hydrogen fluoride
Hg	Mercury
HNO_3	Nitric acid
MgO	Magnesium oxide
Mn	Manganese
N_2O	Dinitrogen oxide, nitrous oxide
NaCl	Sodium chloride
NaOCl	Sodium hypochlorite
NaOH	Sodium hydroxide
NH_3	Ammonia
Ni	Nickel
NO_X	Nitrogen oxides
O_2	Oxygen

P_2O_5	Phosphorus pentoxide
Pb	Lead
S	Sulphur
SO_2	Sulphur dioxide
SO_3	Sulphur trioxide
Ti	Titanium
$TiCl_4$	Titanium tetrachloride
TiO_2	Titanium dioxide
$TiOSO_4$	Titanyl sulphate
V	Vanadium
Zn	Zinc

EU Member States

Acronym	Meaning
AT	Austria
BE	Belgium
CZ	Czech Republic
DE	Germany
ES	Spain
FI	Finland
FR	France
IT	Italy
NL	Netherlands
PL	Poland
PT	Portugal
SE	Sweden
SK	Slovakia
SI	Slovenia

Other stakeholders

Acronym/Name	Meaning
CEFIC	European Chemical Industry Council
EEB	European Environmental Bureau
EIGA	European Industrial Gases Association
EUROFER	European Steel Association
EUROMETAUX	European Non-ferrous Metals Association
EUROMINES	European Association of Mining Industries, Metal Ores & Industrial Minerals
Fertilizers Europe	Association representing the major fertiliser manufacturers in Europe
FuelsEurope	European Petroleum Refiners Association
ICBA	International Carbon Black Association (*)
INCOPA	European Inorganic Coagulants Producers Association
IMA Europe	Industrial Minerals Association
IZA	International Zinc Association
TDMA	Titanium Dioxide Manufacturers' Association (*)
VCI	Verband der Chemischen Industrie (German chemical industry association)
(*) CEFIC's sector group.	

1 GENERAL INFORMATION

1.1 The LVIC BREF and its relation to the Work Programme for the exchange of information

At the 11th IED Article 13 Forum meeting on 19-20 December 2017[1] it was decided that the first review cycle for chemical BREFs under the IED would include a new BREF to address activities of the large volume inorganic chemical industry. This LVIC BREF should merge the BREF on Large Volume Inorganic Chemicals – Ammonia, Acids and Fertilisers (LVIC-AAF BREF) and the BREF on Large Volume Inorganic Chemicals – Solids and Others industry (LVIC-S BREF), drawn up under the IPPC Directive.

At the 15th IED Article 13 Forum meeting on 25 January 2021 the 'Proposal for the 2021-2022 work programme for the exchange of information under Article 13(3) of the IED'[2] was discussed, including the activation of the TWG for the drawing up of the new LVIC BREF.

Following the opinion of the IED Article 13 Forum on the proposed work programme mentioned above, the TWG for the drawing up of the LVIC BREF was activated on 12 November 2021[3]. This resulted, as of today, in a list of 177 TWG members from Member States and Norway, industry, environmental non-governmental organisations (NGOs), and services of the Commission, as well as one TWG observer from ECHA. The list of TWG members and observers is available in the BAT Information System (BATIS), in the following folder:
Forum > Large Volume Inorganic Chemicals > Member of the TWG

The TWG activation was followed by the 'Call for expression of initial positions (IPs)' addressed to the TWG members on 18 February 2022[4], in order to collect opinions and preliminary positions on a number of issues related to the drawing up of the BREF.

1.2 Objectives of the LVIC BREF

The main goals of drawing up the LVIC BREF are:

- to address the key environmental issues associated with the production of a broad range of large volume inorganic chemicals (LVIC) so far referred to in the LVIC-AAF and LVIC-S BREFs and close the review cycle of the chemical BREFs under the IED;
- to unify and update the information and data contained in the LVIC-AAF and LVIC-S BREFs, when applicable, in particular on the environmental performance of LVIC installations, on techniques to consider in the determination of BAT and on emerging techniques;
- to improve clarity, coherence and consistency; and
- to draw BAT conclusions and set BAT-AE(P)Ls.

The drawing up of the LVIC BREF will also address those issues identified in the 'Concluding remarks' chapter of the current LVIC-AAF and LVIC-S BREFs, where these are still deemed relevant by the TWG.

[1] European Commission, Summary Minutes of the 11th IED Article 13 Forum meeting on 19-20 December 2017 (Section 3.4. Chemical BREFs Strategy): https://circabc.europa.eu/sd/a/be05880d-8e93-4a06-b165-9f05c12a2ff1/Final%20Minutes%20Forum%2011.pdf.

[2] European Commission, Proposal for the 2021-2022 work programme: https://circabc.europa.eu/ui/group/06f33a94-9829-4eee-b187-21bb783a0fbf/library/bd04fc9d-9ddb-4d25-aa81-ce3ee93e224a/details.

[3] EIPPCB Note, Ref. Ares(2021)6969295 – 12/11/2021.

[4] EIPPCB Note, Ref. Ares(2022)1231510 – 18/02/2022.

1.3 Process for the drawing up of the LVIC BREF

The general timeline for the drawing up of a BREF is given in the BREF Guidance (see Section 1.2.4) and the approach to take was further agreed at the IED Article 13 Forum meeting of 6 June 2013[5]. It is also noted that the drawing up of the LVIC BREF is taking place within the frame of the European Green Deal where decarbonisation, circular economy and tackling pollution are among the key objectives. Therefore, the LVIC TWG will work using the following approach:

- Adopt a more focused approach to the overall LVIC BREF drawing up process by:
  - focusing on BAT conclusions (and the associated BAT candidate chapter);
  - targeting the key environmental issues (KEIs) associated with LVIC covered by the BREF;
  - considering the European Green Deal objectives (i.e. decarbonisation, circular economy and tackling pollution);
  - collecting sound and reliable data, followed by appropriate data checking and processing.
- Strictly limit the possibilities for time slippages.
- 'Front-load' the exchange of information to achieve the best preparation for the Kick-off Meeting (KoM). The front-loading corresponds to Step 3 'Call for expression of initial positions' in Table 1.1 below.

The timetable for the next steps for the drawing up of the LVIC BREF will be discussed at the KoM. The steps completed and the main envisaged milestones and deadlines are summarised in Table 1.1. A more detailed timeline for the immediate next steps is given in Section 2.5.

Table 1.1: Completed and envisaged major milestones for the drawing up of the LVIC BREF

Step	Milestone	Date
1	Activation of the TWG (done)	12 November 2021
2	Nominations of TWG members (done)	15 December 2021 (deadline)
3	Call for expression of initial positions (done)	18 February 2022 (deadline: 22 April 2022)
4	**Kick-off Meeting (KoM)**	**October 2022** (Second half – tentatively)
5	First formal draft of the LVIC BREF (D1)	2nd quarter of 2024 (tentatively)
6	TWG comments on D1	4rd quarter of 2024 (tentatively)
7	Final TWG Meeting	3rd quarter of 2025 (tentatively)
8	Final draft of the LVIC BREF delivered to the IED Article 13 Forum	3rd quarter of 2026 (tentatively)
9	BAT conclusions vote at an IED Article 75 Committee meeting	4th quarter of 2026 (tentatively)
10	Publication of the BAT conclusions in the Official Journal of the European Union	1st quarter of 2027 (tentatively)
11	Publication of the BREF on the EIPPCB website	2nd quarter of 2027 (tentatively)

[5] European Commission, Work programme for the exchange of information – overview: https://circabc.europa.eu/w/browse/33cff69c-bfd0-49e7-8f19-f75a9e062745

1.4 Call for initial positions

The call for the expression of TWG members' initial positions (IPs) was issued by the EIPPCB on 18 February 2022, with a deadline for responses of 22 April 2022. It took into account the preliminary contributions of the TWG and contained a number of EIPPCB proposals for the issues to be covered by the LVIC BREF, including:

- the scope;
- the BREF structure;
- the candidate KEIs;
- the information and data collection;
- the selection of plants for the collection of plant-specific data;
- the techniques to consider in the determination of BAT and emerging techniques.

A total of 23 stakeholder groups submitted their initial positions (IPs):

- 14 Member States (i.e. AT, BE, CZ, DE, ES, FI, FR, IT, NL, PL, PT, SE, SK, SI);
- 8 industry organisations (i.e. CEFIC – including CEFIC sector groups, EIGA, EUROFER, EUROMETAUX – including IZA, Euromines, Fertilizers Europe, Fuels Europe, IMA Europe);
- 1 environmental NGO (EEB).

All IPs were submitted using the 'Document 3' template that was attached to the call for the expression of IPs, except the IPs of EIGA and Fuel Europe. Several TWG members also provided additional information.

All information related to the TWG initial positions is available on BATIS (Forum > Large Volume Inorganic Chemicals > 02 Call for initial positions > 02 TWG Initial Positions).

1.5 Objectives of the Kick-off Meeting (KoM)

A description of the purpose of the KoM is given in Section 4.6.2.2 of the BREF Guidance.

The KoM will decide particularly on the **scope** (see Section 2.1) and the **key environmental issues (KEIs)** (see Section 2.2) based on the stakeholders' input received via the call for initial positions. As agreed at the IED Article 13 Forum meeting of 6 June 2013, the KoM will adopt a focused approach to the overall LVIC BREF drawing up process and to deriving BAT conclusions. This can be achieved by ensuring that the scope of the LVIC BREF is manageable and by limiting the number of KEIs.

Furthermore, the KoM will address and reach conclusions on the items listed below:

- the nature and extent of the data collection, including via questionnaire and addressing confidentiality issues – see Section 2.3;
- the general timeline of the work – see Section 1.2 and the specific tasks to be carried out by the TWG, especially indicating which TWG member will deliver specific information – see Section 2.5.

The BAT Information System (BATIS), the specific tool that the TWG will use to collect and exchange information (see Section 4.7.1 of the BREF Guidance), will be presented to the TWG as well as the procedures to submit information identified at the KoM.

During the KoM, there will be time to discuss the TWG members' initial positions. The discussions will necessarily be **kept general, and discussions will not enter into deep technical debates. For example, positions on techniques and on whether a particular technique is BAT will not be discussed at this stage, because questions of this nature need to be informed by the upcoming data and information collection exercise**. However, these initial positions will be looked at at a later stage together with the other information collected (e.g. data from the questionnaires, other contributions).

1.6 Structure and overview of this Background Paper

The aim of this Background Paper (BP) is to assist TWG members in their preparation for the KoM and to create a common basis for the discussion during the meeting.

The TWG initial positions have been analysed and presented in subject groups, or issues, described in Sections 2 and 3. Issues where the initial feedback from the TWG showed differing views and any new issues requiring discussion within the TWG are presented in Section 2. These are the items considered the most important in terms of obtaining clarification before starting the LVIC BREF drawing up process and the EIPPCB proposes to discuss these at the KoM.

The EIPPCB proposals provided in the call for initial positions upon which the TWG members generally agree are presented in Section 3 together with other issues that do not need to be discussed during the KoM.

Individual issues in this BP are presented as far as possible as follows:

Original EIPPCB proposal/request
This cell contains the original EIPPCB proposal and/or request from the call for initial positions issued on 18 February 2022 (when relevant).
Summary of initial positions
This cell contains a summary of the TWG members' initial positions. The full text of the individual positions is usually not provided. For more details on the individual initial positions (in particular the underlying rationale), please refer to BATIS (Forum > Large Volume Inorganic Chemicals > 02 Call for initial positions > 02 TWG Initial Positions) where the initial positions of all the contributors can be found in full.
EIPPCB assessment
This cell contains the EIPPCB's assessment of the positions and, where relevant, new information and forms the basis for the EIPPCB proposal(s).
EIPPCB proposal
This cell contains the EIPPCB proposal(s) to develop or resolve the issue. The proposal may be identical to the original EIPPCB proposal, a revised proposal or a new proposal.

A number of supporting documents are referred to in this BP. These documents can be found in the following BATIS folder: Forum > Large Volume Inorganic Chemicals > 02 Call for initial positions > 02 TWG Initial Positions.

The order of the discussion items in this BP will not necessarily be the order of the discussion at the KoM.

1.7 Before coming to the meeting

To enable meaningful discussions at the KoM, it is important that TWG members have read this BP in advance of the meeting.

If you believe that issues other than those included in this BP (as laid down in Section 2) or issues other than those included in this BP need to be discussed at the KoM, please post your request directly in the following BATIS folder **before 5 October 2022**:

Forum > Large Volume Inorganic Chemicals > 03 Kick-off meeting > 03 TWG reactions.

Such request(s) must also include a justification/rationale for each new issue proposed for discussion.

Before coming to the KoM, it is recommended that TWG members also read and familiarise themselves with the contents of the following documents and bring them to the meeting:

- The initial positions of TWG members posted in the BATIS forum for the LVIC BREF (Forum > Large Volume Inorganic Chemicals > 02 Call for initial positions > 02 TWG Initial Positions)

- The BREF Guidance (Commission Implementing Decision 2012/119/EU).
  http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1474283772055&uri=CELEX:32012D0119.

- The Industrial Emissions Directive 2010/75/EU (IED).
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32010L0075:EN:NOT.

2 ITEMS FOR DISCUSSION AT THE KICK-OFF MEETING

2.1 Scope of the LVIC BREF

This section aims to steer the discussion on the scope of the LVIC BREF.

The scope will be determined by considering the following:

- The work programme discussed by the IED Article 13 Forum[6], according to which the LVIC BREF should close the first review cycle for chemical BREFs under the IED (see table below), addressing the inorganic chemical production processes referred to in the LVIC-AAF BREF and the LVIC-S BREF, while considering the scope and information of the WGC BREF.

List of chemical BREFs under the IED

BREF acronym	Title	Status
CAK	Production of Chlor-alkali	Published (2014) ([1])
CWW	Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector	Published (2016) ([1])
LVOC	Large Volume Organic Chemicals	Published (2017) ([1])
WGC	Common Waste Gas Management and Treatment Systems in the Chemical Sector	BATC to be presented at the IED Art. 75 Committee (3rd quarter 2022) ([2])
LVIC	Large Volume Inorganic Chemicals	Drawing up ongoing ([2])
([1]) BREF reviewed under the IED. ([2]) BREF (new) drawn up under the IED.		

- The need to ensure consistency and avoid overlaps within the series of chemical BREFs and other BREFs (both 'horizontal' and 'vertical' ones), due to the legally binding status of the associated BAT conclusions adopted under the IED.

- Which of the activities listed under point 4 of Annex I to the IED should be included/excluded.

[6] European Commission, Summary Minutes of the 11th IED Article 13 Forum meeting on 19-20 December 2017 (Section 3.4. Chemical BREFs Strategy): https://circabc.europa.eu/sd/a/be05880d-8e93-4a06-b165-9f05c12a2ff1/Final%20Minutes%20Forum%2011.pdf

Original EIPPCB proposal

Proposal 1: The EIPPCB proposes to include in the scope of the LVIC BREF the inorganic chemical production processes specified in Table 2.1[7], falling under the categories of activities listed in points 4.2 (a), 4.2 (b), 4.2 (d), 4.2 (e) and 4.3 of Annex I to the IED.

Table 2.1: List of inorganic chemical production processes proposed to be covered in the LVIC BREF

Inorganic chemical production processes	IED category of activities
Ammonia	4.2 (a)
Hydrofluoric acid	4.2 (b)
Nitric acid	4.2 (b)
Phosphoric acid	4.2 (b)
Sulphuric acid*	4.2 (b)
Inorganic phosphates	4.2 (d)
Sodium carbonate (i.e. soda ash)**	4.2 (d)
Sodium chlorate	4.2 (d)
Precipitated calcium carbonate	4.2 (d)
Calcium carbide	4.2 (e)
Carbon black	4.2 (e)
Titanium dioxide (and related products)***	4.2 (e)
Sodium silicate (water glass)	4.2 (e)
Synthetic amorphous silica	4.2 (e)
Ammonium nitrate and calcium ammonium nitrate	4.3
Nitrogen-, phosphorus- or potassium-based fertilisers (simple or compound fertilisers) and calcium nitrate	4.3
Superphosphates	4.3
Urea and urea-ammonium nitrate	4.3

* Including the production of sulphuric acid associated with various processes (e.g. NFM activities; coke ovens; manufacture of viscose) and physical reconcentration and/or purification of spent sulphuric acid when these processes are integrated with (directly associated with) the inorganic chemical processes listed in this table (such as titanium dioxide production).
** Including calcium chloride and refined sodium bicarbonate.
*** Including ferrous chloride, ferrous sulphate (e.g. copperas and related products).

Summary of initial positions

- **16** out of **23** IPs agree with the proposal, **4** partly agree, **none** disagree and **3** do not provide an opinion.

- The main generic comments of the IPs which either agree or partly agree are as follows:
  - Production of hydrogen (category 4.2.a) other than part of ammonia production should be included - from heavy oil residues by partial oxidation (CZ).
  - IED Annex I does not provide for thresholds on what constitutes production of inorganic chemicals "on an industrial scale". Whether such thresholds could be identified should be further explored (EUROFER).
  - To include production of hydrogen based on fossil fuels and raw materials of fossil origin in the scope of the LVIC BREF, regardless of whether the production is a stand-alone process or a directly associated activity, if the environmental aspects of

[7] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

a particular hydrogen production process are not covered by any other BATC (SE).

- The main comments of the IPs specifically associated with the inorganic chemical production processes proposed to be covered in the LVIC BREF are summarised below.

Ammonia

- Ammonia should be covered as far as the production of fertilisers is concerned (CEFIC, IT).

Sulphuric acid

- Different process routes should be considered separately (e.g. wet sulphuric acid / starting from off-gases as raw material vs. starting from pure sulphur). Sulphuric acid production from SO_2 gases can indeed also arise from process gases other than NFM activities (e.g. OFC, CAK) (BE).
- The LVIC BREF is relevant for 'on-purpose' production of H_2SO_4. The production of H_2SO_4 as a by-product of emission reduction operations (desulphurisation of coke oven gas) in the case of coke oven plants should be covered by the IS BREF. Techniques to prevent or reduce emissions from the production of H_2SO_4 in coke oven plants (as a by-product) are process-integrated and very specific, directly linked with iron and steel production (CZ, EUROFER).
- To exclude the sulphuric acid recovery directly associated with the activities covered by FMP BREF (ES).
- Waste water treatment linked to sulphuric acid production from NFM installations is already included in the NFM BREF and should therefore be excluded from the scope of the LVIC BREF. In addition, a dedicated approach should be applied to differentiate between processes in steady and non-steady conditions (EUROMETAUX – IZA).

Inorganic phosphates

- Currently, this is Chapter 6 in the LVIC-S BREF, whereas phosphoric acid, the precursor of inorganic phosphates is Chapter 5 in the LVIC-AAF BREF. Merging the two BREFs should lead to better integration of both activities. The same holds for superphosphates (currently Chapter 10 of the LVIC-AAF BREF) (EEB).

Sodium carbonate (soda ash)

- Sodium carbonate related to pulp production (soda boilers) is covered by the PP BREF (AT).
- To include $CaCl_2$ within the scope separately, describing the different production processes. $CaCl_2$ has been excluded from the scope of the WGC BREF. However, $CaCl_2$ can also be produced through the acid-limestone production process. One plant in Belgium produces $CaCl_2$ through the acid-limestone process where the HCl, a side product from sulphuric acid production, is used for $CaCl_2$ production (BE).
- Calcium chloride produced from soda ash effluents should be included within 'sodium carbonate' if produced from its subproduct, as it is for 'sodium bicarbonate'. Calcium chloride production is analysed in Chapter 7 in the 2007 LVIC-S BREF and should remain so. If not, only the production starting from soda ash plants' waste water should be included. Soda ash producers have no knowledge on the other routes (IT, CEFIC – ESAPA).

Sodium chlorate

- Include the production of sodium chlorate in the update of the CAK BREF (NL).

Titanium dioxide

- Include 'ferric chloride' in the scope of LVIC BREF (1 installation in Flanders) (BE).

Sodium silicate

- There are two specific production routes for water glass. Each route has a specific emission profile. Only the chemical route may be covered by the LVIC BREF, whereas the melting

route should be covered in the scope of the GLS BREF. Exclude the production of water glass from the scope of the LVIC BREF (both routes) and include it in the scope of the next GLS BREF. Only one of the two production routes is specific to the LVIC BREF. However, both production routes correspond to the activity "production of glass" and would fit in the scope of the GLS BREF. Do not split the two production routes, decide for one BREF (DE).

Synthetic amorphous silica

- There are two plants in the EU that produce synthetic amorphous silica derived as a by-product from the production process of aluminium fluoride, one of which is situated in SE. The production of synthetic amorphous silica derived as a by-product from the production of aluminium fluoride should be excluded from the scope of the LVIC BREF, as the data set will potentially be too small to set process-specific BAT-AELs for this type of production (SE).

Superphosphates

- Currently, this is in Chapter 10 in the LVIC-S BREF, whereas phosphoric acid, the precursor of inorganic phosphates, is in Chapter 5 in the LVIC-AAF BREF. Merging the two BREFs should lead to better integration of both activities (EEB).

EIPPCB assessment

- Annex I to the IED does not include any threshold production levels for the chemical industry. Therefore, the meaning of 'Large Volume' is only relevant to outline the boundary of interest for the TWG.
- COM has made available a 'summary of answers given to implementation questions'[8] where the meaning of "production on an industrial scale in Annex I Section 4" is explained. In particular, it is noted that the identification of the precise thresholds which may denote a production of chemicals as being "on an industrial scale" may vary depending on the type of chemical product.
- The inorganic chemical production processes to be covered in the LVIC BREF were already identified as 'large volume' processes, without identifying any precise thresholds (e.g. in both the LVIC-AAF and LVIC-S BREFs).
- The hydrogen production (e.g. by steam reforming, partial oxidation or electrolysis) as a directly associated activity or as a stand-alone process is discussed in the (following) Proposal 2.
- The additional proposals for the 'Scope' provided by the TWG are discussed in Section 2.1.4.

Ammonia

- Annex I to the IED, in point 4.2 (a), refers to the production of ammonia, without any specific reference to the production of fertilisers for example. Although fertiliser production is the main use of ammonia, it is also used for a wide range of industrial applications such as plastics, explosives, refrigerants, and synthetic fibres as well as being proposed as a future low-carbon energy vector. Expanding the use of ammonia as a fuel (e.g. in shipping) is projected to have an important role in achieving the net-zero emissions scenario by 2050[9].

Sulphuric acid

- According to the proposed structure of the LVIC BREF (Section 2.4), the production of sulphuric acid will be addressed in a distinct section. The different process routes will be reflected within the subsection entitled 'Applied processes and techniques', where the peculiarity of each production process technology will be addressed.
- The scope of the IS BREF does not address sulphuric acid plants in coke ovens and refers to the LVIC-AAF BREF for this activity (see Section 2.1.3.1). It is not clear from the

[8] https://ec.europa.eu/environment/industry/stationary/ied/implementation.htm
[9] IEA- Global Hydrogen Review 2021.

preliminary indications provided within the IPs what are the technical reasons behind the proposed differentiation between the process techniques applied for the H_2SO_4 production as a by-product of emission reduction operations occurring at coke oven plants and the applied processes and techniques proposed to be covered in the LVIC BREF.

- The FMP BATC (under finalisation) cover acid recovery, if directly associated with the activities covered by the FMP BATC. Therefore, it is advisable to exclude from the LVIC BREF sulphuric acid recovery directly associated with the activities covered by the FMP BREF, to avoid overlaps with other BREFs and related BAT conclusions.
- The production of sulphuric acid is in the 'Scope' of the LVIC BREF. Whether sulphuric acid production associated with NFM activities generates relevant emissions to water is addressed in Section 2.2.2.2.
- Relevant contextual information is considered essential to allow a thorough analysis of the performance and emission data gathered via plant-specific questionnaires. As it is the standard practice for recent BREFs, contextual information includes *inter alia* the plant conditions (e.g. normal or other than normal operating conditions). The full set of contextual information is carefully pre-identified by the TWG at the questionnaire drafting stage.

Sodium carbonate (soda ash)

- The scope of the PP BREF covers the 'chemical pulping' activity via the 'sulphite pulping process'. Soda boilers are described as a part of this production process. Therefore, the production of sodium carbonate as by-product originating from this type of production process is not covered by the scope of the LVIC BREF.
- $CaCl_2$ can be produced either within an integrated soda ash complex (as a co-product of soda ash manufacture) or via other process routes (i.e. as a co-product of magnesia (MgO) production, or through the acid-limestone production process). Descriptions of the applied production processes are so far covered in Chapter 2 and Section 7.11.2 of the LVIC-S BREF.
- According to the preliminary feedback provided with the IPs, updated elements on the peculiarity of the $CaCl_2$ production process technology associated with the different process routes might be available. Therefore, the decision on a possible rearrangement of the structure and layout of the LVIC BREF in order to include a descriptive section covering $CaCl_2$ production via different process routes other than from soda ash manufacture will depend on the data and information expected to be provided during the BREF information exchange (see also Section 2.4, where the structure of the LVIC BREF and related BAT conclusions are discussed).

Sodium chlorate

- The proposal to include the production of sodium chlorate in the scope of the LVIC BREF is discussed in Section 2.1.2.2.

Titanium dioxide

- According to the preliminary feedback provided with the IPs, information on the production of 'Ferric chloride ($FeCl_3$)' linked to the production of TiO_2 (most likely by the chloride process route) might be available (e.g. from BE). Therefore, the technical and environmental peculiarity of the process technology associated with this combined production might be explored in the LVIC BREF.
- Limited information on the production of 'Ferric chloride ($FeCl_3$)' was collected during the information exchange for the drawing up of the LVIC-S BREF. However, it was not included due to the late submission of the information.

Sodium silicate

- The proposal to include the production of sodium silicate (water glass) in the scope of the LVIC BREF is discussed in Section 2.1.3.2.

Synthetic amorphous silica

- The EIPPCB proposal aims to cover the process technologies and related environmental impacts associated with the two main routes for manufacturing synthetic amorphous silica, namely the 'wet-route' processes (yielding precipitated silica and silica gel) and the thermal route (producing pyrogenic silica).

Inorganic phosphates
Superphosphates

- The structure (and contents) of the BREF and related BAT conclusions are discussed in Section 2.4.

EIPPCB proposal

To slightly modify the original EIPPCB proposal as follows:

- To include in the scope of the LVIC BREF the inorganic chemical production processes specified in the table below, falling under the categories of activities listed in points 4.2 (a), 4.2 (b), 4.2 (d), 4.2 (e) and 4.3 of Annex I to the IED.

List of inorganic chemical production processes proposed to be covered in the LVIC BREF

Inorganic chemical production processes	IED category of activities
Ammonia	4.2 (a)
Hydrofluoric acid	4.2 (b)
Nitric acid	4.2 (b)
Phosphoric acid	4.2 (b)
Sulphuric acid*	4.2 (b)
Inorganic phosphates	4.2 (d)
Sodium carbonate (i.e. soda ash)**	4.2 (d)
Sodium chlorate	4.2 (d)
Precipitated calcium carbonate	4.2 (d)
Calcium carbide	4.2 (e)
Carbon black	4.2 (e)
Titanium dioxide (and related products)***	4.2 (e)
Sodium silicate (water glass)	4.2 (e)
Synthetic amorphous silica	4.2 (e)
Ammonium nitrate and calcium ammonium nitrate	4.3
Nitrogen-, phosphorus- or potassium-based fertilisers (simple or compound fertilisers) and calcium nitrate	4.3
Superphosphates	4.3
Urea and urea ammonium nitrate	4.3

* Including the production of sulphuric acid associated with various processes (e.g. NFM activities; coke ovens; manufacture of viscose) and physical reconcentration and/or purification of spent sulphuric acid when these processes are integrated with (directly associated with) the inorganic chemical processes listed in this table (such as titanium dioxide production).
** Including the production of calcium chloride and refined sodium bicarbonate.
*** Including the production of ferrous chloride, ferric chloride, ferrous sulphate (e.g. copperas and related products).

- To exclude from the scope of the LVIC BREF the sulphuric acid recovery directly associated with the activities covered by the FMP BREF.

- To include in the scope of the LVIC BREF the following inorganic chemical production processes:
    - production of calcium chloride produced via different process routes other than

from soda ash manufacture, i.e. as a co-product of magnesia (MgO) production, through the acid-limestone production process.

Note
The detailed structure and layout of the descriptive sections associated with the above-mentioned inorganic chemical processes will be decided when drafting D1, according to both the data and information collected.

Original EIPPCB proposal

Proposal 2: The EIPPCB proposes 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.

Summary of initial positions

- **4** out of **23** IPs agree with the proposal, **13** partly agree, **2** disagree and **4** do not provide an opinion.

- The main comments of the IPs which either agree or partly agree are as follows:
    - Hydrogen production should be included only when it is directly associated with inorganic chemical production processes included in the scope of LVIC BREF. The LVIC BREF should not include in the scope hydrogen production described in other BREFs (FI, PT).
    - In addition to hydrogen production directly associated with the production of ammonia, to include the stand-alone production of hydrogen through electrolysis as it is currently not covered by a BREF (BE, DE).
    - To include hydrogen production directly associated with the production of other chemicals (than ammonia) (CZ), except for hydrogen produced via electrolysis of water (insufficient data, technology still under development) (CZ, IT).
    - To exclude hydrogen production obtained as a co-product from chemical production processes covered by the scope of other BREFs (REF, CAK, LCP, LVOC, WGC) (ES, IT, PT).
    - To include all types of hydrogen production processes, except when it is produced with decarbonised energies (e.g. green electricity, biomethane from waste) and where there is little or no impact on water resources (FR).
    - To include a production threshold to exclude the production of hydrogen occurring in small plants using electrolysis (NL).
    - Hydrogen production is part of several BREFs but only as directly associated activities to other types of production. To include the production of hydrogen based on fossil fuels and raw materials of fossil origin, regardless of whether the production is a stand-alone process or a directly associated activity, if the environmental aspects of a particular hydrogen production process is not covered by any other BATC (SE).
    - To include hydrogen production irrespective of its subsequent use (EEB).
    - To limit the discussion on hydrogen to the two processes involving it, i.e. production of ammonia and sodium chlorate (CEFIC).

- The main comments of the IPs which disagree are as follows:
    - Hydrogen production should be covered in a dedicated chapter of the LVIC BREF (as it is of increasing importance for industrial production processes, e.g. downstream uses not in the LVIC scope for fuels, methanol, urea, steel, refineries etc.) Ammonia production is mainly related to the steam reforming and/or partial oxidation processes. Therefore, the production of hydrogen by electrolysis would not be adequately taken into account (AT).
    - Hydrogen is an integral part and cannot be split from ammonia production (SK).

EIPPCB assessment

- The production of hydrogen as a product or as a by-product is covered by several BREFs adopted under the IED, i.e.:
  - the REF BREF scope includes the production of hydrogen by partial oxidation, steam reforming, gas heating reforming and hydrogen purification;
  - the LVOC BREF addresses steam reforming for the production of methanol and the recovery of hydrogen from the production of lower olefins;
  - the CAK BREF addresses the production of hydrogen as a by-product of the electrolysis of brine;
  - the WGC BREF (currently being finalised) addresses emissions to air from chemical production processes other than those addressed in the documents above, including steam reforming, stand-alone or when directly associated with those types of chemical production processes covered by the WGC BREF itself.
- The LVIC-AAF BREF includes the production of hydrogen by steam reforming, partial oxidation and electrolysis associated with the production of ammonia.
- According to the preliminary feedback provided with the IPs (see Section 4.1, Annex 1), the production of hydrogen directly associated with the inorganic chemical processes to be covered in the LVIC BREF is carried out by steam reforming, electrolysis or partial oxidation.
- Global ammonia production currently relies heavily on fossil fuels (accounting for around 2 % (8.6 EJ) of total final energy consumption). Over 70 % of ammonia production is via natural gas-based steam reforming, while most of the remainder is via coal gasification[10].
- Ammonia is one of the most emissions-intensive commodities produced by the chemical industry, despite coal accounting for a much smaller share of its energy inputs than in other sectors.
- Hydrogen is not only produced as a product or by-product in the chemicals industry or in oil refining, iron and steel manufacturing and chemical production. Hydrogen is a versatile energy carrier, which is an increasingly important piece of the Net Zero Emissions by 2050 roadmap to decarbonise the energy sector[11]. A significant uptake of hydrogen and hydrogen-based fuels for new uses in heavy industry, heavy-duty road transport, shipping, aviation and to balance the power grid is projected in order to reach net-zero emissions[12].
- Renewable and low-carbon hydrogen production routes are emerging and projects commissioned worldwide (since 2000) to produce hydrogen for energy or climate-change-mitigation purposes (for existing applications, as industrial feedstock or as an energy carrier) are constantly increasing[13]. It is to be expected that these projects will further develop, during the drawing up of the LVIC BREF.
- The identification of a production threshold for the production of hydrogen occurring in plants using electrolysis does not seem possible at this stage.

EIPPCB proposal

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.

[10] IEA - Ammonia Technology Roadmap – October 2021.
[11] IEA - Hydrogen - Fuels & Technologies.
[12] IEA- Global Hydrogen Review 2021.
[13] IEA - Database of hydrogen projects.

2.1.1 Independently operated waste water treatment plants and combined treatment of waste water

Original EIPPCB proposal

Proposal 3: The EIPPCB proposes to include in the scope of the LVIC BREF the activity listed in point 6.11 of Annex I to the IED (i.e. independently operated treatment of waste water not covered by Directive 91/271/EEC) when the main pollutant load originates from the inorganic chemical production processes (see Table 2.1[14]) covered by the LVIC BREF.

Summary of initial positions

- **10** out of **23** IPs agree with the proposal, **5** partly agree, **4** disagree and **4** do not provide an opinion.

- The main comments of the IPs which either agree or partly agree are as follows:
  - Independently operated WWTPs may be included in the scope of the LVIC BREF as long as no regulatory overlap occurs with Commission Implementing Decision (EU) 2016/902 (CWW BATC) (ES, IT, EUROFER) and only if emissions from relevant processes are addressed (e.g. no pollution arising from emissions to water of sulphuric acid generation from coke oven gas desulphurisation) (EUROFER).
  - More specification in the BREF regarding what 'main pollutant load' means is needed (IT, CEFIC, Fertilizers Europe).
  - For water pollutants where the reduction at point source principle applies the emissions should be reduced by treatment at the point source and not by mixing waste water streams (AT).

- The main comments of the IPs which disagree are as follows:
  - Waste water treatment and discharge of waste water to recipient is included in the CWW BREF. Not to include waste water from inorganic production processes which are discharged to waste water treatment under the LVIC BREF (CZ).
  - Emissions to water from the chemical sector are already covered by the CWW BREF. This also includes independently operated WWTPs processing waste waters from the LVIC sector as well as combined treatment from different origins if the main pollutant load comes from the LVIC sector. Inclusion of activity 6.11 may cause overlaps and inconsistency in the scopes of BREFs and BAT conclusions (PL).
  - The proposal is unclear; explanation is needed (SK).
  - WWTPs are not always part of PCC plants. Independently operated WWTPs are not the responsibility of PCC plant operators. Only on-site WWTPs should be considered in this BREF (IMA).

EIPPCB assessment

- According to the preliminary feedback provided with the IPs (see Section 4.2, Annex 2), installations where the treatment of waste water is carried out by independently operated WWTPs seem to be relevant for the inorganic chemical production processes to be covered by the LVIC BREF.
- Proposal 3 needs to be assessed in conjunction with Proposal 4 (discussed below) and Proposal 5 (Section 2.1.2.1).
- The CWW BREF and related BAT conclusions concern the activities specified in Sections 4 and 6.11 of Annex I to Directive 2010/75/EU, namely:
  - Section 4: Chemical industry;
  - Section 6.11: Independently operated treatment of waste water not covered by Council Directive 91/271/EEC and discharged by an installation undertaking activities covered under Section 4 of Annex I to Directive 2010/75/EU.

  The document also covers the combined treatment of waste water from different origins if

[14] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

the main pollutant load originates from the activities covered under Section 4 of Annex I to Directive 2010/75/EU.

- Proposal 3, in conjunction with Proposal 4 (discussed later on) and Proposal 5 (Section 2.1.2.1), aims to have a greater focus on issues of environmental relevance for water that are specific to the inorganic chemical production processes covered by the LVIC BREF (e.g. monitoring and releases of key substances/pollutants, pretreatment/end-of-pipe treatment techniques), by purposefully minimising any potential overlap between the LVIC BREF and the CWW BREF.
- Information (e.g. on type and main characteristics) on the waste water streams that are treated in the independently operated WWTPs together with those from the inorganic chemical production processes covered by the LVIC BREF is important. This issue will be addressed during the design of the questionnaire for the data collection.
- The identification of the key substances/pollutants for emissions to water or other performance indicators that are specific to the inorganic chemical production processes covered by the LVIC BREF are discussed in Section 2.2.2.2.
- The data collection exercise (via a plant-specific questionnaire) should seek information on the above-mentioned key substances/pollutants for emissions to water or any other relevant performance indicators, as well as on the type of treatment (i.e. whether dedicated or combined), in order to ensure that, as far as possible, performance data are provided in a form that will facilitate direct comparison among WWTPs and with the BAT conclusions contained in the CWW BREF as well.
- The list of the most suitable independently operated WWTPs that could take part in the data collection process (via a plant-specific questionnaire) will be identified and proposed by the TWG members, following the conventional, iterative and collaborative procedure indicated in Section 3.1.2.

EIPPCB proposal

To confirm the original EIPPCB proposal as follows:

- To include in the scope of the LVIC BREF the activity listed in point 6.11 of Annex I to the IED (i.e. independently operated treatment of waste water not covered by Directive 91/271/EEC) when the main pollutant load originates from the inorganic chemical production processes covered by the LVIC BREF.

Original EIPPCB proposal

Proposal 4: The EIPPCB proposes to include in the scope of the LVIC BREF the combined treatment of waste water from different origins provided that the main pollutant load originates from the inorganic chemical production processes (see Table 2.1[15]) covered by the LVIC BREF and that the waste water treatment is not covered by Directive 91/271/EEC.

Summary of initial positions

- **10** out of **23** IPs agree with the proposal, **5** partly agree, **5** disagree and **3** do not provide an opinion.

- The main comments of the IPs which either agree or partly agree are as follows:
  - Combined treatment of waste water from different origins may be included in the scope of the LVIC BREF as long as no regulatory overlap occurs with Commission Implementing Decision (EU) 2016/902 (BATC CWW) (ES, IT, EUROFER) and only if emissions from relevant processes are addressed (e.g. no pollution arising from emissions to water of sulphuric acid generation from coke oven gas desulphurisation) (EUROFER).
  - More specification in the BREF regarding what 'main pollutant load' means is needed (IT, CEFIC, Fertilizers Europe).
  - For water pollutants where the reduction at point source principle applies the emissions should be reduced by treatment at the point source and not by mixing waste water streams (AT).

- The main comments of the IPs which disagree are as follows:
  - Waste water treatment and discharge of waste water to recipient is included in the CWW BREF. Not to include waste water from inorganic production processes which are discharged to waste water treatment under the LVIC BREF (CZ).
  - Treatment of waste water from sulphuric acid plants linked to non-ferrous metals production is already included in the NFM BREF as it occurs together with other effluents in the NFM plants. It should therefore be excluded from the scope of the LVIC BREF (EUROMETAUX).
  - WWTPs are not always part of PCC plants. Independently operated WWTPs are not the responsibility of PCC plant operators. Only on-site WWTP should be considered in this BREF (IMA).
  - The proposal is unclear; explanation is needed (SK).
  - Emissions to water from the chemical sector are already covered by the CWW BREF. This also includes independently operated WWTP processing waste waters from the LVIC sector as well as combined treatment from different origins if the main pollutant load comes from LVIC sector. Inclusion of activity 6.11 may cause overlaps and inconsistency in the scopes of BREFs and BAT conclusions (PL).

EIPPCB assessment

- According to the preliminary feedback provided with the IPs (see Section 4, Annex 2), installations where the treatment of waste water is carried out by independently operated WWTPs or by on-site WWTP (together with waste water arising from different origins) seem to be relevant.
- Proposal 4 needs to be assessed in conjunction with Proposal 3 (previously discussed) and Proposal 5 (Section 2.1.2.1).
- The CWW BREF and related BAT conclusions concern the activities specified in Sections 4 and 6.11 of Annex I to Directive 2010/75/EU, namely:
  - Section 4: Chemical industry;
  - Section 6.11: Independently operated treatment of waste water not covered by Council Directive 91/271/EEC and discharged by an installation undertaking activities covered under Section 4 of Annex I to Directive 2010/75/EU.

[15] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

The document also covers the combined treatment of waste water from different origins if the main pollutant load originates from the activities covered under Section 4 of Annex I to Directive 2010/75/EU.

- Proposal 4, in conjunction with Proposal 3 (previously discussed) and Proposal 5 (Section 2.1.2.1), aims to have a greater focus on issues of environmental relevance for water that are specific to the inorganic chemical production processes covered by the LVIC BREF (e.g. monitoring and releases of key substances/pollutants, pretreatment/end-of-pipe treatment techniques), by purposefully minimising any potential overlap between the LVIC BREF and the CWW BREF.
- For both cases, independently operated WWTPs and combined treatment of waste water from different origins, information (e.g. on type and main characteristics) on the other waste water streams that are treated together with those from the inorganic chemical production processes covered by the LVIC BREF is important. This issue will be addressed during the design of the questionnaire for the data collection.
- The identification of the key substances/pollutants for emissions to water or other performance indicators that are specific to the inorganic chemical production processes covered by the LVIC BREF are discussed in Section 2.2.2.2.
- The data collection exercise (via a plant-specific questionnaire) should seek information on the above-mentioned key substances/pollutants for emissions to water or any other relevant performance indicators, as well as on the type of treatment (i.e. whether dedicated or combined), in order to ensure that, as far as possible, performance data are provided in a form that will facilitate direct comparison among WWTPs and with the BAT conclusions contained in the CWW BREF as well.
- The NFM BREF and related BAT conclusions (i.e. Commission Implementing Decision 2016/1032) do not address the production of sulphuric acid based on SO_2 gases from non-ferrous metals production. Moreover, the BAT and BAT-AELs concerning emissions to water identified in these documents do not seem to refer to the production of sulphuric acid based on SO_2 gases from non-ferrous metals production.
- The list of the most suitable WWTPs that could take part in the data collection process (via a plant-specific questionnaire) will be identified and proposed by the TWG members, following the conventional, iterative and collaborative procedure indicated in Section 3.1.2.

EIPPCB proposal

To confirm the original EIPPCB proposal as follows:

- To include in the scope of the LVIC BREF the combined treatment of waste water from different origins provided that the main pollutant load originates from the inorganic chemical production processes covered by the LVIC BREF.

2.1.2 Scope interface with other relevant chemical BREFs

2.1.2.1 CWW BREF

Original EIPPCB proposal
Proposal 5: The EIPPCB proposes to complement the CWW BREF.
Summary of initial positions
• **4** out of **23** IPs agree with the proposal, **8** partly agree, **6** disagree and **5** do not provide an opinion. • The main comments of the IPs which either agree or partly agree are as follows: o The specific waste water issues related to LVIC processes (e.g. inorganic processes where no organics are present) should be dealt with in the LVIC BREF as these are not in the current BREF (FI, IT, SI). o To complement the CWW BREF on topics of specific relevance for the LVIC production and not yet addressed in that previous BREF (IT, PT, EEB). However, it must be clarified in which situations the LVIC BREF or CWW BREF will apply. To avoid overlapping different BREFs for the same topic and the related implementation difficulties (PT). o For the LVIC sectors, more specific ELVs and (lower) mass flow thresholds may be needed for: TSS, COD, TOC, AOX. Mass flow thresholds in the CWW BREF were too high (BE). o To collect data for the specific emissions (KEIs) not mentioned in the CWW BREF or for sectors covered by exceptions in the CWW BREF (footnotes) (CZ, DE). o The CWW BREF may be supplemented by data referring to indirect emissions if waste water is sent to a WWTP not covered by the CWW BREF (PL). • The main comments of the IPs which disagree are as follows: o Differences in KEI pollutants and emission levels can occur between the different production processes. The BAT-AELs in the CWW BREF are often not applicable for large volume inorganic chemicals production (e.g. footnote ([8]) in Table 4.1; footnote ([5]) in Table 4.3). The CWW BREF contains thresholds for BAT-AELs (annual emission loads which need to be exceeded so that the BAT-AELs apply) and the IED does not set thresholds for the chemical sector in Annex I. To gather data on emissions to water and derive sound BAT-AELs for LVIC processes (AT). o To review all KEIs for water (and not only those LVIC processes excluded from or not covered by the CWW BREF) and set new values as short-term averages for all KEIs. CWW BAT-AELs have mass flow thresholds for their applicability, and are set as a yearly average. This is not compatible with Proposal 20 (for the same activity BAT-AELs for some parameters would be yearly averages and would have an applicability threshold, whereas others would be daily averages and may not have an applicability threshold) (FR). o To complement the CWW BREF during the update of the CWW BREF. The structure of the scopes of the different BREFs is already complex and will become even more complex if the CWW BREF is complemented in the LVIC BREF (NL) o The CWW BREF covers the entire chemical sector as data were collected for all sectors and BAT and BAT-AELs were derived. This process followed the BREF process under the existing IED and must not be reopened (CEFIC, EIGA). o Explanation is needed (SK).
EIPPCB assessment
• Proposal 5 needs to be assessed in conjunction with Proposal 3 and Proposal 4 (previously discussed, Section 2.1.1). • The CWW BREF and related BAT conclusions (i.e. Commission Implementing Decision (EU) 2016/902) concern the activities specified in Sections 4 and 6.11 of Annex I to

Directive 2010/75/EU, namely:
  - Section 4: Chemical industry;
  - Section 6.11: Independently operated treatment of waste water not covered by Council Directive 91/271/EEC and discharged by an installation undertaking activities covered under Section 4 of Annex I to Directive 2010/75/EU.

  Both documents also cover the combined treatment of waste water from different origins if the main pollutant load originates from the activities covered under Section 4 of Annex I to Directive 2010/75/EU.
- Proposal 5, in conjunction with Proposal 3 and Proposal 4 (previously discussed, Section 2.1.1), aims to have a greater focus on issues of environmental relevance for water that are specific to the inorganic chemical production processes covered by the LVIC BREF (e.g. monitoring and releases of key substances/pollutants, pretreatment/final treatment techniques), by purposefully minimising any potential overlap between the LVIC BREF and the CWW BREF.
- The identification of the key substances/pollutants for emissions to water or other performance indicators that are relevant to the inorganic chemical production processes covered by the LVIC BREF is discussed in Section 2.2.2.2.
- The data collection exercise (via a plant-specific questionnaire) should seek information on the above-mentioned key substances/pollutants for emissions to water or any other relevant performance indicators, as well as on the type of treatment (i.e. whether dedicated or combined), in order to ensure that, as far as possible, performance data are provided in a form that will facilitate direct comparison among plants and with the BAT conclusions contained in the CWW BREF as well. The type of data and information to be collected are discussed in Sections 2.2.2.2 and 2.3.

EIPPCB proposal

To slightly amend the original EIPPCB proposal as follows:

- To complement the CWW BREF.
- To focus on key substances/pollutants for emissions to water that are relevant to the inorganic chemical production processes covered by the LVIC BREF, as discussed in the BP.

2.1.2.2 CAK BREF

Original EIPPCB proposal

Proposal 6: The EIPPCB proposes to:

- cover in the LVIC BREF the electrolysis of brine for the production of sodium chlorate (see Table 2.1[16]);
- exclude the chemical activities covered by the CAK BREF from the scope of the LVIC BREF.

Summary of initial positions

- **11** out of **23** IPs agree with the proposal, **1** partly agrees, **1** disagrees and **10** do not provide an opinion.

- The main comments of the IPs which either agree or partly agree are as follows:
  - This proposal does not concern soda ash plants (IT).
  - The CAK BREF does not include the electrolysis of brine for the production of sodium chlorate. However, chemical activities covered by the scope of the CAK BREF should not be duplicated in the LVIC-S BREF (AT).

- The main comment of the IP which disagrees is as follows:
  - Sodium chlorate should be covered by the CAK BREF (NL).

EIPPCB assessment

- The CAK BREF (2014) covers the production of chlor-alkali chemicals (chlorine, hydrogen, potassium hydroxide and sodium hydroxide) by the electrolysis of brine, referred to in points 4.2 (a) and 4.2 (c) of Annex I to the IED. However, the electrolysis of brine for the production of sodium chlorate is not addressed by the CAK BREF; instead, it refers to the LVIC-S BREF for this activity.
- Since the LVIC BREF should merge the LVIC-AAF BREF and LVIC-S BREF, it is proposed to cover in the LVIC BREF the electrolysis of brine for the production of sodium chlorate, but to exclude the chemical activities covered by the CAK BREF from the scope of the LVIC BREF.

EIPPCB proposal

To confirm the EIPPCB proposal as follows:

- To cover in the LVIC BREF the electrolysis of brine for the production of sodium chlorate.
- To exclude the chemical activities covered by the CAK BREF from the scope of the LVIC BREF.

[16] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

2.1.3 Scope interface with legislation and BREFs other than chemical BREFs

2.1.3.1 NFM BREF

Original EIPPCB proposal
Proposal 9: The EIPPCB proposes to include the production of sulphuric acid based on SO_2 gases from NFM activities in the scope of the LVIC BREF (see Table 2.1[17]).
Summary of initial positions
• **12** out of **23** IPs agree with the proposal, **1** partly agrees, **none** disagree and **10** do not provide an opinion. • The main comments of the IPs which either agree or partly agree are as follows: o Include all types of sulphuric acid production based on SO_2-containing waste gases independent of the origin of the sulphur (e.g. elementary sulphur from Claus process or other sources such as viscous production, iron and steel mills and NFM plants) as a whole (AT, DE). o The BAT and BAT AELs for sulphuric acid production occurring in non-ferrous metals (NFM) plants deserve specific attention due to their technical specificities linked to the use of SO_2 as a raw material and to the high variations in the inlet concentrations for the sulphuric acid plants (ES).
EIPPCB assessment
• As summarised in the Chapter 12 'Concluding remarks and recommendations for future work' of the NFM BREF (2017), emission data and descriptive information on the techniques applied by NFM industries to produce sulphuric acid were gathered during the process for reviewing the NFM BREF under the IED. The outcome of this data collection is documented mainly in Chapters 2, 3, 5 and 6 of the NFM BREF. • For the sake of consistency and to avoid overlaps, the NFM TWG, during the final NFM TWG meeting, decided to remove the production of sulphuric acid from the scope of the NFM BREF. On completion of the plant-specific data analysis process carried out by the NFM TWG, it was also acknowledged that the upper end of the BAT-AEL range for SO_2 emissions to air from the production of sulphuric acid in a double contact/double absorption plant in Table 4.24 'Conversion rates and SO_2 emission levels associated with BAT' in the LVIC-AAF BREF (adopted in 2007) should have been corrected. • The proposal needs to be discussed in conjunction with Proposal 1 (addressed in Section 2.1).
EIPPCB proposal
To confirm the EIPPCB proposal as follows: • To include the production of sulphuric acid based on SO_2 gases from NFM activities in the scope of the LVIC BREF.

[17] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

2.1.3.2 GLS BREF

Original EIPPCB proposal

Proposal 10: The EIPPCB proposes to include the production of sodium silicate (water glass, see Table 2.1[18]) in the scope of the LVIC BREF.

Summary of initial positions

- **11** out of **23** IPs agree with the proposal, **none** partly agree, **one** disagrees and **11** do not provide an opinion.

- The main comment of the IPs which either agree or partly agree is as follows:
  - The production of sodium silicate (water glass) is excluded from the GLS BREF (2012) and related BAT conclusions (BE, AT).

- The main comment of the IP which disagrees is as follows:
  - Only one of the two production routes is specific to the LVIC BREF. However, both production routes correspond to the activity "production of glass" and would fit in the scope of the GLS BREF. Do not split the two production routes, decide for one BREF, may be even on the number of installations for each production process (DE).

EIPPCB assessment

- The GLS BREF (March 2012) and related BAT conclusions (i.e. Commission Implementing Decision 2012/134/EU) do not address the production of sodium silicate (water glass), indicating that such an activity is covered by the LVIC-S BREF.
- Following the decision of the IED Article 13 Forum (*ref.* 11th meeting on 19-20 December 2017), the LVIC BREF should close the first review cycle for chemical BREFs under the IED, merging the BREF on Large Volume Inorganic Chemicals – Ammonia, Acids and Fertilisers (LVIC-AAF BREF) and the BREF on Large Volume Inorganic Chemicals – Solids and Others industry (LVIC-S BREF), while considering the scope and information of the WGC BREF being finalised.
- Information so far available (provided in advance to the TWG KoM for the WGC BREF from one industrial organisation) indicates the following:
  - the total annual production of sodium silicate, in 2017, exceeded 1 Mt/year;
  - 25-50 % of plants are co-located with plants producing synthetic amorphous silica or zeolites;
  - the process involves a furnace operating at 1 000 ºC.
- Sodium silicate (water glass) is one of the basic raw materials for the production of synthetic amorphous silica, also included in the scope of the LVIC BREF. It might be appropriate to address the impact of the synergistic interactions resulting from these production processes on the associated common key environmental aspects (e.g. emissions to air, energy consumption).

EIPPCB proposal

To keep the original EIPPCB proposal unchanged:

- To include the production of sodium silicate (water glass) in the scope of the LVIC BREF.

[18] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

2.1.3.3 LCP BREF and MCP Directive

Original EIPPCB proposal

Proposal 7: The EIPPCB proposes to exclude emissions from the combustion of fuels in plants covered by the LCP BREF or the MCP Directive from the scope of the LVIC BREF.

Summary of initial positions

- **14** out of **23** IPs agree with the proposal, **5** partly agree, **1** disagrees and **3** do not provide an opinion.

- The main **comments** of the IPs which either agree or partly agree are as follows:
  - Processes/emissions covered by the MCP Directive and the LCP BREF should not be covered by the LVIC BREF to avoid overlapping obligations and the related implementation difficulties (PT).
  - To clarify that furnaces/heaters/reactors which are part of the furnace black process as well as tail gas combustors are to be covered under the LVIC BREF (CZ, CEFIC-ICBA).
  - There needs to be a clear definition of what constitutes a reactor (instead of e.g. a heater or burner). LVIC production units were not covered in the LCP BREF data gathering (FI).
  - To include in the scope the emissions from the combustion of fuel in units with a total rated thermal input equal to or greater than 1 MW, used in the inorganic chemical production processes covered by the LVIC BREF, and not covered by the LCP BREF or WGC BREF, such as furnaces for the production of carbon black, gas dryer for $CaCl_2$ drying and other processes (like production of ammonia and others) carried out in reactors. The introduction of a clear definition of what constitutes a reactor (instead of e.g. a heater or burner) is needed (IT).
  - Energy generation (electricity/heat or cooling) is generally relevant, hence the LVIC BREF should address more broadly "energy generation" (heat/cooling and electrical). Combined heat and power should also be considered (EEB).
  - Auxiliary boilers are part of the chemical reaction (fully integrated process) and then are not under LCP/MCP regulation (Fertilizers Europe).

- The main comment of the IP which disagrees is as follows:
  - Explanation is needed (SK).

EIPPCB assessment

- The LCP BREF covers emissions from ‘combustion plants’ with a rated thermal input of 50 MW_{th} or more, defining a 'combustion plant' as any technical apparatus in which fuels are oxidised in order to use the heat thus generated. The fuels considered in the LCP BREF are any conventional solid, liquid and/or gaseous combustible material, as well as industry-specific fuels, e.g. by-products from chemical industries. However, some types of combustion plants, e.g. process furnaces and heaters, considered an integral part of the reactors used in the chemical industry, are excluded by the LCP BREF scope (as per the definitions in the LCP BREF itself).
- The same definition of ‘combustion plants’ included in the LCP BREF is provided in the MCP Directive. The Directive applies to ‘combustion plants’ with a total rated thermal input equal to or greater than 1 MW and less than 50 MW, irrespective of the type of fuel they use. However, Article 2(3) of the MCP Directive stipulates that reactors used in the chemical industry and plants in which the products of combustion are used for the direct heating, drying, or any other treatment of objects or materials are excluded from the provisions of the Directive itself.
- The EIPPCB proposal aims to simply exclude from the scope of the LVIC BREF emissions from the combustion of fuels in plants (used by the inorganic chemical production processes in the LVIC BREF) which are already covered by the LCP BREF or the MCP Directive, to avoid the overlapping of the legal dispositions.
- Emissions from combustion plants such as process furnaces/heaters, considered an integral

part of reactors used in the chemical industry, are proposed to be covered in the LVIC BREF (addressed in Proposal 8).
- The same definition of process furnaces/heaters given in the LCP BREF, LVOC BREF and WGC BREF is expected to be used for consistency in the LVIC BREF as well.

EIPPCB proposal

To keep the original EIPPCB proposal unchanged:

- To exclude emissions from the combustion of fuels in plants covered by the LCP BREF or the MCP Directive from the scope of the LVIC BREF.

Original EIPPCB proposal

Proposal 8: The EIPPCB proposes to include in the scope of the LVIC BREF emissions from process furnaces/heaters with a total rated thermal input equal to or greater than 1 MW used in the inorganic chemical production processes to be covered by the LVIC BREF (see Table 2.1[19]).

Summary of initial positions

- **12** out of **23** IPs agree with the proposal, **6** partly agree, **2** disagree and **3** do not provide an opinion.

- The main comments of the IPs which either agree or partly agree are as follows:
  - To clarify that the process furnaces/heaters that will be covered by the LVIC BREF are not under the scope of the MCP Directive and/or the LCP BREF (to avoid overlapping obligations and the related implementation difficulties) (PT).
  - To include in the scope of the LVIC BREF emissions from process furnaces/heaters used in the inorganic chemical production processes to be covered by the LVIC BREF, without the threshold of 1 MW (AT).
  - To clarify that furnaces/heaters/reactors which are part of the furnace black process as well as tail gas combustors are to be covered under the LVIC BREF (CEFIC-ICBA).
  - In the case of indirect heating (e.g. with steam), it is not applicable or generalised for all installations (CZ).
  - A distinction needs to be made between true combustion units and units that chemically convert fuels to raw materials for a process, e.g. steam methane reforming for ammonia, which does not fit the description of a furnace or heater. It is also important to note that auxiliary boilers are dimensioned for start-up procedures, and operated intermittently, as an integrated part of the process even if these are spatially separated from the main installation. To keep the equipment associated with a chemical reactor within the scope of the relevant LVIC BREF, thus allowing efficient overall management of emissions and taking into account the technical specificities of the installation. To allow the monitoring of NO_X emissions in a global way (at the stack outlet) (FERTILIZERS EUROPE).
  - There needs to be a clear definition of what constitutes a reactor (instead of e.g. a heater or burner). LVIC production units were not covered in the LCP BREF data gathering (FI).
  - Some processes using direct heating may have significant emissions even though the combustion unit is below 1 MW, since the emissions do not only come from the combustion of fuels, but may also contain other chemicals. (FR).
  - The proposal is not in line with the position defined in other BREFs (FDM, PP, WBP). The topic is already covered by the WGC BREF. There is the need to clarify the definition of what constitutes a reactor (instead of e.g. a heater or burner). "Soda ash plants" can have a gas dryer for $CaCl_2$ drying; this should be included in the LVIC

[19] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

BREF and not in the LCP BREF. To merge Proposal 7 and Proposal 8 (IT).

- The main comments of the IPs which disagree are as follows:
  - To establish a threshold of 20 MW. This would lower the administrative burden for small-scale appliances, whilst still providing a good amount of furnaces that would be subject to this BREF, whose emissions are more impactful than those of 1 MW (IMA).
  - Drying installations are not necessarily part of the IED installation; depending on the situation on site they can be subject to an independent approval (e.g. in Germany: separate permit according to BImSchG) (EUROMINES).

EIPPCB assessment

- A preliminary overview of the type of process furnaces/heaters (i.e. direct heating, indirect heating or dual use) associated with the inorganic chemical production processes to be covered by the LVIC BREF is provided in Annex 3 (see Request 3).
- The LCP BREF (as per the definitions applied in the LCP BREF itself) does not cover some types of combustion plants, e.g. process furnaces and heaters, considered an integral part of the reactors used in the chemical industry.
- The MCP Directive applies to 'combustion plants' with a total rated thermal input equal to or greater than 1 MW and less than 50 MW. However, Article 2(3) of the MCP Directive stipulates that reactors used in the chemical industry and plants in which the products of combustion are used for the direct heating, drying, or any other treatment of objects or materials are excluded from the provisions of the Directive itself.
- The proposal aims to coves in the LVIC BREF emissions from those combustion plants such as process furnaces/heaters, considered an integral part of reactors used in the chemical industry, excluded from the LCP BREF and MCP Directive.
- For consistency, it is advisable to refer in the LVIC BREF to the same definition of process furnaces/heaters adopted in the LCP BREF, LVOC BREF and WGC BREF, including process furnaces/heaters with a total rated thermal input equal to or greater than 1 MW.

EIPPCB proposal

To keep the original EIPPCB proposal unchanged:

- To include in the scope of the LVIC BREF emissions from process furnaces/heaters with a total rated thermal input equal to or greater than 1 MW used in the inorganic chemical production processes covered by the LVIC BREF.

2.2 Key environmental issues (KEIs) for the LVIC BREF

2.2.1 Overview

In the call for IPs, the EIPPCB made a number of proposals and requests in order to seek the TWG's opinion about issues which may be considered KEIs or for which data may be collected as contextual information.

The feedback provided by the initial positions and the TWG proposals for candidate KEIs have been assessed by the EIPPCB. This assessment and the subsequent EIPPCB proposals for the drawing up of the LVIC BREF are presented in the following sections:

- Candidate KEIs for emissions to air: Section 2.2.3;
- Candidate KEIs for emissions to water: Section 2.2.4;
- Candidate KEIs for water consumption (and amount of waste water discharged): Section 2.2.5;
- Candidate KEIs for the consumption of raw materials: Section 2.2.6;
- Candidate KEIs for energy consumption: Section 2.2.7;
- Candidate KEIs for residues/waste generation: Section 2.2.8.

Important:
In this BP, a KEI is understood as an environmental issue that is considered so important for the production processes of inorganic chemicals covered by the LVIC BREF that information should be collected through plant-specific questionnaires and/or as bulk information. The aim of collecting such information may then differ from one KEI to another (e.g. deriving BAT and/or BAT-AE(P)Ls.

2.2.2 Identification of relevant pollutant(s)/parameter(s) for emissions to air and water

With a view to a targeted data collection, the so-called focused approach and the front-loading of the information exchange were presented to stakeholders by the Commission at the IED Article 13 Forum meeting in June 2013[20].

At the Forum meeting in 2015, the Commission presented the following criteria for defining KEIs at the earliest possible stage of the information exchange for reviewing a BREF:

- **Criterion 1: environmental relevance of pollution** caused by the activity or process, i.e. whether it may cause an environmental problem;
- **Criterion 2: significance of activity** (number of installations, geographical spread, contribution to total (industrial) emissions in the EU);
- **Criterion 3:** potential of the BREF review for identifying **new or additional techniques** that would further significantly reduce pollution;
- **Criterion 4:** potential of the BREF review/drawing up to set **BAT-AELs** that would significantly improve the level of environmental protection compared to current emission levels.

Based on the information currently available and on the initial positions received, the EIPPCB applied the four criteria mentioned above to assess candidate KEIs in this Background Paper.

Criterion 1
As explained in the call for initial positions, a number of available sources allowed the assessment of Criterion 1 ('environmental relevance of pollutants emitted to air and to water'). The EIPPCB carried out a screening of these sources, which resulted in the establishment of a preliminary list of substances/pollutants potentially relevant for the the inorganic chemical production processes to be covered in the LVIC BREF. This preliminary list of substances/pollutants was presented in Section 3.3.1.1 of the call for initial positions.

Given the information submitted with the IPs, this Background Paper aims to reassess the environmental relevance of the candidate KEIs, i.e. whether they are relevant to the the inorganic chemical production processes to be covered in the LVIC BREF, as well as whether these pollutants have intrinsic characteristics which may lead to environmental problems.

Criterion 2
For the assessment of Criterion 2 ('significance of activity'), the analysis based on the E-PRTR database was used as a first estimate to identify the possible areas of significance for the LVIC BREF, even though the results need to be interpreted with caution due to the following:

- data (even from recent reporting years) might be currently incomplete;
- the E-PRTR thresholds for reporting;
- there is not a unique correlation between the inorganic chemical production processes proposed to be covered by the LVIC BREF and the E-PRTR chemical categories of activities. In particular, this may lead to overestimated results when it comes to selecting E-PRTR activity 4 (b), since the reduced granularity of the E-PRTR data (i.e. product type and production volume not publicly available) does not allow the extraction of data corresponding solely to those specific inorganic chemicals proposed to be covered by the LVIC BREF.

[20] IED Article 13 Forum meeting of 6 June 2013, https://circabc.europa.eu/w/browse/77c81228-4492-4348-9b3f-299ee5ecca93.

Criteria 3 and 4

Among the four criteria to identify KEIs, Criteria 3 and 4 are the most difficult to assess, as they rely on projections for the future. Nevertheless, some information is available regarding new/existing techniques and current legislation.

In particular, when pollutants are covered by national regulations, they are included in a monitoring plan so there is therefore potential to collect data and then to set BAT-AELs. Those BAT-AELs could have the potential to improve the current state of play at European level as the BAT-AELs in the current LVIC-AAF and LVIC-S BREFs (adopted under the IED's predecessor, the IPPC Directive) do not have the same legally binding status as BAT-AELs in BAT conclusions adopted under the IED.

2.2.3 Emissions to air

This section refers to Request 5, Request 6 and Request 7 of the call for the expression of IPs.

To ensure transparency, the IPs in these requests were assessed by the EIPPCB individually. Additional information accompanying the IPs submitted with these requests was also taken into account for the EIPPCB assessments.

However, the EIPPCB proposals for KEIs relevant for emissions to air, organised by LVIC production process, are tabled in Section 2.2.3.4 as a result of the EIPPCB overall assessments provided in Sections 2.2.3.1.1 to 2.2.3.1.10, in Sections 2.2.3.2.1 to 2.2.3.2.18 and Section 2.2.3.3.

2.2.3.1 EIPPCB proposals

Original EIPPCB request
Request 5: TWG members are asked to provide feedback on the EIPPCB proposals for KEIs relevant for emissions to air, including the associated monitoring practices and contextual information/parameters (by filling in the corresponding cells in Document 3). Information on emission limit values and monitoring on proposed KEIs is also expected to be provided (see Document 3).

The IPs and related EIPPCB assessments associated with Request 5, 'EIPPCB proposals for KEIs', are summarised in Sections 2.2.3.1.1 to 2.2.3.1.10, grouped according to substances/pollutants as presented by 'Document 3 of the call for IPs':

- Ammonia;
- Hydrochloric acid;
- Dust;
- Hydrofluoric acid;
- Gaseous chloride;
- Hydrogen sulphide;
- Nitrous oxide;
- Nitrogen oxides;
- Total P (as P_2O_5);
- Sulphur oxides.

The EIPPCB proposals of KEIs for emissions to air, organised by LVIC production process, are tabled in Section 2.2.3.4., as a result of the EIPPCB overall assessments provided in Sections 2.2.3.1.1 to 2.2.3.1.10 and Sections 2.2.3.2.1 to 2.2.3.2.18.

2.2.3.1.1 Ammonia (NH_3)

Original EIPPCB proposal
To include **ammonia (NH_3)** as a KEI relevant for production of nitric acid, NPK and CN, superphosphates, urea and UAN.
Summary of initial positions
• **6** out of 23 IPs agree with the proposal, **10** partly agree and **7** do not provide an opinion. • The main comments of the IPs which partly agree are the following: o To include ammonia (NH_3) as a relevant KEI for the production of the following: ▪ Ammonia (AT, BE, FR, IT). Several installations have specific ELVs for NH_3 in their permit (e.g. subsector NPK, ammonia, phosphoric acid, AN) (BE).

- AN/CAN (AT, BE, FR). NH_3 is mentioned as relevant parameter for AN/CAN in LVIC-AAF BREF. NH_3 was considered relevant for AN/CAN and for soda ash in the EIPPCB analysis carried out during the determination of the scope of the WGC BREF. NH_3 for AN/CAN was included in the 'Key emissions Fact Sheets' for the fertilisers sector (see BATIS WGC BREF) (BE).
- Sodium carbonate (soda ash) production (BE, DE, FR). NH_3 was considered relevant for soda ash in the EIPPCB analysis carried out during the determination of the scope of the WGC BREF (BE). Emission data on NH_3 as a KEI for soda ash production may be provided on request (DE).
- Metal catalysts (FR).

- According to E-PRTR 2020 data, the chemical sector accounts for 7.7 % of the emissions of NH_3, where the main contributors are units 4.b (iv) with 3 696 tons/yr and 4.c with 4 691 tons/year. (CEFIC, IT).
- NH_3 is not a KEI for the following processes:
  - UAN stand-alone units have no significant air emissions (Fertilizers Europe). When UAN is made from AN solution and urea without additional heating no limits for NH_3 should be set (CZ).
  - Nitric acid production plants (ES). Nitric acid production where technologies like dual pressure process with no NH_3 emission are used (PL).
  - For sulphuric acid: In SO_2/SO_3 abatement systems with NH^{4+}, NH_3 should be controlled. (ES).

EIPPCB assessment

- NH_3 slip should be considered in the case of NO_X reduction technologies such as SNCR and SCR, which are commonly used in ammonia production and in nitric acid (HNO_3) production.
- NH_3 is mentioned as a pollutant for AN/CAN production in LVIC-AAF BREF (see pollutants in Table 9.4 in the LVIC-AAF BREF, where ammonia is reported in dryer and cooling processes; however, emissions can be up to 50 g/tonne of product, whereas dust could be an order of magnitude higher).
- NH_3 was considered relevant for AN/CAN production in the EIPPCB analysis extensively carried out during the finalisation of the WGC BREF scope[21].
- NH_3 was considered relevant for soda ash production in the EIPPCB analysis extensively carried out during the finalisation of the WGC BREF scope[21]. Moreover, according to the preliminary feedback provided with the IPs, emission data seems to be available from at least one MS (DE).
- NH_3 was considered a KEI for urea plants in the LVIC-AAF BREF (Table 8.10). NH_3 is consumed as raw material during the production of UAN, commonly used in the pH adjustment / corrosion inhibitor of UAN solution (LVIC-AAF BREF). The issue of types of production processes (e.g. stand-alone production) would be better addressed during the design phase of the plant-specific questionnaire.

EIPPCB proposal

- See Section 2.2.3.4.

2.2.3.1.2 Hydrochloric acid (HCl)

Original EIPPCB proposal

To include HCl as a KEI relevant for inorganic phosphates, calcium chloride, TiO_2 (and related products), sodium silicate, synthetic amorphous silica and superphosphates production.

Summary of initial positions

- **6** out of 23 IPs agree with the proposal, **8** partly agree, **1** disagrees and **8** do not provide an

[21] EIPPCB document [Ref. Ares(2018)987720 - 21/02/2018].

opinion.

- The main comments of the IPs which agree or partly agree are the following:
  To include HCl as KEI with the following considerations:
  - For pyrogenic silica only (CEFIC). There are no HCl emissions in the precipitated silica production (ES). The production of colloidal silica generally does not have KEIs for emissions to air. In the process only dilute acid is used for regeneration of ion exchange resin. Emissions of HCl can only occur from storage tanks of HCl (SE).
  - To assess whether HCl is a relevant KEI for the production process of sodium chlorate (SE, FR). HCl is used to regenerate the ion exchange resin and tail gas scrubber emissions can contain Cl_2, HCl, Cl_2O, HClO, etc. (SE).
  - Only TiO_2 by the chloride process (CZ, CEFIC, PL). Sectoral ELV for TiO_2 (BE). HCl is not a KEI for TiO_2 production via sulphate process (ES, IT).
  - There are no emissions of HCl to the atmosphere for all the inorganic phosphates (LVIC-S BREF, 2007) (ES).
  - ELV in permit in Flanders for sulphuric/nitric acid plant (BE). HCl may be relevant to the production of sulphuric acid (FR).
  - HCl is a KEI for production of NPK in the LVIC-AAF BREF (see Table 7.14 with BAT-AELs, several installations in Table 7.5) and according to the EIPPCB analysis carried out during the WGC BREF scope determination. Several MSs have plant emission data and the parameter is in permits (BE, AT, DE).
  - For precipitated calcium carbonate production (DE).
  - According to E-PRTR 2020 data, the chemical sector accounts for 4.2 % of the emissions of HCl, where the main contributors are units of sector 4.c with 138.7 tons/year (CEFIC, IT).
  - For feed phosphates, evaporation of HCl is minimum or inexistent because of the quality of the phosphoric acid. HCl is only relevant if the hydrochloridic process is used and included in the scope of this section (CEFIC-INCOPA).
- The main comment of the IP which disagrees is the following:
  - Only TiO_2 produced by the chloride process (SI).

EIPPCB assessment

- HCl is a KEI for emission to air for synthetic amorphous pyrogenic silica as indicated in the LVIC-S BREF.
- For the production of sodium chlorate, the LVIC-S BREF simply indicates that emissions of chlorine to air might be relevant (when chlorine is not recovered using efficient alkaline scrubbing of gases containing chlorine). However, it is not clear from the information submitted with the IPs if relevant HCl emission/monitoring data are available for the production of sodium chlorate.
- In the LVIC-S BREF, HCl is a KEI for TiO_2 manufactured through the chloride process (for example see Table 3.19 in the LVIC-S BREF describing emissions from the chlorination process). However, in TiO_2 fabricated by the sulphate process route, the main emissions to air from the calcination process are acid mist (sulphuric acid), dust, SO_2, and NO_2 and SO_2 and H_2S from the digestion step.
- Relevant emission data and BAT-AELs for HCl in NPK production are reported in the LVIC-AAF BREF (Table 7.14) but associated with wet scrubbing systems.
- On inorganic phosphates, it is noted that HCl is only relevant in the production of dicalcium phosphate (DCP) based on the hydrochloric acid route (from phosphate rock only) (Table 6.16 and Table 6.17 in LVIC-S BREF).
- For sulphuric acid production, the LVIC-AAF BREF indicates that HCl and other gaseous substances (HF, CO and VOCs) could appear during the raw gas purification originating from the decomposition of spent acids, roasting of pyrite or in non-ferrous metal processing under reductive conditions (Table 4.16) and these contaminants must be removed prior to H_2SO_4 production to prevent product contamination or to ensure catalyst

performance. However, there is insufficient information to assess whether these emissions are relevant and if they are being monitored. • For nitric acid production, a preliminary check of technical literature indicates that HCl is not a KEI. Moreover, from the information submitted with the IPs it is not clear if relevant HCl emission data are available. • HCl does not appear to be a KEI in the production of precipitated calcium carbonate according to LVIC-S BREF.
EIPPCB proposal
• See Section 2.2.3.4.

2.2.3.1.3 Dust

Original EIPPCB proposal
To include dust as a KEI for the following processes: hydrofluoric acid, phosphoric acid, inorganic phosphates, sodium carbonate (i.e. soda ash), calcium chloride, sodium chlorate, carbon black, titanium dioxide (and related products), ferrous sulphate, sodium silicate, synthetic amorphous silica, AN and CAN, NPK and CN, superphosphates, and urea and UAN.
Summary of initial positions
• **10** out of 23 IPs agree with the proposal, **8** partly agree and **5** do not provide an opinion. • The main comments of the IPs which agree or partly agree are the following**:** o General and sectorial ELVs in Flanders. Additional ELVs in permits of several plants (BE). o Dust emission permitting is different depending on the sites = concentration in stack for some and flow of dust for others (kg/h). Impact of grade on the powder emission and efficiency of the separation (CEFIC). o Where the presence of heavy metals adds to the pollution (on top of the dustiness aspect), these emissions should be considered a KEI. Therefore, data on heavy metal content in relevant processes (soda ash, TiO_2 etc.) should be collected (EEB). o Sodium chlorate production: relevant only when a drying step is included (IT, CEFIC, ES). o Only for AN and CAN production (PL). o In cases when there is no installation of urea but there is an installation of UAN made from AN solution and urea - no adequate limits for dust set in this case (CZ). o Include dust as a KEI for the following production processes: ▪ Ammonia (partial oxidation process) (AT, FR). ▪ Calcium carbide production (AT). Dust is a KEI also for CaC_2 production (tapping gas combustion, drying, storage, crushing), emission data DE (2020), see the LVIC-S BREF, page 359 (< 5-15 mg/Nm^3) (DE). ▪ Calcium carbonate (dry processes only) (IMA). ▪ Thermal treatment or direct heating (AT, FR). Contextual information on thermal treatment of dust important for data collection on fertiliser production (AT). o For sulphuric acid production, it may be relevant (FR, ES). The use of solid sulphur can generate dust (ES). o Dust is not a KEI for the following processes: ▪ ferrous sulphate (ES); ▪ production of colloidal silica - not applicable (SE); ▪ liquid production of calcium chloride via the acid-lime route (SE); ▪ UAN stand-alone units have no significant air emissions (Fertilizers Europe).

EIPPCB assessment
• Dust is reported as a relevant emission for ammonia production using partial oxidation in the LVIC-AAF BREF (Table 2.9). • There is an inconsistency between the request description in the Excel spreadsheet (Document 3 of the call for IPs) and the Word document (Document 2 of the call for IPs): in the Excel template, dust was not marked as a KEI for calcium carbide production but it was indicated as a KEI in the Word document. Emission data exist for several plants as it is mentioned in the LVIC-S BREF (Table 7.10) and as reported by several MSs. • For copperas (ferrous sulphate), the LVIC-S BREF shows the process flow diagram for the drying process of copperas (ferrous sulphate heptahydrate and ferrous sulphate monohydrate) in Figure 7.7 indicating dust emissions should be minimised by wet scrubbing systems or bag filters. • Dust is a KEI for the drying step of colloidal silica production (see the LVIC-S BREF, Tables 5.14 and 5.15) and depends on the technique employed. • Calcium chloride via the acid-lime route also includes a drying process where solid residues are collected in bags (see Figure 7.37 in the LVIC-S BREF). • Regarding UAN stand-alone plants, the process takes place in a liquid state with steam and products are liquid (however, the reactants AN and urea can be fed in solid). • The LVIC-AAF BREF on the production of sulphuric acid indicates that dust is present in raw gases mainly from roasting of ores, melting and refining processes (see Table 4.16) and, like other contaminants (e.g. heavy metals), must be removed prior to H_2SO_4 production to prevent product contamination or to ensure catalyst performance. • Information submitted with the IPs shows that monitoring is continuous and/or discontinuous, with no clear trends.
EIPPCB proposal
• See Section 2.2.3.4.

2.2.3.1.4 Hydrofluoric acid (HF)

Original EIPPCB proposal
To include HF as a KEI relevant for production of hydrofluoric acid, phosphoric acid, inorganic phosphates, sodium silicate, NPK and CN, and superphosphates
Summary of initial positions
• **9** out of 23 IPs agree with the proposal, **6** partly agree and **8** do not provide an opinion. • The main comments of the IPs which agree or partly agree are the following: o Broaden the scope: ▪ CAN (AT); ▪ sulphuric/nitric acid, as ELVs are set in permit in Flanders (BE); ▪ inorganic phosphates production during desulphation (see the LVIC-S BREF) and for HF production (see the LVIC-AAF BREF) (DE). o There are no emissions of HF to air for all the inorganic phosphates (LVIC-S BREF, 2007). In nitrogen fertilisers, HF is relevant only if it is present (ES). o HF evaporation from the process is captured in filters and recycled in the plant. The level of fluoride is very low in the raw material (phosphoric acid) (CEFIC).
EIPPCB assessment
• There are data on HF emissions to air from CAN plant using raw materials obtained from an 'ODDA' plant (nitrophosphate process) in AT (LVIC-S BREF, Table 9.4 and information submitted via call for IPs). • Sulphuric acid production: the LVIC-AAF BREF indicates that HF and other gaseous substances (HCl, CO and VOCs) could appear during the raw gas purification originating from the decomposition of spent acids, roasting of pyrite or in non-ferrous metal

processing under reductive conditions (Table 4.16) and these contaminants must be removed prior to H_2SO_4 production to prevent product contamination or to ensure catalyst performance.
- Nitric acid production: from the literature survey, it does not seem like HF is a KEI for nitric acid production.
- Regarding inorganic phosphates: the LVIC-S BREF mentions fluoride vapours as off-gases in desulphation step (Table 6.3).

EIPPCB proposal

- See Section 2.2.3.4.

2.2.3.1.5 Gaseous chloride (Cl_2)

Original EIPPCB proposal

To include **gaseous chloride (Cl_2)** as a KEI for the following processes: sodium chlorate, ferrous sulphate, and synthetic amorphous silica.

Summary of initial positions

- **6** out of 23 IPs agree with the request, **6** partly agree and **11** do not provide an opinion.
- The main comments of the IPs which agree or partly agree are as follows:
  - Silica: Pyrogenic silica only, discontinuous monitoring frequency (CEFIC). There are no Cl_2 emissions in the precipitated silica production process using natural gas as combustible (ES). Gaseous chloride is not applicable for the production of colloidal silica (SE).
  - Ferrous sulphate: No emissions of chlorine from ferrous sulphate ($FeSO_4$) production (CZ, DE, ES). Very small quantities of Cl_2 from iron chloride sulphate production. No emissions of chlorine from ferrous sulphate production (CEFIC). Cl_2 was a KEI for copperas in the LVIC-S BREF; general ELV in Flanders; no sectoral ELVs and no additional ELVs in permits (BE).
  - Sodium chlorate: Not relevant as Cl_2, but relevant as Cl_2O, HClO and possibly also for HCl and ClO_2 (SE). Some sodium chlorate plants do not have any channelled emissions to air (ES).
  - Emission of Cl_2 is important for TiO_2 chloride process (PL).

EIPPCB assessment

- For silica production, the LVIC-S BREF included values for Cl_2 emissions to air in the case of synthetic amorphous pyrogenic silica (i.e. Table 5.7). For colloidal silica, it would not be relevant unless related to emissions from associated firing units used in the drying processes of precipitated silica and silica gel.
- Cl_2 was included as KEI for copperas (ferrous sulphate) in the LVIC-S BREF (Table 7.31). Indeed, it does not seem relevant for other copperas manufacturing processes, but here those processes are treated as a complete section.
- Chlorine was included in the overview of inputs and outputs in the sodium chlorate manufacturing processes (Table 7.79, LVIC-S BREF). Relevant species could be further investigated.
- For manufacturing of TiO_2 using the chloride process, during the chlorination step Cl_2 is a KEI for emissions to air (see LVIC-S BREF Table 3.19). Therefore, it seems reasonable to it include as KEI.

EIPPCB proposal

- See Section 2.2.3.4.

2.2.3.1.6 Hydrogen sulphide (H_2S)

Original EIPPCB proposal
To include hydrogen sulphide (**H_2S**) as a KEI for the production of ammonia.
Summary of initial positions
• **4** out of 23 IPs agree with the proposal, **1** partly agrees, **4** disagree and **14** do not provide an opinion. • The main comments of the IPs which agree or partly agree are the following: o According to the BREF LVIC-AAF, H_2S emissions are typical of the partial oxidation process (see Table 2.9) (AT) o The H_2S evolves from desulphurisation in the steam reforming process, i.e. for the production of H_2. In our view, production of H_2 should be dealt with in a separate chapter - therefore H_2S should be a KEI for H_2 production, not for NH_3 production (EEB) o H_2S is not applicable for carbon black (CEFIC-ICBA). o H_2S in the LVIC-S BREF is a KEI for production of TiO_2 (sulphate process route). In Flanders, there is an additional ELV in the permit for H_2S for synthetic amorphous silica (1 plant). H_2S is a possible emission to air from the evaporators of phosphoric acid plants (during production of white phosphoric acid from black phosphoric acid) (BE). • The main comments of the IPs which disagree are the following: o Not a KEI for the sectors of the LVIC BREF (CEFIC, IT, PL). There is no significant H_2S in the ammonia process and it is not present in the air emission (Fertilizers Europe). H_2S reacts in process and it is not present in flue-gases (SK). o This pollutant should be SO_3/H_2SO_4, in that case the pollutant should be included (NL). o In sulphuric acid production H_2S may appear, when sulphuric acid is made from solid sulphur (ES).
EIPPCB assessment
• H_2S is a KEI for partial oxidation (gasification) of heavy feedstocks such as residual oil and coal (see Table 2.9 in the LVIC-AAF BREF). The sulphur originating from the feedstock is present in the raw gas, mainly as H_2S. Different abatement systems to remove sulphur compounds exist. In some cases, the raw gas is scrubbed and fed to a Claus plant (where H_2S is converted to elemental sulphur by combustion with air). In other cases, the H_2S is removed after the shift conversion together with the CO_2. • For methane steam reforming, H_2S appears as an intermediate product of the desulphurisation units used prior to reforming to avoid catalyst poisoning (catalysts used in the reforming process are highly sensitive to sulphur compounds). Typically, the methane feed gas is preheated to 350-400 °C and then hydrogenated to form H_2S, which is then adsorbed on a typical ZnO-packed bed, forming ZnS and water. H_2S reacts during the process and is not typically in the flue-gas stream; it is unclear if it is monitored. However, as a first step in the process, it applies to the production/synthesis of H_2 by methane steam reforming to produce NH_3. • H_2S is a KEI for the production of TiO_2 using the sulphate process (as shown in Table 3.43 in the LVIC-S BREF) for scrubbers in the digestion section. • There is no indication that H_2S should be a relevant KEI for synthetic amorphous silica production based on the LVIC-S BREF. • There are little reported data indicating H_2S emissions are relevant/monitored in the production of phosphoric acid. • Sulphuric acid production may have H_2S as a source of SO_2 emissions (Table 4.7, in the LVIC-AAF BREF).
EIPPCB proposal
• See Section 2.2.3.4.

2.2.3.1.7 Nitrous oxide (N_2O)

Original EIPPCB proposal
To include nitrous oxide (N_2O) as a KEI relevant for production of nitric acid (HNO_3).
Summary of initial positions
• **8** out of 23 IPs agree with the proposal, **5** partly agree, **2** disagree and **8** do not provide an opinion. • The main comments of the IPs which agree or partly agree are the following: o New and update of techniques in the production of HNO_3, i.e. combined NO_X and N_2O abatement with hydrocarbons and secondary abatement for normal pressure plants. Information uploaded to BATIS and can be provided via questionnaire data gathering (AT). o In permits of several installations of other subsectors there are requirements for techniques for N_2O reduction that need to be implemented. N_2O has a high GWP and has been measured in relevant quantities in other subsectors as well. It can e.g. be formed in $DeNO_X$ installations (BE). o N_2O is also a KEI for the production of N_2O. Consequently, it is proposed to add the production of N_2O in the scope of the LVIC BREF, and to collect data on the emissions from this production process (FR). o This is included in the ETS; no BAT-AELs should be added in the LVIC BREF (FI, IT, SE) • The main comment of the IPs which disagree is the following: o This is included in the ETS; no BAT-AELs should be added in the LVIC BREF (CEFIC, Fertilizers UE, PL).
EIPPCB assessment
• The EU ETS covers nitrous oxide (N_2O) from production of nitric, adipic and glyoxylic acids and glyoxal. However, the LVIC-AAF BREF covered N_2O emissions as a KEI for the production of nitric acid as well as in $DeNO_X$ processes. However, according to Article 9(1) of the IED, the permit shall not include ELVs for direct emissions of greenhouse gases specified under the ETS, unless it is necessary to ensure that no significant local pollution effect is caused. • Data will be collected and analysed, with the aim of better understanding the techniques to mitigate or abate its production.
EIPPCB proposal
• See Section 2.2.3.4.

2.2.3.1.8 Nitrogen oxides

Original EIPPCB proposal
To include nitrogen oxides (NO_X/NO_2) as a KEI relevant for production of ammonia, nitric acid, carbon black, TiO_2 (and related products), sodium silicate, NPK and CN.
Summary of initial positions
• **10** out of 23 IPs agree with the proposal, **7** partly agree and **6** do not provide an opinion. • The main comments of the IPs which agree or partly agree are the following: o According to E-PRTR data (2020), the chemical production facilities are significant contributors with 8.8 % of total NO_X emissions reported (about 14 % are from 4.b units, about 11 % from 4.c. units) (IT, CEFIC). o NO_X is applicable to carbon black (CEFIC-ICBA). o Titanium dioxide process does not emit a significant amount of NO_X (IT). o NO_X is not applicable for ammonia production when hydrogen is obtained by electrolysis (ES).

- NO_X may also be relevant to sulphuric acid production (FR, SE) and the production of catalysts (FR).
- NO_X is relevant for calcium carbide (AT).
- Broaden the scope of subsectors. ELV in permit in Flanders for phosphoric acid, sulphuric acid, calcium chloride and sodium carbonate plant. Also, general ELV in Flanders. Sectoral ELV for nitric acid plants. Additional ELV in permit for 1 ammonia plant. KEI in the LVIC-S BREF for copperas (BE).
- NO_X is also a KEI for soda ash/$NaHCO_3$ production, synthetic amorphous silica, AN and CAN production (DE).
- Affects operation of chlorine incinerator - it should be included for pyrogenic fumed silica production (due to cross-media effects with chlorine). Also applies to pyrogenic fumed silica calcination process (CEFIC).

EIPPCB assessment

- Information from the IPs suggests that provisions exist in at least one MS (BE) for NO_X emissions from sulphuric acid production. The current LVIC-AAF BREF does not explicitly mention NO_X emissions as a KEI; however, it could appear in the exhaust gas of denitrification processes in the product H_2SO_4 treatment (Table 4.6). Also, NO_X could appear in the 'double contact/double absorption process' due to the high sulphur combustion temperatures (1 800 °C), during the decomposition of spent acids and during the roasting of sulphidic ores and pyrite for which low-NOx burners are recommended (LVIC-AAF BREF, Section 4.4.17 Minimisation of NO_X emissions). Therefore, it would be useful to collect data to update this type of information and to reflect in the new LVIC BREF the current performances of the installations carrying out these processes.
- For phosphoric acid production, the LVIC-AAF BREF does not mention NO_X emissions as a KEI. However, NO_X emissions in the phosphoric acid production could be linked to the off-gas from the sintering of the phosphate rock pellets (and depends on the phosphate rock quality/composition) and drying of cokes in the sinter furnace (the off-gas from the sinter furnace also contains a wide range of other pollutants such as dust, fluoride, phosphate, heavy metals, radio nuclides and SO_2).
- Environmental impacts from the production of solid calcium chloride ($CaCl_2$), as a co-product of magnesia (MgO) production, might include NO_X emissions (LVIC-S BREF, Table 7.73).
- Sodium carbonate (soda ash) production is indicated to have relevant NO_X emissions by two MSs (BE, DE). According to the LVIC-S BREF, NO_X is produced inside the calcination lime kiln by the oxidation of nitrogen contained in the air used in the combustion process.
- Synthetic amorphous silica production can result in NO_X emissions as indicated in the information provided with the IPs (DE, CEFIC-CABOT). This is also indicated in the LVIC-S BREF, Table 5.7: Emission concentrations and emission values – synthetic amorphous pyrogenic silica and Table 5.16: Emissions from firing units in the production of precipitated silica and silica gel.
- It is not clear from the preliminary feedback provided from the IPs why NO_X emissions are relevant for the production of AN and CAN. The LVIC-AAF BREF does not include any information on NO_X emissions.
- NO_X emissions can be relevant in the drying of copperas and related products as indicated in the LVIC-S BREF in Table 7.24: Consumption and emission values – dried $FeSO_4.7H_2O$ and $FeSO_4.H_2O$, in Table 7.27: Typical values for production of ferric sulphate using nitric and sulphuric acids, in Table 7.35: Typical emission values for the dehydration of copperas or Table 7.37: Consumption and emission values for the production of the iron oxide pigment.
- A calcium carbide plant measures NO_X in one MS (AT), requesting information from additional TWG members.

EIPPCB proposal

- See Section 2.2.3.4.

2.2.3.1.9 Total P (as P_2O_5)

Original EIPPCB proposal
To include P_2O_5 as a KEI relevant for production of inorganic phosphates.
Summary of initial positions
• **10** out of 23 IPs agree with the proposal, **3** partly agree and **10** do not provide an opinion. • The main comments of the IPs which agree or partly agree are the following: o No inorganic phosphate plants in Flanders, but 6 in the Walloon Region (BE). o Only relevant for inorganic phosphates (CEFIC-Cabot). o P is in some cases included in dust limits (FI). o P_2O_5 may be relevant to the production of superphosphate (FR). • The main comment of the IPs which disagree is the following: o There is no evaporation of P_2O_5 to air. Phosphorus emitted takes only the form of dust and is accounted for when monitoring the dust emissions (CEFIC-IFP).
EIPPCB assessment
• P_2O_5 droplets and dust are identified as KEIs for the production of inorganic phosphates (see LVIC-S BREF, Table 6.9: Consumption and emissions levels – orthophosphate solution to dry STPP).
EIPPCB proposal
• See Section 2.2.3.4.

2.2.3.1.10 Sulphur oxides

Original EIPPCB proposal
To include sulphur oxides (SO_X) as a KEI relevant for production of hydrofluoric acid and sulphuric acid.
Summary of initial positions
• **5** out of 23 IPs agree with the proposal, **9** partly agree, **1** disagrees and **8** do not provide an opinion. • The main comments of the IPs which agree or partly agree are the following: o SO_2 to be a KEI for additional LVIC production processes: ▪ TiO_2 production via sulphate process route (PL, ES), TiO_2 (BE, DE, FR); ▪ carbon black (AT, BE, DE, ES, IT, SE); ▪ sodium silicate (BE); ▪ copperas (BE); ▪ 4.b units (CEFIC, IT); ▪ soda ash (DE); ▪ synthetic amorphous silica production (DE). o In the LVIC Call for IPs – Document 2 – Background, Table 3.12 the term 'Sulphur oxides (SO_X)' is used, but in the Excel worksheet the term SO_2 is used. The parameter should either be SOx = the sum of SO_2 and SO_3 expressed as SO_2 OR SO_2 = The mixture of SO_2 and SO_3 expressed as SO_2 (SE). o Sectoral ELV for one TiO_2 plant. ELVs in permit for two sulphuric acid plants. Remark for future work on NO_X and SO_X in the LVIC-S BREF for carbon black production (BE). o According to E-PRTR data (2020), the contribution of the whole chemical sector accounts for 3.6 % of industrial emissions, 30 % thereof from 4.b units, 8 % from fertilisers (CEFIC, IT). Additional information for carbon black: BAT-AEL for SO_2 in LVIC-S H_2SO_4: Continuous measurement (daily average/half-hourly or in one case

two-hourly). New Austrian H_2SO_4 installation with H_2O_2 scrubber (AT).
    - It is more appropriate to address SO_2 emissions from sulphuric acid generation from coke ovens in the IS BREF (EUROFER).[22]

- The main comment of the IP which disagrees is the following:
    - According to 2020 E-PRTR data the contribution of the whole chemical sector accounts for 3.6% of industrial emissions, 30% thereof from 4.b units (CZ).

EIPPCB assessment

- SO_2 is a KEI for the production of hydrofluoric acid and sulphuric acid as shown in the LVIC-AAF BREF (Table 6.6, Section 4.3).
- For TiO_2 production via the chloride process route, the LVIC-S BREF also indicated SO_2 as a KEI (Table 3.19). For TiO_2 production via the sulphate process route, the LVIC-S BREF also indicated SO_2 as a KEI (Table 3.43).
- For the production of carbon black, the LVIC-S BREF indicates that sulphur oxides (SO_X) are a potential pollutant from the production process, originating from the oxidation of feedstock sulphur compounds in the reactor and the oxidation of sulphur compounds present in the tail-gas (Table 4.7). SO_X reduction is commonly achieved with two process-integrated approaches: a) by using low-sulphur feedstock and b) by increasing the sulphur retention in the product. Many European plants have been committed to using a low-sulphur feedstock to reduce the SO_X emissions to air.
- The production of sodium silicate may result in emissions of sulphur oxides depending on the fuel used in the furnace (see for example the LVIC-S BREF, Table 7.52 and Table 7.53).
- Sulphur oxides emissions can be relevant for the production of copperas during the dehydration, calcination and drying process to produce a solid product (see the LVIC-S BREF, Table 7.24 or Table 7.29, Table 7.35, Table 7.36, Table 7.37).
- In the production of soda ash, SO_X emissions originate from the oxidation of compounds containing sulphur in the limestone and coke. The formation of SO_X is limited both due to the low sulphur content in fuels used in limestone burning and some autopurification reactions in the lime kilns (see LVIC-S BREF, Section 2.3.3). Emission levels depend on the raw materials and equipment used, the location of the sampling, and other factors.
- The LVIC-S BREF does not report relevant emissions of SO_X in the production of synthetic amorphous silica (for pyrogenic silica or for precipitated silica/silica gel).

EIPPCB proposal

- See Section 2.2.3.4.

2.2.3.2 Additional proposals: KEIs relevant for emissions to air

The proposals for additional potential KEIs were indicated by some TWG members separately through Requests 5 and 6. For a summary of the initial requests and the proposed modifications to Request 5 and Request 6 please see Section 4.7 (Annex 7). The KEIs to air are organised here by production process, rather than individual pollutants.

Request 6: TWG members are asked to submit or propose any additional candidate KEIs relevant for emissions to air, if any, accompanied by a rationale addressing the four criteria mentioned in Section 3.1. Information on emission limit values and on monitoring of these additional candidate KEIs is also expected to be provided.

[22] A comprehensive justification of this position is given in the annexed paper 'EUROFER paper on scope of H_2SO_4 production from coke ovens.pdf'.

The IPs and EIPPCB assessments related to Request 6 ‘Additional candidate KEIs’ are grouped according to inorganic chemical production process presented by the ‘Document 3 of the call for IPs’:

- Ammonia production;
- Phosphoric acid production;
- Sulphuric acid production;
- Inorganic phosphates production;
- Sodium carbonate (soda ash) production;
- Calcium chloride production;
- Sodium chlorate production;
- Calcium carbide production;
- Carbon black production;
- Titanium dioxide (and related products) production;
- Ferrous sulphate production;
- Sodium silicate production;
- Synthetic amorphous silica;
- AN and CAN production;
- NPK and CN production;
- Superphosphates production;
- Precipitated calcium carbonate.

The IPs concerning Request 6 included, besides the proposals for additional candidate KEIs, proposals to extend the EIPPCB proposals for KEIs to other production processes.

2.2.3.2.1 Production of ammonia

Original EIPPCB proposal
Submit or propose any other candidate KEIs relevant for emissions to air for the production of ammonia in addition to: H_2S and nitrogen oxides (NO_X/NO_2)
Summary of initial positions per subsector/products/processes
Ammonia production, to include the following KEIs: • CO (AT): typical emissions according to the LVIC-AAF BREF (see Table 2.9); measured in Austrian plant according to IED permit. Continuous measurement in AT ammonia plants. • CH_4 (AT): in Austria CH_4 dissolved in liquid ammonia (approximately 500 t/a) is balanced and attributed to different processes according to the use of ammonia (urea, NPK, ammonia, when using ammonia in HNO_3 production CH_4 is converted to CO_2). • Dust (AT). • NH_3 (AT, IT): o It is suggest to introduce the parameter NH_3 in the ammonia production process, when SNCR/SCR are used (IT). • Alcohols (including methanol): o During the production process of ammonia via reformation, an intermittent process gas contains CO. CO is afterwards converted via high- and low-temperature converters into CO_2 using catalysts, but alcohols (including methanol) are formed. The magnitude of alcohol formation depends on the chosen catalysts and is highest when the catalysts are "fresh" (new) (BE). o Relevant methanol emissions from partial oxidation process for NH_3 production. DE

emission data can be provided on request (DE).

- SO_2: emissions from partial oxidation process (DE).
- H_2 can be emitted from the ammonia process step. They are low; nevertheless, it has recently been shown that H_2 - despite not absorbing IR radiation - acts as a greenhouse gas[23] with a GWP of 11 (i.e. roughly like methane), by quenching hydroxyl radicals in the high atmosphere and thereby slowing down breakdown of e.g. methane. H_2 from H_2 production or NH_3 production is not covered in the EU-ETS; legally there is no prohibition regarding H_2 as a KEI - this could improve monitoring and prevent leakage and energy wasting (EEB).

EIPPCB assessment

- CO is released during ammonia production at different stages and/or process routes such as: CO_2 desorption, gas-based conventional primary steam reformer, partial oxidation, superheater or thermal post-combustion. Moreover, CO emissions can be used as a good indicator of combustion efficiency and typically co-exist with soot (unburnt HC) emissions.
- CH_4 is a greenhouse gas (GHG) and a KEI for ammonia production from hydrocarbons (methane steam reforming, partial oxidation). It is important to understand what techniques can mitigate GHG emissions and relevant monitoring procedures to identify BAT. Methane emission reduction is a key pillar to reach climate neutrality by 2050 in the context of the EU Green Deal[24]. Moreover, the Global Methane Pledge[25] agreed at COP26 to which the European Union has subscribed has the goal of reducing man-made methane emissions by at least 30 % from 2020 levels by 2030. However, IED Article 9(1) regarding emissions of GHG states that "the permit shall not include an emission limit value for direct emissions of that gas, unless necessary to ensure that no significant local pollution is caused". As such, BAT-AELs could be set regarding methane emissions.
- See also Section 2.2.3.1.3 for the assessment of dust. Dust is reported as a relevant emission for ammonia production using partial oxidation in the LVIC-AAF BREF (Table 2.9).
- See Request 5 for NH_3 as a KEI: NH_3 slip should be considered in the case of NO_X reduction technologies such as SNCR and SCR, which are commonly used in ammonia production and in nitric acid (HNO_3) production.
- Alcohols (including methanol): methanol is formed in the partial oxidation process as reported by plant data shown in the LVIC-AAF BREF (Table 2.9). However, there is not sufficient information regarding the monitoring of methanol or other alcohols to confirm these emissions as a relevant KEI for the production of ammonia.
- SO_2 is reported as other emissions in the LVIC-AAF BREF (Table 2.9) from the primary reformer, for partial oxidation, superheater, auxiliary boiler and thermal oxidiser after the Claus unit. Emissions will depend on the fuel S-content. There is not sufficient information indicating this is a relevant KEI for the production of ammonia.
- H_2 is not reported so far as a KEI for ammonia production. Nevertheless, monitoring diffuse emissions and leakages may provide information regarding production efficiency (and as a hazard or for fire safety). As hydrogen production in general is rapidly increased, a better understanding of these diffusion emissions will appear.

EIPPCB proposal

- See Section 2.2.3.4.

2.2.3.2.2 Production of phosphoric acid

Original EIPPCB proposal
Submit or propose any other candidate KEIs relevant for emissions to air for the production

[23] Atmospheric Implications of Increased Hydrogen Use
[24] EU Methane Strategy
[25] Global Methane Pledge –COP 26

of phosphoric acid in addition to: HF and dust.
Summary of initial positions
To include the following pollutants/parameters as KEIs for the production of phosphoric acid: • Hexafluorosilicic acid H_2SiF_6: mentioned in the LVIC-AAF BREF as a major issue to air for production of H_3PO_4 (BE).
EIPPCB assessment
• In the LVIC-AAF BREF, in the section describing fluoride recovery and abatement of phosphoric acid, fluosilicic acid is indeed mentioned: 'fluoride is released in the reaction as hydrogen fluoride (HF), but in the presence of silica it reacts readily to form fluorosilicic acid (H_2SiF_6) and compounds such as magnesium fluorosilicate ($MgSiF_6$) and aluminium hydrogen fluoride (H_3AlF_6). The fluorosilicic acid may decompose with heating to give volatile silicon tetrafluoride (SiF_4) and hydrogen fluoride (HF)'. Thus, the volatile species are SiF_4 and HF. • The information provided is insufficient to include H_2SiF_6 as a relevant KEI for emissions to air for the production of phosphoric acid. This compound is generally found in aqueous solution.
EIPPCB proposal
• See Section 2.2.3.4.

2.2.3.2.3 Production of sulphuric acid

Original EIPPCB proposal
Submit or propose any other candidate KEIs relevant for emissions to air for the production of sulphuric acid in addition to: SO2 and SO3/H2SO4.
Summary of initial positions
To include the following pollutants/parameters as KEIs for the production of sulphuric acid: • SO3 (AT, BE, DE), SO2 (BE, EEB), sulphuric acid mists (BE), NOX (BE): o Sulphuric acid: BAT-AEL in the LVIC-AAF BREF. The formation of SO3 emissions takes place due to an incomplete absorption. Most Austrian installations monitor SO3. An ELV has been set for one installation. Request frequency discontinuous (AT). o Relevant SO3 emissions from H2SO4 production. DE emission data can be provided on request (DE). o Production of H2SO4 is likely to emit SO2 (EEB). o EIPPCB analysis for this subsector when the WGC BREF scope was determined: "Emissions to air are relevant – process emissions of SO2, SO3, sulphuric acid mists and in some cases of NOX (from denitrification of sulphuric acid or as combustion NOX)." (BE). • Metals, associated with raw materials used in the process (e.g. Cd, Ti, Hg, Sb, As, Pb, Cr, Co, Cu, Mn, Ni, Va, Sn, Mo, included in permits) (BE): o Several metals are included as ELVs in the permits of (mainly) sulphuric acid installations, but also other subsectors, in Flanders, depending on which raw materials are used within the process, e.g. mainly, but not limited to, from sulphuric acid production from NFM off-gases. • Hg (DE): o Hg emissions are relevant for H2SO4 production from waste gas of NFM installations and cokers. DE emission data can be provided on request (DE). • Dioxins and furans (BE): o Additional ELVs in the permit of one plant with sulphuric acid production from NFM off-gases. • HCl, HF, TOC (BE): o Additional ELVs in the permit of one plant with sulphuric acid production from NFM off-gases.
EIPPCB assessment
For assessment on HCl, HF, dust, NOX and H2S – please see Request 5 (Sections 2.2.3.1.2 for HCl, 2.2.3.1.4 for HF, 2.2.3.1.3 for dust, 2.2.3.1.8 for NOX and 2.2.3.1.6 for H2S assessments).

- Metals: the LVIC-AAF BREF mentions metals as contaminants in the following steps:
- Regeneration of spent acids: Inorganic materials, such as Mg, Fe, Pb and heavy metal compounds remain in the coke.
- Raw gas purification, main contaminants: Volatile compounds of As, Se, Cd and Hg from roasting of metal ores (Table 4.16) and these contaminants must be removed prior to H_2SO_4 production to prevent product contamination or to ensure catalyst performance.
- Dioxins and furans: mentioned in the LVIC-AAF BREF as contaminants in raw gas (Table 4.16). There is no sufficient information to understand if they are being monitored.
- TOC: VOCs mentioned in the LVIC-AAF BREF as contaminants in raw gas coming from the decomposition of spent acids, roasting of pyrite or in non-ferrous metal processing under reductive conditions (Table 4.16). From the information submitted with the IPs it is not clear if relevant emission data are available.

EIPPCB proposal

See Section 2.2.3.4.

2.2.3.2.4 Production of inorganic phosphates

Original EIPPCB proposal

Submit or propose any other candidate KEIs relevant for emissions to air for the production of inorganic phosphates in addition to: dust, HF, HCl and P_2O_5 equivalent.

Summary of initial positions

To include the following pollutants/parameters as KEIs for the production of inorganic phosphates production:

- HF (DE):
  - Relevant HF emission levels reported for inorganic phosphates in the LVIC-S BREF (desulphation) and for hydrofluoric acid in the LVIC-AAF BREF.

EIPPCB assessment

- The LVIC-S BREF indicates fluoride vapours are off-gases in the desulphation step (Table 6.3). HF was initially proposed as a KEI for emissions to air for the production of inorganic phosphates.

EIPPCB proposal

- See Section 2.2.3.4.

2.2.3.2.5 Production of sodium carbonate

Original EIPPCB proposal

Submit or propose any other candidate KEIs relevant for emissions to air for the production of sodium carbonate (i.e. soda ash) in addition to dust.

Summary of initial positions

To include the following pollutants/parameters as KEIs for the production of sodium carbonate (i.e. soda ash):

- CO (BE):
  - Sectoral ELV for soda ash production. CO was also mentioned as relevant for soda ash in the EIPPCB analysis during the WGC BREF scope determination (BE).
- H_2S (DE):
  - Relevant H_2S emissions arise from soda production (DE).

- NH_3 (DE, IT, EEB):
  - Relevant NH_3 emissions from soda production (emission data DE 2020). DE emission data can be provided on request (DE).
  - In the production of soda ash, NH_3 is an air pollutant. To consider it for sodium carbonate production (IT).
  - As ammonia is a process ingredient of soda ash production, data on its emissions should be collected (EEB).

- NO_X (DE):
  - Relevant NO_X emissions reported from soda (> 30 000 kg/a) and $NaHCO_3$ (8 000 kg/a). DE emissions data can be provided upon request (DE).

- SO_2 (DE):
  - Relevant SO_2 emissions from soda production. DE emission data can be provided on request (DE).

EIPPCB assessment

- CO: The outlet gas from the carbonation columns will discharge gases that have not reacted in the process. This gas is subjected to a cleaning process with brine in a packed or plate washer to recover NH_3, and possibly H_2S, which are recycled while CO_2 and CO and other inert gases are released to the atmosphere.
- H_2S: According to the LVIC-S BREF, in some plants H_2S may be added as a corrosion inhibitor, and emissions are from the tower gas washers and H_2S is typically controlled to maximum emission levels of 5 to 15 mg/Nm^3 of the outlet gas.
- For the assessment on NO_X, SO_X, NH_3 please refer to Request 5 (see Sections 2.2.3.1.8 for NO_X, 2.2.3.1.10 for SO_X and 2.2.3.1.1 for NH_3 assessments).

EIPPCB proposal

- See Section 2.2.3.4.

2.2.3.2.6 Production of sodium chlorate

Original EIPPCB proposal

Submit or propose any other candidate KEIs relevant for emissions to air for the production of sodium chlorate in addition to dust and Cl_2.

Summary of initial positions

To include the following pollutant/parameter as a KEI for the production of sodium chlorate as a KEI:

- $NaClO_3$ (SE). In SE there is one plant with ELVs for this parameter for scrubbers in the production of sodium chlorate. The following BAT conclusion for chlorate dust emissions is included in the LVIC-S BREF, Chapter 7.13.5 Best Available Techniques for the manufacture of sodium chlorate: "Reduce chlorate dust emissions from sodium chlorate crystal drying and handling to 0.3 – 10 g $NaClO_3$ per tonne of sodium chlorate produced by using a combination of dust abatement techniques (filters, scrubbers) – see Section 7.13.4.5.1." For additional permit information, please refer to the file "SE - Additional information Annual environmental report, ref 2" uploaded on BATIS (SE).

EIPPCB assessment

- Further data would be needed to assess whether monitoring of $NaClO_3$ is widespread or only in a single MS.

EIPPCB proposal

- See Section 2.2.3.4.

2.2.3.2.7 Production of calcium carbide

Original EIPPCB proposal
Submit or propose any other candidate KEIs relevant for emissions to air for the production of calcium carbide in addition to dust.
Summary of initial positions

To include the following pollutants/parameters as KEIs for the production of calcium carbide:
• CO (AT):
  o CO is measured in Austrian calcium carbide plant (AT).
• Dust (AT, DE, EEB):
  o Relevant dust emissions from CaC_2 production arise, e.g. from tapping gas combustion, drying, storage, crushing (2020 data, see also the LVIC-S BREF). Additionally to be considered: relevant dust emissions from precipitated calcium carbonate production (drying, grinding, packaging, see LVIC-S BREF p. 506) (DE).
  o Calcium carbide production involves the use of a carbonaceous material such as coke or coal, which have the tendency to produce dust. Aerial photographs (provided) of production plants in Monzón (ES) or Hart (DE) show that the site is heavily coloured in dark grey, hinting at substantial dust emissions. Monitoring should follow dust monitoring requirements and techniques from other activities. See aerial pictures. (EEB)
• NO_X (AT).
• PAHs (Polycyclic aromatic hydrocarbons) (EEB):
  o PAHs can form where carbonaceous material undergoes incomplete combustion, e.g. in CaC_2, carbon black production, but also in steam reforming from coal. Also, PAHs tend to adsorb to dust particles (especially where the dust is soot/black carbon/carbon black etc.). For this reason, looking at dust only underestimates the problem, as a PAH-containing dust is clearly toxicologically much more potent than e.g. a dust from limestone (EEB).

EIPPCB assessment
• According to the LVIC-S BREF, the main emissions from the production of CaC_2 are dust, CO_2 and NO_X, mainly from the combustion of the CO-rich furnace gas. • Dust emission data exist for several plants as it is mentioned in the LVIC-S BREF (Table 7.10) and as reported by several MSs. • PAH emissions would be of concern not only for the environment but also for workers at the production site. However, it is not clear from the information submitted with the IPs if relevant monitoring data of PAHs are available for calcium carbide production. Although links between increased cancer rates among calcium carbide workers have been reported[26], it is unclear if the main culprit is PAHs, asbestos and/or cadmium.
EIPPCB proposal
• See Section 2.2.3.4.

[26] Kjuus H, Andersen A, Langård S. Incidence of cancer among workers producing calcium carbide. Br J Ind Med. 1986 Apr;43(4):237-42. doi: 10.1136/oem.43.4.237.

2.2.3.2.8 Production of carbon black

Original EIPPCB proposal
Submit or propose any other candidate KEIs relevant for emissions to air for the production of carbon black in addition to dust and NO_X.
Summary of initial positions
To include the following pollutants/parameters as KEIs for the production of carbon black: • CO (AT, DE): o Typical emissions according to the LVIC-S BREF (Table 4.9). Emissions are controlled with thermal combustion (tail gas combustion, see Chapter 4.3.2.3) (AT). o Relevant CO emissions; low values are indicating process efficiency (DE). • SO_2 (AT, CZ, DE, CEFIC): o Relevant SO_2 emissions from carbon black production, data provided on request (DE). o SO_2 emissions from CB production controlled utilising low-S FSK. See ICBA's initial position paper (file name "ICBA's Initial Positions Paper v1.docx") (CEFIC-ICBA, CZ). o Consider SO_X in the carbon black process because of high SO_X in raw material (IT). o CO (BE), SO_X (BE, IT), reduced sulphur compounds (H_2S, CS_2, COS), NO_X, other nitrogen compounds (HCN, NH_3), VOCs, PAHs, dust and heavy metals. Many of these originate from trace impurities in the feedstock fuel (BE). • TVOC, PCDD/PCDF, HCl, HF, metals and metalloids (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Se, TI, V, Zn), PAH. Additional ELVs in the permit of one installation as a result of having no information on the fuel used for production of carbon black. The ELVs are set for a unit for energy recuperation where previously a thermal treatment was in place. E-PRTR data indicate that > 7 % of chromium emissions in Flanders originate from the chemical sector (mainly carbon black production) (BE). • PAHs can form where carbonaceous material undergoes incomplete combustion, e.g. in CaC_2, carbon black production, but also in steam reforming from coal. According to the E-PRTR, a substantial emitter of PAHs is Grupa Azoty Zakłady Azotowe "Puławy" S.A. (PL), a site manufacturing fertilisers as well as organic and inorganic chemicals. It is unclear what the source of the PAHs is, but their environmental and health consequences are high. PAHs are mentioned in Section 4.3.2.1 of the LVIC-S BREF and tend to adsorb to dust particles. PAH-containing dust is clearly toxicologically much more potent than e.g. a dust from limestone (EEB). • TOC, NMVOC, benzene, PAH with BaP as indicator (DE): o Carbon black production has relevant emissions of TOC, NMVOC, benzene and potential PAH emissions (TOC > 16 000 kg/a, benzene 1 800 kg/a). Emission data can be provided on request (DE). • Toxics in dust (Hg, Tl, Pb, Co, Ni, Se, Te, Sb, Cr, CN, NaF, Cu, Mn, V, Zn) (DE): o Carbon black production has potential emissions of toxic dust components in emissions (TA Luft classes I, II, III). Emission data can be provided (DE). To exclude the following KEI: o CO (CZ, CEFIC): ▪ CO cannot be considered as a proxy for combustion efficiency (CZ, CEFIC).
EIPPCB assessment
• Dust (or particulate matter) is generated in the production of carbon black as slip through filter systems behind the reactor, through dedusting filter systems, or through thermal combustors, as well as from fugitive emissions due to storage, transportation and packaging. (LVIC-S BREF, Table 4.7).

- CO and CO_2 are typical emissions to air originating from the incomplete combustion in the reactor or in dryers, boilers, flares, etc. (LVIC-S BREF, Table 4.7). Moreover, CO emissions can be used as a good indicator of combustion efficiency and typically co-exist with soot (unburnt HC) emissions.
- Sulphur oxides (SO_X) appear from the oxidation of sulphur-containing feedstock present in the reactor and tail-gas (LVIC-S BREF, Table 4.7).
- Reduced sulphur compounds (hydrogen sulphide, H_2S), carbon disulphide (CS_2), carbonyl sulphide (COS)) are originated by the decomposition and partial oxidation of feedstock sulphur compounds in the reactor (LVIC-S BREF, Table 4.7, Table 4.8). However, from the information submitted with the IPs it is not clear if relevant emission data are available.
- NOx present in the production of carbon black has many sources: thermal NO_X from the combustion processes in dryers, boilers, flares, or from the reactor; from the oxidation of nitrogen compounds in the feedstock; or from the post-treatment of carbon black with NO_2 or HNO_3 (LVIC-S BREF, Table 4.7).
- Heavy metals can appear if the feedstock contains those impurities (LVIC-S BREF, Table 4.7). These metals usually adsorb to dust, which is a relevant KEI for carbon black production. The data collection may suggest if they are sufficiently relevant.
- PAHs can appear due to the incomplete decomposition of feedstock in the reactor. Emissions of PAHs would be of concern not only for the environment but also for workers at the production site. However, from the information submitted with the IPs it is not clear if relevant emission data are available for carbon black production. Reviewing the literature on PAHs and production of carbon black, there seems no justification to indicate PAHs as a KEI, although some studies have evaluated the worker-cancer correlation for this sector[27].
- TVOC, as indicated by the LVIC-S BREF, related to volatile organic compounds (VOCs) (e.g. methane, acetylene, ethylene) appear as potential pollutants from the incomplete decomposition of feedstock in the reactor (LVIC-S BREF, Table 4.7, Table 4.8, Table 4.9).

EIPPCB proposal

- See Section 2.2.3.4.

2.2.3.2.9 Production of TiO_2 (chloride route)

Original EIPPCB proposal

Submit or propose any other candidate KEIs relevant for emissions to air for the production of TiO_2 (chloride process route) in addition to dust, HCl and NO_X.

Summary of initial positions

To include the following pollutants/parameters as KEIs for the production of TiO_2 (chloride route):

- CO, HCl, $TiCl_4$, TiO_2 (AT):
  - EIPPCB analysis for titanium dioxide subsector when the WGC BREF scope was determined: "Emissions to air are relevant – CO, HCl, $TiCl_4$ and TiO_2 from the chloride route and dust, NO_X, SO_2 and H_2S from the sulphate route." Note that dust should also be a KEI for the chloride route. Specific attention should go to TiO_2-dust, since TiO_2 has recently been labelled as hazard status H351 (also for powders of mixtures containing 1 % or more of titanium dioxide in the form of or incorporated in particles with aerodynamic diameter ≤ 10 µm.)(AT).

- CO (CZ, IT, SI, CEFIC):
  - CO from furnaces in TiO_2 production usually a part of permits (CZ, IT, SI, CEFIC-

[27] Boffetta, P., Jourenkova, N. & Gustavsson, P. Cancer risk from occupational and environmental exposure to polycyclic aromatic hydrocarbons. Cancer Causes Control 8, 444–472 (1997). https://doi.org/10.1023/A:1018465507029.

TDMA). • Dioxins and furans: Measurements of dioxins and furans in titanium dioxide installation in Flanders show that these substances can be found in their air emissions (BE). • SO_2 (CZ): o SO_2 from the sulphate/chloride process of TiO_2 is part of the IED, Annex VIII, as well as the current LVIC-S BREF. (CZ). • Cl_2 from the chloride process of TiO_2 is part of the IED, Annex VIII (CZ, IT, CEFIC-TDMA). • CO_2 (EEB): o TiO_2 production emits large amounts of CO_2. As this activity is not covered by Annex I of the EU-ETS Directive, Article 9(1) of the IED is not applicable, and logically the BREF process should apply. Possibly other processes are similar in carbon intensity and outside the ETS and should be included as well (EEB).
EIPPCB assessment
• For the assessment on HCl, dust, nitrogen oxides (NO_X), sulphur oxides (SO_X) and gaseous chloride (Cl_2), see Request 5 (Sections 2.2.3.1.2 for HCl, 2.2.3.1.3 for dust, 2.2.3.1.8 for NO_X, 2.2.3.1.10 for SO_X and 2.2.3.1.5 for Cl_2 assessments). • Regarding $TiCl_4$, the LVIC-S BREF indicates the following: o Most of the $TiCl_4$ is condensed and separated from the gas stream. It is a valuable volatile liquid by-product which must be purified. o The higher the yield of the TiO_2 ore to $TiCl_4$, the lower the overall impact of titanium dioxide production on the environment. • In the chloride process, C is oxidised and forms carbon dioxide (CO_2) and carbon monoxide (CO). CO and CO_2 are also emitted by the furnaces used in the process. CO emissions can be used as a good indicator of combustion efficiency. • Recent publications[28] report on the finding of polychlorinated dibenzodioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and polychlorinated biphenyls (PCBs) on the surface of commercially available TiO_2 nanoparticles, found in TiO_2 produced via the chloride route, increasing the concern regarding TiO_2 use due to their potential toxicity. The information suggests concern for the downstream use of TiO_2 in certain products, but does not indicate this is a KEI associated with its production. The European Dioxin Emission Inventory Stage II - Volume 2[29] published by DG ENV in 2000 concluded that dioxin emissions to ambient air from the chlorine process for titanium dioxide production as carried out in the investigated plant could not be found.
EIPPCB proposal
• See Section 2.2.3.4.

2.2.3.2.10 Production of TiO_2 (sulphate route)

Original EIPPCB proposal
Submit or propose any other candidate KEIs relevant for emissions to air for the production of TiO_2 (sulphate process route) in addition to dust, HCl and NO_X.
Summary of initial positions

[28] Ctistis, G., Schön, P., Bakker, W. et al. PCDDs, PCDFs, and PCBs co-occurrence in TiO2 nanoparticles. Environ Sci Pollut Res 23, 4837–4843 (2016). https://doi.org/10.1007/s11356-015-5628-7

[29] European Dioxin Emission Inventory Stage II - Volume 2

To include the following pollutants/parameters as KEIs for the production of TiO_2 (sulphate route):

- Dust, NOx, SO_2, H_2S (AT):
  - EIPPCB analysis for titanium dioxide subsector when the WGC BREF scope was determined: "Emissions to air are relevant – CO, HCl, $TiCl_4$ and TiO_2 from the chloride route and dust, NO_X, SO_2 and H2S from the sulphate route." (AT).
- H_2S (DE, IT, SI, CEFIC, EEB):
  - Relevant H_2S emissions arise from TiO_2 dissolving, bleaching, filter press, storage breathing (DE).
  - H_2S from the sulphate process of TiO_2, when slag is used as raw material, is a part of LVIC-S. (IT, SI, CEFIC-TDMA).
- SO_2 (CZ, DE, IT, SI, CEFIC, EEB):
  - SO_2 from the sulphate/chloride process of TiO_2 is part of the IED, Annex VIII, as well as the current LVIC-S BREF (CZ, IT, CEFIC-TDMA).
  - Relevant SO_2 emissions from TiO_2 production. DE emission data can be provided on request (DE).
  - SO_2 from the sulphate/chloride process of TiO_2 is part of the IED, Annex VIII, as well as the current LVIC-S BREF. These answers represent the current situation in the overall TiO_2 industry in the EU. As the plants are located in a number of Member States the monitoring stipulated in permits substantially differs. Therefore, the option 'other' has been chosen as the averaging period where necessary. Indeed, there occurs most of the possibilities in the drop-down menu (SI).
  - Production of TiO_2 in the sulphate process is likely to emit SO_2 (EEB).
- H_2 (EEB):
  - The LVIC-S BREF mentions in Section 3.3.3.3.3 H_2 emissions from a single site. H_2 from TiO_2 production is not covered in the EU-ETS; legally there is no prohibition to set a KEI on H_2.

EIPPCB assessment

- For the assessment on HCl, dust, nitrogen oxides (NO_X), sulphur oxides (SO_X) and H_2S, see Request 5 (see Sections 2.2.3.1.2 for HCl, 2.2.3.1.3 for dust, 2.2.3.1.8 for NO_X, 2.2.3.1.10 for SO_X and 2.2.3.1.6 for H_2S assessments).
- The sulphate process, in contrast to the chloride process, does not have any process related CO or CO_2 emissions. CO emissions can be used as a good indicator of combustion efficiency. CO_2 originates from fuel use and as a by-product from the neutralisation of acidic waste streams to form gypsum. Data from the LVIC-S BREF indicate that over the years, carbon monoxide (CO) emissions in the sulphate process have fallen by 91 %. The only significant source on site is now the white gypsum dryer (LVIC-S BREF, Section 3.3.3.6 Environmental performance – Grimsby Works 2002). Literature seems to indicate that the sulphate process route emits less GHGs but perhaps it may be less economical[30].
- The LVIC-S BREF indicates there may be some hydrogen emissions (Table 3.44). This process generates a small amount of hydrogen, which is normally rendered harmless by dispersion in air.

EIPPCB proposal

- See Section 2.2.3.4.

2.2.3.2.11 Production of ferrous sulphate

Original EIPPCB proposal

Submit or propose any other candidate KEIs relevant for emissions to air for the production of ferrous sulphate in addition to dust and Cl_2.

[30] Croce, P.S., Mousavi, A. A sustainable sulfate process to produce TiO2 pigments. Environ Chem Lett 11, 325–328 (2013)

Summary of initial positions
To include the following pollutants/parameters as KEIs for the production of ferrous sulphate: • SO_2 should be included for iron chlorosulphate (CEFIC-INCOPA). Process pollutants, a part of permits (CEFIC-TDMA). • NO_X should be included for iron chlorosulphate, and ferric sulphate (CEFIC-INCOPA). Process pollutants, a part of permits (CEFIC-TDMA).
EIPPCB assessment
• For the assessment on NO_X and SO_X, see Request 5 (Sections 2.2.3.1.8 and 2.2.3.1.10 respectively).
EIPPCB proposal
• See Section 2.2.3.4.

2.2.3.2.12 Production of sodium silicate

Original EIPPCB proposal
Submit or propose any other candidate KEIs relevant for emissions to air for the production of sodium silicate in addition to dust, HCl, HF and NO_X.
Summary of initial positions
To include the following pollutants/parameters as KEIs for the production of sodium silicate: • EIPPCB analysis for the sodium silicate subsector when the WGC BREF scope was determined: "Emissions to air are relevant – CO, NO_X, SO_X, dust, chlorides, and fluorides." (BE). • **SO_2**: It was included in the previous LVIC BREF (CEFIC-CEES).
EIPPCB assessment
• For the assessment on HCl, dust, HF, NO_X and SO_X, see Request 5 (see Sections 2.2.3.1.2 for HCl, 2.2.3.1.3 for dust, 2.2.3.1.4 for HF, 2.2.3.1.8 for NO_X and 2.2.3.1.10 for SO_X assessments).
EIPPCB proposal
• See Section 2.2.3.4.

2.2.3.2.13 Production of synthetic amorphous silica

Original EIPPCB proposal
Submit or propose any other candidate KEIs relevant for emissions to air for the production of synthetic amorphous silica in addition to dust, HCl and Cl_2.
Summary of initial positions

To include the following pollutants/parameters as KEIs for the production of synthetic amorphous silica:

- CO (BE, CEFIC), NO_X (BE, DE, CEFIC), C_{l2} (BE), HCl (BE), VOCs (BE), dust (BE): EIPPCB analysis for the synthetic amorphous silica subsector when the WGC BREF scope was determined: "Emissions to air are relevant – process emissions of dust, CO, NO_X, Cl_2, HCl and VOCs." (BE).
- CO and NO_X need to be included for synthetic amorphous silica to consider cross-media impacts vs chlorine. This is unique to Cabot GmbH due to the type of chlorine abatement used (chlorine incinerator technology) (CEFIC-Cabot).
- Relevant NO_X emissions reported from synthetic amorphous silica (see the LVIC-S BREF). DE emission data can be provided upon request (DE).

- SO_2 (DE):
  - Relevant SO_2 emissions from synthetic amorphous silica production. DE emission data can be provided on request (DE).

- TOC (DE):
  - Relevant TOC arises from synthetic amorphous silica production. DE emission data can be provided on request (DE).

EIPPCB assessment

- For the assessment on HCl, dust, Cl_2 and NO_X, see Request 5 (see Sections 2.2.3.1.2 for HCl, 2.2.3.1.3 for dust, 2.2.3.1.5 for gaseous chloride and 2.2.3.1.8 for NO_X assessments).
- CO and VOCs are indicated as emissions in the LVIC-S BREF (Table 5.7).
- According to the preliminary feedback provided with the IPs, emission data of TOC seem to be available at least in one MS (DE).

EIPPCB proposal

- See Section 2.2.3.4.

2.2.3.2.14 Production of AN and CAN

Original EIPPCB proposal

Submit or propose any other candidate KEIs relevant for emissions to air for the production of AN and CAN in addition to dust.

Summary of initial positions

To include the following pollutants/parameters as KEIs for the production of AN and CAN:

- HF (AT, DE):
  - Relevant HF emission levels reported for inorganic phosphates in the LVIC-S BREF (desulphation) and for hydrofluoric acid in the LVIC-AAF BREF.
- NH_3 (AT, DE):
  - Relevant NH_3 emissions from AN and CAN (emissions reported in the LVIC-AAF BREF). DE emission data can be provided on request (DE).
- NO_X: Relevant NOx emissions reported from AN and CAN (see the LVIC-AAF BREF). Emission data can be provided on request (DE).

EIPPCB assessment

- For the assessment on dust, NH_3, HF and NO_X, see Request 5 (see Sections 2.2.3.1.3 for dust, 2.2.3.1.1 for NH_3, 2.2.3.1.4 for HF, and 2.2.3.1.8 for NO_X assessments).

EIPPCB proposal

• See Section 2.2.3.4.

2.2.3.2.15 Production of NPK and CN

Original EIPPCB proposal
Submit or propose any other candidate KEIs relevant for emissions to air for the production of NPK and CN in addition to dust, NH_3, HF and NO_X.
Summary of initial positions
• To include the following pollutant/parameter as a KEI for the production of NPK and CN: HCl (AT, DE): Relevant HCl emissions reported from NPK and CN in the LVIC-AAF BREF (BAT-AEL). DE emission data can be provided on request.
EIPPCB assessment
• For the assessment on HCl, see Request 5, Section 2.2.3.1.2.
EIPPCB proposal
• See Section 2.2.3.4.

2.2.3.2.16 Production of superphosphates

Original EIPPCB proposal
Submit or propose any other candidate KEIs relevant for emissions to air for the production of superphosphates in addition to dust, NH_3, HF and HCl.
Summary of initial positions
To include the following parameter as a KEI for the production of supherphosphate: • Odour. Depending on the origin of the phosphate rock, it may contain organic matter which produces malodorous gases when it is attacked with sulphuric acid (ES).
EIPPCB assessment
• As indicated in the LVIC-AAF BREF, odour nuisance might occur depending on the impurities in the raw materials used. Phosphate rock can contain small amounts of organic compounds (such as mercaptans), which are released during the reaction with acid, causing odour nuisance. However, from the information submitted with the IPs it is not clear if relevant emission data are available.
EIPPCB proposal
• See Section 2.2.3.4.

2.2.3.2.17 Additional comments regarding KEIs

Summary of initial positions - General comments
To include the following KEIs: • Particulate matter (FR). Particulate matter (PM_{10} and $PM_{2.5}$) should also be considered in addition to dust. These KEIs have been reported by some French fertiliser plants. Particulate matter is relevant to at least all processes where dust is relevant. • CO_2 (SE). Assessment of BAT and BAT-AELs for reduction of emissions of CO_2 from inorganic chemical production processes should be carried out. However, BAT-AELs cannot be derived for CO_2 emissions under the EU ETS.
EIPPCB assessment

- If data are available regarding the particle size distribution of dust, then PM_{10} and/or $PM_{2.5}$ could be analysed. However, from previous experience (e.g. WGC BREF) this is not always the case.
- CO_2 emissions are a key indicator for tracking the decarbonisation of the chemical sector. Recognising the key importance of CO_2 emissions in the context of the European Green Deal, it would be useful to collect information on techniques related to the reduction of CO_2 emissions from large volume inorganic chemicals manufacturing plants and to collect data on CO_2 emissions to air as contextual information through plant-specific questionnaires. However, BAT-AELs will not be derived for plants covered under the scope of the EU ETS.

EIPPCB proposal

- To leave the proposal regarding dust as as a KEI to air as initially proposed. To assess the opportunity to collect data on particulate matter (PM_{10} and $PM_{2.5}$) during the phase of questionnaire design and decide at a later stage if the data collected via the plant-specific questionnaires allow further distinction according to particle size.
- To collect information on techniques related to the reduction of CO_2 emissions from large volume inorganic chemicals manufacturing plants and to collect data on CO_2 emissions to air as contextual information through plant-specific questionnaires. See EIPPCB proposal associated to Request 14, in Section 3.2.3.

2.2.3.2.18 Additional sectors/processes/products

Summary of initial positions

To include the following processes/products /subsectors:

- Hydrogen (AT) to include NO_X, CO, NH_3 as KEIs:
  - Missing sector, at least for steam reforming KEIs are the same as for steam reforming in the ammonia production. NH_3 slip should be considered in the case of reduction technologies such as SNCR and SCR (AT).
  - To include H_2 (EEB):
    - H_2 can be emitted from its production. Emissions are low (of the order of 1 kg/ton of TiO_2); nevertheless it has recently been shown that H_2 - despite not absorbing IR radiation - acts as a greenhouse gas with a GWP of 11 (i.e. roughly like methane), by quenching hydroxyl radicals in the high atmosphere and thereby slowing down breakdown of e.g. methane. H_2 from H_2 production or NH_3 production is not covered in the EU-ETS; legally there is no prohibition regarding H_2 as a KEI - this could improve monitoring and prevent leakage and energy wasting (EEB)[31].
- Precipitated calcium carbonate production to include as KEIs:
  - HCl emissions. DE emission data can be provided on request (DE).
  - CO (FR). CO was reported by one French plant as a relevant KEI for calcium carbonate production. More generally, CO is a relevant parameter for all processes using combustion.

EIPPCB assessment

- Hydrogen production (e.g. by steam reforming, partial oxidation or electrolysis) as a directly associated activity or as a stand-alone process is discussed in Section 2.1.
- There are currently no monitoring data on diffuse emissions of hydrogen in the production of NH_3 or TiO_2.
- Precipitated calcium carbonate (PCC) is proposed to be included in the scope of the

[31] Atmospheric Implications of Increased Hydrogen Use

LVIC BREF (Section 2.1, Proposal 1). However, no KEIs for emissions to air were proposed initially by the EIPPCB. According to the LVIC-S BREF, the main emissions to air of the PCC production are CO_2 and dust. However, the PCC process is a net consumer of CO_2, as it uses the carbon dioxide generated in other industrial activities. There is no indication that there are relevant HCl and CO emissions to consider them as KEIs to air for this process.

EIPPCB proposal

- To confirm the original proposal from the EIPPCB regarding the processes or subsectors to be included in the scope of the LVIC BREF (see Section 2.1 on the scope of the LVIC BREF).

2.2.3.3 Diffuse emissions to air

Original EIPPCB request

Request 7: TWG members are asked to provide their view (in Document 3) regarding whether diffuse emissions is a KEI for the inorganic chemical production processes (see Table 2.1[32]) proposed to be covered by the scope of the LVIC BREF. Where deemed relevant, information on the techniques used to prevent/reduce diffuse (fugitive and non-fugitive) emissions and their performance (where monitoring practices are in place) is also expected.

Summary of initial positions

- Of the 23 questionnaires, **6** MSs provided additional information regarding diffuse emissions.
- Comments were mostly regarding dust, NH_3 and others (VOCs, CH_4, inorganic compounds, emissions from curing).
  - Dust was mentioned for the production of fertilisers, phosphoric and sulphuric acid and carbon black mainly.
  - NH_3 was relevant for the production of fertilisers and ammonia.
- One MS stated that there were no diffuse emissions nor relevant issues that were not already covered by other BREFs.

Comments regarding diffuse emissions of dust:

- Dust – non-fugitive – Other production process:
  - Dust is generally an issue for fertiliser production during delivery, handling, transport, storage and packaging. In AT, relevant emission sources and transfer points to a large extent are enclosed and/or equipped with extraction and filters (e.g. bunkers, raw phosphate storage, raw phosphate sieving, dedusting of production building, bagging plant for urea). Measurements are carried out regularly for these emission sources. If they are not enclosed / extracted / equipped with filters, significant fugitive emissions are to be expected (AT).
  - The LVIC-AAF BREF recognises fugitive dust emissions in Section 5.4.8 in relation to phosphoric acid (Recovery and abatement of dust from rock grinding: 'Dust emissions begin with the unloading, handling and grinding of phosphate rock. Phosphate rock is normally transported by ship. It is unloaded by cranes and transferred to storage and grinding sections by conveyor belts or trucks. The spread of phosphate rock dust is commonly prevented by using covered conveyor belts and indoor storage. A further dispersion of phosphate rock dust (by wind or rain) can be prevented by good housekeeping measures such as frequently cleaning/sweeping the plant grounds and the quay.'). However, these aspects are also relevant for the production of fertilisers, as the processes used are similar to those for phosphoric acid (AT).
- Dust – non specified (BE).

[32] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

- Dust. Diffuse (fugitive + non-fugitive). Phosphoric acid (DE), AN and CAN (DE), NPK and CN (DE), Superphosphates (DE).
- Dust. Diffuse (fugitive + non-fugitive). Carbon black (DE, IT):
  - Concept of diffuse emission control implemented in reference plant (DE).
  - The process is characterised by dust emissions in the following phases: the stages of production of chemical compounds; handling of raw materials; handling of materials leaving the production line compressed waste (IT).
- Dust. Diffuse (fugitive + non-fugitive). Sulphuric acid. (ES):
  - When sulphuric acid is made from solid sulphur (ES).
- Dust. Diffuse (fugitive+non-fugitive). Soda ash, TiO_2, synthetic amorphous silica, inorganic phosphates, calcium carbide, sodium silicate, calcium chloride, sodium chlorate:
  - The process is characterised by dust emissions in the following phases: the stages of production of chemical compounds; handling of raw materials; handling of materials leaving the production line compressed waste (IT).

Comments regarding diffuse emissions of NH_3:

- NH_3 Non-fugitive. Urea and UAN (AT):
  - Emission sources are ammonia-containing vents in scrubbers and atmospheric tank and the bagging plant. In the Austrian bagging plant, NH_3 emissions are recorded and measured via the extraction system (for dust filters). The LVIC-AAF BREF, Table 8.11, typical emissions from Dutch urea plants in the order of 10 tons NH_3/year. If there is no enclosure / extraction / abatement equipment, significant non-fugitive emissions are to be expected (AT).
- NH_3 Non-fugitive. AN and CAN (AT) (fugitive +non-fugitive) (DE):
  - Moist ODDA lime containing NH_3 is dried, especially during CAN production. Diffuse NH_3 emissions are relevant during transport and transfer. If there is no enclosure / extraction / abatement equipment, significant non-fugitive emissions are to be expected (AT).
- NH_3 Fugitive, Ammonia (AT, DE, ES):
  - LVIC-AAF BREF, Chapter 2.2.5: Start-up/shutdown operations, trip-conditions, leaks and fugitive sources cause periodic emissions. The initial start-up is usually the most severe because of its duration. The normal vent points are the desulphuriser's outlets, the high-temperature shift reactor outlet, the CO_2 absorber inlet, the methanator inlet and outlet, the ammonia converter outlet and the purge from the synthesis loop and refrigeration system. The pollutants comprise NO_X, SO_2, CO, H_2, and natural gas. In Table 2.9, fugitive emissions of NH_3 are reported (AT).
- NH_3 Diffuse (fugitive+non-fugitive) NPK and CN (DE).
- NH_3 Monitoring techniques for diffuse emissions exist[33] (BE).
- CH_4 Fugitive, Ammonia (AT).
- Diffuse emissions from curing – non-fugitive - Superphosphates (AT).
  - LVIC-AAF BREF, Section 10.4.1: Avoiding diffuse emissions from curing (AT).
- Inorganic compounds. Diffuse (fugitive + non-fugitive) (BE). Also, inorganic compounds/gases can leak. Monitoring of some compounds is done via gas detectors for workers' safety, which indicates that they can possibly leak. Not much information available (BE).
- VOCs. Diffuse (fugitive and non-fugitive) could be relevant for several sectors. Also in inorganic processes, organic compounds are used or formed, e.g. VOC emissions during pre-conditioning of fuels of carbon black production, e.g. methane in reformers. See the WGC BREF for information (BE).
- Management measures to reduce emissions during OTNOC should be taken into account in the review of the BREF (AT).
- No diffuse emissions. No issues identified for all sectors, which are not already covered in other specific BREFs (CZ).

[33] Grandperspective GmbH

EIPPCB assessment
• On diffuse emissions to air, in recent years more effort has been put into identifying, monitoring and limiting diffuse emissions to air (e.g. WGC BAT-AELs for diffuse VOC emissions to air). Environmental management systems should include establishing, maintaining and regularly reviewing an inventory of diffuse emissions to air (e.g. WGC BREF, Management system for diffuse VOC emissions - BAT 19, Monitoring – BAT 20, 21 and 22, Prevention or reduction of diffuse VOC emissions – BAT 23). • In the current LVIC-AAF and LVIC-S BREFs the references to diffuse emissions relate mainly to prevention techniques. Except for a table for urea production (Table 8.11), no other information is found reporting actual plant data. • The LVIC-AAF BREF includes certain recommendations related to diffuse emissions: o Phosphoric acid. Section 5.4.8. Recovery and abatement of dust from rock grinding. o Superphosphates. Section 10.4.1. Avoiding diffuse emissions from curing (e.g. direct granulation is BAT). • The LVIC-S BREF includes certain recommendations related to diffuse emissions: o Soda ash. Section 2.3.3.5 Ammonia (emissions). Diffuse losses of ammonia from filters, bicarbonate conveyors and from the handling and processing of the distillation effluent. o Calcium carbide. Section 7.2.3.1 Emissions to air. Diffuse emissions arising from the tapping of liquid CaC_2 can be reduced by a fume extraction system and waste gas treatment to a large extent. o Common abatement measures applied in the LVIC-S industry. Section 8.2.4 Measures to reduce or prevent releases into air: where appropriate and practicable, reduction of diffuse emissions by means of process measures (e.g. plant operation slightly below atmospheric pressure), of prevention measures (e.g. flanges replaced by welded connections, usage of seal-less pumps, and bellow valves) and of minimisation measures (e.g. high-performance sealing systems like effective gaskets and flanges, valves and pumps with high integrity packing). • Monitoring techniques have evolved from LDAR and standard OGI to more sophisticated detection systems that allow better identification and quantification of diffuse emissions over large surfaces such as NH_3.
EIPPCB proposal
• To collect information on the techniques used to prevent/reduce dust and NH_3 diffuse (fugitive and non-fugitive) emissions and their performances (where monitoring practices are in place), for the inorganic chemical production processes covered by the scope of the LVIC BREF.

2.2.3.4 EIPPCB final proposals of KEIs for emissions to air

The following table summarises the EIPPCB proposal of KEIs for emissions to air as a result of the assessments in Sections 2.2.3.1, 2.2.3.2 and 2.2.3.3, here organised by LVIC production process. For the detailed proposal, see below.

LVIC production process	EIPPCB original proposal	EIPPCB revised proposal		
	Pollutants/Parameters			
	KEI	KEI	Candidate KEI	Contextual Information
Ammonia	▪ H_2S ▪ Nitrogen oxides (NO_X)	▪ H_2S ▪ Nitrogen oxides (NO_X) ▪ Dust ▪ Ammonia (NH_3)	-	▪ CO ▪ CH_4

Hydrofluoric acid	▪ Dust ▪ Fluorine and inorganic compounds (as HF) ▪ Sulphur oxides (SO_X)	▪ Dust ▪ Fluorine and inorganic compounds (as HF) ▪ Sulphur oxides (SO_X)	-	-
Nitric acid	▪ N_2O ▪ Ammonia (NH_3) ▪ Nitrogen oxides (NO_X)	▪ N_2O ▪ Ammonia (NH_3) ▪ Nitrogen oxides (NO_X)	-	-
Phosphoric acid	▪ Dust ▪ Fluorine and inorganic compounds (as HF)	▪ Dust ▪ Fluorine and inorganic compounds (as HF)	-	-
Sulphuric acid	▪ Sulphur oxides (SO_X)	▪ Sulphur oxides (SO_X) ▪ Nitrogen oxides (NO_X)	▪ H_2S	-
Inorganic phosphates	▪ Dust ▪ Fluorine and inorganic compounds (as HF) ▪ Chlorine and inorganic compounds (as HCl) ▪ P_2O_5 equivalent	▪ Dust ▪ Fluorine and inorganic compounds (as HF) ▪ Chlorine and inorganic compounds (as HCl) ▪ P_2O_5 equivalent	-	-
Sodium carbonate (i.e. soda ash)	▪ Dust	▪ Dust ▪ Ammonia (NH_3)	▪ Nitrogen oxides (NO_X) ▪ Sulphur oxides (SO_X)	▪ CO
Calcium chloride	▪ Dust ▪ Chlorine and inorganic compounds (as HCl)	▪ Dust ▪ Chlorine and inorganic compounds (as HCl)	▪ Nitrogen oxides (NO_X)	-
Sodium chlorate	▪ Gaseous chloride (Cl_2) ▪ Dust	Gaseous chloride (Cl_2) ▪ Dust	-	-
Calcium carbide	▪ Dust	▪ Dust	▪ Nitrogen oxides (NO_X)	▪ CO
Carbon black	▪ Dust ▪ Nitrogen oxides (NO_X)	▪ Dust ▪ Nitrogen oxides (NO_X)	▪ Sulphur oxides (SO_X) ▪ Heavy metals ▪ TVOC	▪ CO
Titanium dioxide (chloride process route)	▪ Dust ▪ Chlorine and inorganic compounds (as HCl) ▪ Nitrogen oxides (NO_X)	▪ Dust ▪ Chlorine and inorganic compounds (as HCl) ▪ Nitrogen oxides (NO_X/NO_2) ▪ Gaseous chloride (Cl_2)	-	▪ CO
Titanium dioxide (sulphate process route)	▪ Dust ▪ Nitrogen oxides (NO_X)	▪ Dust ▪ Nitrogen oxides (NO_X) ▪ Sulphur oxides (SO_X) ▪ H_2S	-	-

Ferrous sulphate	▪ Gaseous chloride (Cl_2) ▪ Dust	▪ Gaseous chloride (Cl_2) ▪ Dust	▪ Sulphur oxides (SO_X) ▪ Nitrogen oxides (NO_X)	-
Sodium silicate	▪ Dust ▪ Fluorine and inorganic compounds (as HF) ▪ Chlorine and inorganic compounds (as HCl) ▪ Nitrogen oxides (NO_X)	Dust Fluorine and inorganic compounds (as HF) Chlorine and inorganic compounds (as HCl) Nitrogen oxides (NO_X/NO_2)	Sulphur oxides (SO_X)	-
Synthetic amorphous silica	▪ Gaseous chloride (Cl_2) ▪ Dust ▪ Chlorine and inorganic compounds (as HCl)	▪ Gaseous chloride (Cl_2) ▪ Dust ▪ Chlorine and inorganic compounds (as HCl) ▪ Nitrogen oxides (NO_X)	▪ TOC	▪ CO
AN and CAN	▪ Dust	▪ Dust ▪ Ammonia (NH_3) ▪ Fluorine and inorganic compounds (as HF)	-	-
NPK and CN	▪ Dust ▪ Ammonia (NH_3) ▪ Fluorine and inorganic compounds (as HF) ▪ Nitrogen oxides (NO_X)	▪ Dust ▪ Ammonia (NH_3) ▪ Fluorine and inorganic compounds (as HF) ▪ Nitrogen oxides (NO_X) ▪ Chlorine and inorganic compounds (as HCl)	-	-
Superphosphates	▪ Dust ▪ Ammonia (NH_3) ▪ Fluorine and inorganic compounds (as HF) ▪ Chlorine and inorganic compounds (as HCl)	▪ Dust ▪ Ammonia (NH_3) ▪ Fluorine and inorganic compounds (as HF) ▪ Chlorine and inorganic compounds (as HCl)	-	-
Urea and UAN	▪ Dust ▪ Ammonia (NH_3)	▪ Dust ▪ Ammonia (NH_3)	-	-
Precipitated calcium carbonate	-	-	-	-
Legend: KEI: To derive BAT-AELs. Candidate KEI: To decide at a later stage if BAT/BAT-AELs should be derived.				

A detailed list of the revised EIPPCB proposals for KEIs for emissions to air organised by LVIC production process can be found below.

Table 3 - Ammonia production - KEIs for emissions to air

Original EIPPCB proposal
To include NO_X and H_2S as KEIs for the production of ammonia.

EIPPCB proposal
To modify the proposal as follows: • To include the following KEIs for emissions to air for the production of ammonia: NO_X, H_2S, dust (for partial oxidation) and NH_3 (associated with NO_X reduction technologies SNCR/SCR). • To collect data for CO and CH_4 emissions as contextual information to identify mitigating techniques, to assess thermal process / combustion efficiency and to update the descriptive section of the BREF.

Table 4 - Hydrofluoric acid production - KEIs for emissions to air

Original EIPPCB proposal
To include dust, fluorine and inorganic compounds (as HF), and sulphur oxides (SO_X) as KEIs for the production of hydrofluoric acid.
EIPPCB proposal
To confirm the original EIPPCB proposal.

Table 5 - Nitric acid production - KEIs for emissions to air

Original EIPPCB proposal
To include nitrous oxide (N_2O), ammonia (NH_3) and nitrogen oxides (NO_X/NO_2) as KEIs for the production of nitric acid.
EIPPCB proposal
To confirm the original EIPPCB proposal.

Table 6 - Phosphoric acid production - KEIs for emissions to air

Original EIPPCB proposal
To include HF and dust as KEIs for the production of phosphoric acid.
EIPPCB proposal
To confirm the original EIPPCB proposal.

Table 7 - Sulphuric acid production - KEIs for emissions to air

Original EIPPCB proposal
To include SO_2 and SO_3/H_2SO_4 as KEIs for the production of sulphuric acid.
EIPPCB proposal
To modify the proposal as follows: • To include the following KEIs for emissions to air for the production of sulphuric acid: SO_2 and SO_3/H_2SO_4, and nitrogen oxides (NO_X/NO_2). • To collect data for H_2S and metals (associated with the raw materials used in the process, including in particular Hg) via plant-specific questionnaires and the TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs for emissions to air should be derived.

Table 8 - Inorganic phosphates production - KEIs for emissions to air

Original EIPPCB proposal
To include dust, fluorine and inorganic compounds (as HF), chlorine and inorganic compounds (as HCl) and phosphate (P_2O_5) equivalent as KEIs for the production of inorganic phosphates.
EIPPCB proposal
To confirm the original EIPPCB proposal.

Table 9 - Sodium carbonate (i.e. soda ash) production - KEI for emissions to air

Original EIPPCB proposal
To include dust as a KEI for the production of sodium carbonate (i.e. soda ash).
EIPPCB proposal
To modify the proposal as follows: • To include dust and ammonia (NH_3) as KEIs for emissions to air for the production of sodium carbonate (i.e. soda ash). • To collect data regarding emissions of nitrogen oxides (NO_X) and sulphur oxides (SO_X) via plant-specific questionnaires from process furnaces/heaters and/or drying processes directly associated with the production of sodium carbonate. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs for emissions to air of NO_X/NO_2 and SO_X should be derived. • To collect data for CO emissions as contextual information.

Table 10 - Calcium chloride production - KEIs for emissions to air

Original EIPPCB proposal
To include dust and chlorine and inorganic compounds (as HCl) as KEIs for the production of calcium chloride.
EIPPCB proposal
To slightly modify the proposal as follows: • To include dust and chlorine and inorganic compounds (as HCl) as KEIs for the production of calcium chloride. • To collect data regarding emissions of nitrogen oxides (NO_X/NO_2) from the process furnaces/heaters and/or drying processes directly associated with the production of calcium chloride via plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs for emissions to air of NO_X/NO_2 should be derived.

Table 11 - Sodium chlorate production - KEI for emissions to air

Original EIPPCB proposal
To include dust and gaseous chloride (Cl_2) as KEIs for the production of sodium chlorate.
EIPPCB proposal
To confirm the original EIPPCB proposal.

Table 12- Calcium carbide production - KEI for emissions to air

Original EIPPCB proposal
To include dust as a KEI for the production of calcium carbide.
EIPPCB proposal
To slightly modify the proposal as follows: • To include dust as a KEI for the production of calcium carbide. • To collect data regarding emissions of nitrogen oxides (NO_X/NO_2) via plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs for emissions to air of NO_X/NO_2 should be derived. • To collect data for CO emissions as contextual information.

Table 13 - Carbon black production - KEIs for emissions to air

Original EIPPCB proposal
To include dust and nitrogen oxides (NO_X/NO_2) as KEIs for the production of carbon black.
EIPPCB proposal
To slightly modify the proposal as follows: • To include dust and nitrogen oxides (NO_X/NO_2) as KEIs for the production of carbon black. • To collect data regarding emissions of sulphur oxides (SO_X), heavy metals and TVOC via plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs should be derived. • To collect data for CO emissions as contextual information.

Table 14 - Titanium dioxide production (chloride process route) - KEIs for emissions to air

Original EIPPCB proposal
To include dust, chlorine and inorganic compounds (as HCl) and nitrogen oxides (NO_X/NO_2) as KEIs for the production of titanium dioxide (chloride process route).
EIPPCB proposal
• To include dust, chlorine and inorganic compounds (as HCl), gaseous chloride (Cl_2) and nitrogen oxides (NO_X/NO_2) as KEIs for the production of titanium dioxide (chloride process route). • To collect data regarding emissions of carbon monoxide (CO) via plant-specific questionnaires as contextual information.

Table 15 - Titanium dioxide production (sulphate process route) - KEIs for emissions to air

Original EIPPCB proposal
To include dust and nitrogen oxides (NO_X/NO_2) as KEIs for the production of titanium dioxide (sulphate process route).
EIPPCB proposal
• To include dust, sulphur oxides (SO_X), hydrogen sulphide (H_2S) and nitrogen oxides (NO_X/NO_2) as KEIs for the production of titanium dioxide (sulphate process route).

Table 16 - Ferrous sulphate production - KEIs for emissions to air

Original EIPPCB proposal
To include gaseous chloride (Cl_2) and dust as KEIs for the production of ferrous sulphate.
EIPPCB proposal
To modify the proposal as follows: • To include gaseous chloride (Cl_2) and dust as KEI for the production of ferrous sulphate. • To collect data regarding sulphur oxides (SO_X) and nitrogen oxides (NO_X/NO_2) from the process furnaces/heaters and/or drying processes directly associated with the production of copperas via plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs for emissions to air should be derived.

Table 17 - Sodium silicate production - KEIs for emissions to air

Original EIPPCB proposal
To include dust, fluorine and inorganic compounds (as HF), chlorine and inorganic compounds (as HCl), and nitrogen oxides (NO_X/NO_2) as KEIs for the production of sodium silicate.
EIPPCB proposal
To modify the proposal as follows: • To include dust, fluorine and inorganic compounds (as HF), chlorine and inorganic compounds (as HCl), and nitrogen oxides (NO_X/NO_2) as KEIs for the production of sodium silicate. • To collect data regarding sulphur oxides (SO_X) via plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs for emissions to air should be derived.

Table 18 - Synthetic amorphous silica production - KEI for emissions to air

Original EIPPCB proposal
To include dust, chlorine and inorganic compounds (as HCl), and gaseous chloride (Cl_2) as KEIs for the production of synthetic amorphous silica.
EIPPCB proposal
To modify the proposal as follows: • To include dust, chlorine and inorganic compounds (as HCl), and gaseous chloride (Cl_2), and nitrogen oxides (NO_X/NO_2) as KEIs for the production of synthetic amorphous silica. • To collect data regarding total organic carbon (TOC) via plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT/BAT-AELs for emissions to air should be derived. • To collect data for CO emissions as contextual information.

Table 19 - AN and CAN fertilisers production - KEI for emissions to air

Original EIPPCB proposal
To include dust as a KEI for the production of AN and CAN fertilisers.
EIPPCB proposal
To modify the proposal as follows: • To include dust, fluorine and inorganic compounds (as HF), and ammonia (NH_3) as a KEI for the production of AN and CAN.

Table 20 - NPK and CN fertilisers production - KEIs for emissions to air

Original EIPPCB proposal
To include dust, ammonia (NH_3), fluorine and inorganic compounds (as HF), and nitrogen oxides (NO_X/NO_2) as KEIs for the production of NPK and CN fertilisers.
EIPPCB proposal
To modify the proposal as follows: • To include dust, ammonia (NH_3), fluorine and inorganic compounds (as HF), nitrogen oxides (NO_X/NO_2) and chlorine and inorganic compounds (as HCl) as KEIs for the production of NPK and CN fertilisers.

Table 21 - Superphosphates production - KEIs for emissions to air

Original EIPPCB proposal
To include dust, ammonia (NH_3), fluorine and inorganic compounds (as HF), and chlorine and inorganic compounds (as HCl) as KEIs for the production of superphosphates.
EIPPCB proposal
• To confirm the original EIPPCB proposal.

Table 22 - Urea and UAN production - KEIs for emissions to air

Original EIPPCB proposal
To include dust and ammonia (NH_3) as KEIs for the production of urea and UAN.
EIPPCB proposal
• To confirm the original EIPPCB proposal.

Table 23 - Precipitated calcium carbonate (PCC) production - KEI for emissions to air

Original EIPPCB proposal
None.
EIPPCB proposal
• To confirm the original EIPPCB proposal.

2.2.4 Emissions to water

This section refers to Proposal 13, Request 8 and Request 9 of the call for the expression of IPs.

To ensure transparency, the IPs in Requests 8 and 9 were assessed by the EIPPCB individually. Additional information accompanying the IPs submitted with these Requests was also taken into account for the EIPPCB assessments.

However, the EIPPCB proposals for KEIs relevant for emissions to water, organised by LVIC production process, are tabled in Section 2.2.4.4, as a result of the EIPPCB overall assessments provided in Sections 2.2.4.2.1 to 2.2.4.2.8 and in Sections 2.2.4.3.1 to 2.2.4.3.20.

2.2.4.1 Waste water pretreatment

Original EIPPCB proposal
Proposal 13: The EIPPCB proposes to collect performance data on waste water pre-treatment techniques used in the inorganic chemical subsectors/products/processes covered by the scope of the LVIC BREF. The TWG to decide at a later stage, based on the data collected through plant-specific questionnaires, whether and how BAT and BAT-AE(P)Ls for waste water pre-treatment should be derived (i.e. of a generic type or specific for the inorganic chemical subsectors/products/processes concerned, where relevant).
Summary of initial positions
• **8** out of 23 IPs agree with the proposal, **5** partly agree, **2** disagree and **8** do not provide an opinion. • The main comments of the IPs which agree or partly agree are as follows: o The term 'performance data' is broad and may include emission levels. Make clear that the sentence 'The TWG to decide at a later stage whether BAT-AELs should be derived' does not apply for KEIs. For KEIs BAT-AELs have to be defined (AT). o The CWW BREF covers the entire chemical sector, and data were collected for all sectors and BAT/BAT-AELs were derived. Do not reopen generally the CWW BREF process under the current IED (PL, CEFIC). o The need to include emissions to water for nitrogen and phosphorous compounds was addressed in the CWW BREF with a reference to Chapter 2.4.4.2: 'The abatement of nitrates is particularly difficult if, due to lack of organic compounds in the waste water, no biological WWTP is operated' (Fertilizers Europe). o It is not clear what is pretreatment vs. treatment (IMA). o In the case of soda ash production, pre-treatment is not relevant (IT). • The main comments of the IPs which disagree are as follows: o In the case of of titanium dioxide production, pretreatment is not relevant (CZ, CEFIC). o In the case of soda ash production, pretreatment is not relevant (CEFIC).
EIPPCB assessment
• The proposal aims to gather data on environmental performances (e.g. indicators/levels other than 'emission levels') associated with waste water pretreatment steps (if applied), i.e. those treatments before the final treatment steps where instead 'emission levels' (BAT-AELs) are expected to be derived for those substances/pollutants identified as KEIs for water emissions (direct and indirect), discussed in the following sections. • In line with the 'focused approach' referred to Section 1.3, the identification of the KEIs is discussed in Sections 2.2.4.2 and 2.2.4.3. • The CWW BREF reports in the recommendations for future work that the information exchange revealed a number of issues that should be addressed during the next reviews of the chemical BREFs, including the following: o further collection of performance data on waste water pretreatment techniques in order to assess the possibility of setting BAT-associated environmental performance levels (BAT-AEPLs) during the next reviews of all chemical BREFs. • Waste water pretreatment is described as a technique to abate pollutants before the final waste water treatment (e.g. in CAK BATC, BAT 11) and has been used for other BREFs (e.g. FDM BATC, BAT 3) to differentiate between pretreatment and final treatment.
EIPPCB proposal
To keep the original proposal unchanged: • To collect performance data on waste water pretreatment techniques used in the inorganic chemical subsectors/products/processes covered by the scope of the LVIC BREF. • The TWG to decide at a later stage, based on the data collected through plant-specific questionnaires, whether and how BAT and BAT-AEPLs for waste water pretreatment should be derived (i.e. of a generic type or specific for the inorganic chemical subsectors/products/processes concerned, where relevant).

2.2.4.2 EIPPCB proposal

Original EIPPCB request
Request 8: TWG members are asked to provide feedback on the EIPPCB proposals for KEIs relevant for emissions to water, including the associated monitoring practices and contextual information/parameters (by filling in the corresponding cells in Document 3). Information on emission limit values and monitoring on proposed KEIs is also expected to be provided (see Document 3).

The IPs and related EIPPCB assessments associated with Request 8, 'EIPPCB proposals for KEIs', are summarised in Sections 2.2.4.2.1 to 2.2.4.2.8, grouped according to substances/pollutants as presented by 'Document 3 of the call for IPs':

- Chlorides (as total);
- Total phosphorus;
- Sulphates;
- Suspended solids (TSS);
- Total inorganic nitrogen;
- Metals (Cr, Ni, Cu, Zn);
- Metals (Hg, Cd);
- Metals (V, Zn, Cr, Pb, Ni, Cu, As, Ti and Mn).

The EIPPCB proposals of KEIs for emissions to water, organised by LVIC production process, are tabled in Section 2.2.4.4, as a result of the EIPPCB overall assessments provided in Sections 2.2.4.2.1 to 2.2.4.2.8 and in Sections 2.2.4.3.1 to 2.2.4.3.20.

2.2.4.2.1 Chlorides (as total)

Original EIPPCB proposal
To include chlorides (as total) as a KEI for the following LVIC production processes: • Synthetic amorphous silica • Titanium dioxide (chloride process route)
Summary of initial positions
• **3** out of 23 IPs agree with the proposal, **12** partly agree and **8** do not provide an opinion. • The main generic comment of the IPs which agree or partly agree is as follows: o BAT-AELs should not be mandatory for emissions to the sea (SE). • The main comments of the IPs which agree or partly agree, associated with the inorganic chemical production processes to be covered by the LVIC BREF, are summarised below. o The parameter is included in permits and monitored for the following inorganic chemical production processes: ▪ Calcium carbide (AT, BE); ▪ Calcium chloride (BE); ▪ Ferric chloride (BE); ▪ Fertilisers, i.e. NPK and CN (BE, DE); ▪ Soda ash (DE); ▪ Titanium dioxide and related products (BE): - the parameter is only relevant for the chloride process route (CZ, IT, PL, SI, CEFIC). ▪ Synthetic amorphous silica production (ES, SE): - no emissions to water from the process (ES); - the parameter is not relevant (SE).
EIPPCB assessment
• The CWW BREF does not provide BAT-AELs for emissions to water for the parameter

'Chlorides (as total)'. There is no specific recommendation for future work on how to consider this parameter for the next BREF review.
- Information in the E-PRTR (2019) indicates that the emissions of 'Chlorides (as total)' may represent a high share (40.5 %) of emissions from category 4 (b, c) versus the emissions corresponding to all industrial activities. Due to the granularity of the E-PRTR data, the emissions of the LVIC production processes in the scope of the LVIC BREF may be overestimated.
- According to the preliminary feedback provided with the IPs, relevant chlorides emissions provisions seem to be included in permits issued in various MSs (AT, BE, DE) and monitoring data could be available.
- It is not clear from the information submitted with the IPs why emissions to water for the parameter 'Chlorides (as total)' are relevant for the production of calcium carbide. The LVIC-S BREF does not include any information on the emission levels of 'Chlorides (as total)'. See also the assessment in Section 2.2.4.3.19.
- Information in the LVIC-S BREF indicates that emissions to water may be considered relevant only for the pyrogenic silica process for the production of synthetic amorphous silica.
- Information in the LVIC-S BREF does not include emission levels for chlorides in the case of titanium dioxide production via the sulphate process route.

EIPPCB proposal

- See Section 2.2.4.4.

2.2.4.2.2 Total phosphorus

Original EIPPCB proposal

To include total phosphorus as a KEI for the following production process:
- Inorganic phosphates (only feed phosphates – feed grade DCP product).

Summary of initial positions

- **6** out of 23 IPs agree with the proposal, **7** partly agree and **10** do not provide an opinion.
- The main comments of the IPs which agree or partly agree, associated with the inorganic chemical production processes to be covered by the LVIC BREF, are summarised below.
  - The parameter is included in permits and monitored for the following inorganic chemical production processes:
    - Calcium chloride (DE);
    - Fertilisers, i.e. NPK and CN (AT, BE, DE);
    - Phosphoric acid (AT, BE, DE);
    - Soda ash (AT, DE);
    - Superphosphates (DE).
  - The parameter is relevant for the production of NPK and superphosphates (Fertilizers Europe).
  - The parameter is only relevant for the production of phosphates, taking into account data from the E-PRTR (CEFIC).
  - The parameter seems to be relevant for the production of phosphoric acid, NPK, and superphosphates (EEB).

EIPPCB assessment

- The CWW BREF provides BAT-AELs for direct emissions to water of the parameter 'Total phosphorus' (see Table 4.2), expressed in concentration (mg/l), as a yearly average and coupled with a yearly mass flow threshold (expressed as kg/yr).
- The CWW BREF includes a specific recommendation for future work to collect short-term emission data in order to assess the possibility of setting short-term BAT-AELs for emissions to water during the next review of the CWW BREF. However, the LVIC BREF would be the first opportunity to have a targeted data collection on the parameter 'Total phosphorus' via plant-specific questionnaires, in order to assess such a possibility (i.e. short-term levels).

- Information in the E-PRTR (2019) indicates that the emissions of the sector may represent a low share of emissions (1.2 %) of category 4 (b, c) versus the emissions corresponding to all industrial activities. Due to the granularity of the E-PRTR data, the emissions of the LVIC sector in the scope of the LVIC BREF may be overestimated.
- According to the preliminary feedback provided with the IPs, relevant provisions on total phosphorus seems to be included in permits issued by some MSs (AT, BE, DE) and monitoring data could be available.
- However, it is not clear why emissions to water for the parameter 'Total phosphorus' are relevant for the production of soda ash and calcium chloride. The LVIC-S BREF does not include any information on the use of phosphorus-containing substances for soda ash and calcium chloride production. In addition, information in the LVIC-S BREF does not indicate emissions to water of phosphorus compounds in the case of the production of soda ash and calcium chloride.
- At this stage of the process for drawing up the LVIC BREF (i.e. KoM), it does not seem necessary to specify whether a KEI is relevant for all or for specific types of products (e.g. production of feed phosphates). The issue of specific products associated with production processes could be better addressed during the design phase of the plant-specific questionnaire.

EIPPCB proposal

- See Section 2.2.4.4.

2.2.4.2.3 Total suspended solids (TSS)

Original EIPPCB proposal

To include total suspended solids (TSS) as a KEI for the following production processes:

- Precipitated calcium carbonate
- Soda ash
- Titanium dioxide (chloride and sulphate process route)

Summary of initial positions

- **7** out of 23 IPs agree with the proposal, **7** partly agree, **1** disagrees and **5** do not provide an opinion.
- The main generic comments of the IPs which agree or partly agree are as follows:
  - The parameter is relevant for all production processes to monitor dissolved pollutants. There is an added value to set ELVs for TSS as this triggers improvement in settling processes and filtration (AT).
  - Broaden the scope to all LVIC sectors to gather information (BE). TSS is related to hazardous substances which can absorb on suspended solids (BE).
- The main comments of the IPs which agree or partly agree associated with the inorganic chemical production processes to be covered by the LVIC BREF are summarised below.
  - TSS is included in permits and monitored for the following inorganic chemical production processes:
    - Calcium chloride (BE);
    - Calcium carbide (DE);
    - Ferric chloride (BE);
    - Fertilizers, including NPF/CN and AN/CAN (BE, DE);
    - Hydrofluoric acid (DE);
    - Soda ash (DE);
    - Sulphuric acid (BE);
    - Synthetic amorphous silica (BE, DE, SE);
    - Titanium dioxide (BE).
  - Emission data were reported by the LVIC-AAF and LVIC-S BREFs for the production of AN and CAN, carbon black, hydrofluoric acid, soda ash and sulphuric acid (AT).
  - TSS is relevant for fertilisers, i.e. AN and CAN, NPK (Fertilizers Europe).
  - TSS is relevant for ammonia, fertilisers (AN and CAN, NPK), inorganic phosphates

and sulphuric acid (FR).
    - TSS is not relevant for stand-alone production of UAN (CZ, Fertilizers Europe).
- The main comment of the IPs which disagree is as follows:
    - The parameter is not relevant for the production of urea (SK).

EIPPCB assessment

- The CWW BREF provides BAT-AELs for direct emissions to water for the parameter 'Total suspended solids (TSS)' (see Table 4.1), expressed in concentration (mg/l) as a yearly average, coupled with a yearly mass flow threshold (expressed as t/yr). However, it includes footnote ([8]) which reads: 'This BAT-AEL may not apply when the main pollutant load originates from the production of soda ash via the Solvay process or from the production of titanium dioxide'.
- The CWW BREF includes a specific recommendation for future work to collect short-term emission data in order to assess the possibility of setting short-term BAT-AELs for emissions to water during the next review of the CWW BREF. However, the LVIC BREF would be the first opportunity to have a targeted data collection on the parameter 'TSS' via plant-specific questionnaires, in order to assess such a possibility (i.e. short-term levels) for the LVIC production processes covered by the LVIC BREF where relevant.
- Generally, the environmental relevance of the pollution monitored under the parameter TSS is not clear and depends on the nature of the suspended solids emitted by the specific process and therefore data collected may not be comparable. TSS may contain hazardous substances. However, emissions of hazardous substances such as heavy metals may be better addressed by specific parameters.

EIPPCB proposal

- See Section 2.2.4.4.

2.2.4.2.4 Sulphates

Original EIPPCB proposal

To include sulphates as a KEI for the following production process:

- Titanium dioxide (sulphate process route)

Summary of initial positions

- 3 out of 23 IPs agree with the proposal, **9** partly agree, **1** disagrees and **10** do not provide an opinion.
- The main comment of the IPs which agree or partly agree is as follows:
    - Broaden the scope to all LVIC sectors to gather information. The parameter is included in permits for the production processes, e.g. the production of calcium chloride, carbon black, ferric chloride, NPK, sulphuric acid and synthetic amorphous silica (BE).
- The main comments of the IPs which agree or partly agree, associated with the inorganic chemical production processes to be covered by the LVIC BREF, are summarised below.
    - The parameter is included in permits and monitored for the following inorganic chemical production processes:
        - Calcium chloride (BE);
        - Carbon black (BE);
        - Hydrofluoric acid (AT, DE);
        - Ferric chloride (BE);
        - Fertilisers, i.e. NPK, AN, CAN (AT);
        - Soda ash (DE);
        - Sulphuric acid (BE);
        - Synthetic amorphous silica (BE, DE).
    - Emission data were reported by the LVIC-AAF and LVIC-S BREFs for the following inorganic production processes (AT):
        - AN and CAN, hydrofluoric acid, sulphuric acid.

- Sulphates may be relevant for ammonia, sodium silicate and sulphuric acid (FR).
- Sulphates may be relevant for fertilisers (ES).
- Sulphates are only relevant for the titanium dioxide sulphate process route (BE, CZ, PL, SI, CEFIC).

- The main comment of the IP which disagrees is as follows:
  - The parameter is not relevant referring to national legislation (IT).

EIPPCB assessment

- The CWW BREF does not provide BAT-AELs on emissions to water for the parameter 'Sulphates'. There is no specific recommendation for future work on whether and how to consider this parameter for the next BREF review.
- The LVIC-S BREF includes a 'total emission level to water associated with the application of BAT' for the parameter 'SO_4 total', expressed as kg/t TiO_2 pigment, for all the possible configurations of the titanium dioxide plant based on the sulphate process.
- According to the preliminary feedback provided with the IPs, relevant provisions on sulphates seem to be included in permits issued by some MSs (AT, BE, DE) and monitoring data could be available.
- Generally, the environmental relevance of the pollution monitored by the parameter sulphates is not clear and depends on the nature of the suspended solids emitted by the specific process and therefore data collected between may not be comparable. Sulphates may contain hazardous substances; however, it seems that emissions of hazardous substances such as heavy metals may be better addressed by specific parameters. Moreover, the parameter 'Total suspended solids' for emissions to water is not included in the monitoring (by EC/166/2006 E-PRTR).
- Information in the ECHA database shows that substances like potassium sulphate (fertiliser) that may cause sulphate emissions to water are not classified and labelled as environmental hazards.
- The criteria to select pollutants as KEIs do not refer to national legislation.

EIPPCB proposal

- See Section 2.2.4.4.

2.2.4.2.5 Total inorganic nitrogen

Original EIPPCB proposal

To include total inorganic nitrogen as a KEI for the following production processes:
- Soda ash
- Urea and UAN

Summary of initial positions

- **5** out of 23 IPs agree with the proposal, **10** partly agree, **1** disagrees and **7** do not provide an opinion.
- The main generic comments of the IPs which agree or partly agree are as follows:
  - The parameter may be relevant for the production processes using nitrogen compounds (FR).
  - The contribution of the chemical sector to industrial emissions is low (4.3%), out of which the main emitters are the activities 4.b (c) followed by 4.b (e) (CEFIC).
- The main comments of the IPs which agree or partly agree, associated with the inorganic chemical production processes to be covered by the LVIC BREF, are summarised below.
  - The parameter is included in permits and monitored for the following inorganic chemical production processes:
    - Ammonia (AT, DE);

- AN and CAN (BE, DE);
- Calcium carbide (DE);
- Nitric acid (DE);
- NPK and CN (DE);
- Synthetic amorphous silica (DE);
- Titanium dioxide (DE);
- Urea (AT).

- Emission data were reported by the LVIC-AAF and LVIC-S BREFs for the following inorganic production processes (AT):
  - Ammonia;
  - Fertilisers including AN, CAN, NPK, superphosphates;
  - Soda ash;
  - Urea.
- The parameter may be relevant for the following production processes:
  - Calcium carbide (ES);
  - Fertilisers, i.e. NPK and CN, AN and CAN (ES, PT, Fertilizers Europe);
  - Nitric acid (PT);
  - Urea and UAN (AT, FR, IT): it is not a KEI for urea production processes when the substances containing nitrogen are fully recovered (IT).

- The main comment of the IP which disagrees is as follows:
  - UAN: Not relevant in the case of stand-alone plants. These plants have no waste water discharge (Fertilizers Europe).

EIPPCB assessment

- The CWW BREF provides BAT-AELs for direct emissions to water for the parameters 'Total nitrogen (TN) and Total inorganic nitrogen (N_{inorg})' (see Table 4.2), expressed in concentration (mg/l) as a yearly average, coupled with a yearly mass flow threshold (expressed as t/yr). However, Table 4.2 includes footnote ([2]) which reads: 'The BAT-AEL for TN and N_{inorg} do not apply to installations without biological waste water treatment. The lower end of the range is typically achieved when the influent to the biological waste water treatment plant contains low levels of nitrogen and/or when nitrification/denitrification can be operated under optimum conditions'.
- The CWW BREF includes a specific recommendation for future work to collect short-term emission data in order to assess the possibility of setting short-term BAT-AELs for emissions to water during the next review of the CWW BREF. However, the LVIC BREF would be the first opportunity to have a targeted data collection on the parameter 'Total inorganic nitrogen' via plant-specific questionnaires, in order to assess such a possibility (i.e. short-term levels) for those LVIC production processes to be covered by the LVIC BREF, considering also the information submitted with the IPs which indicates that the LVIC BREF would include relevant installations without biological waste water treatment.
- Information submitted with the IPs shows that relevant provisions exist in the permits and specific monitoring is also carried out (AT, BE, DE).
- The LVIC-AAF and LVIC-S BREFs include information on emission levels for the following production processes: ammonia, NPK fertilisers, urea and UAN, AN and CAN, superphosphates. Therefore, it would be useful to collect data to update this type of information and to reflect in the new LVIC BREF the current performances of the installations carrying out these production processes.
- The LVIC-AAF BREF does not include information on emission levels for the production of nitric acid, but it is indicated that process condensates may need waste water treatment.
- It is not clear from the information submitted with IPs why emissions to water for the parameter 'Total inorganic nitrogen' are relevant for the following production processes: calcium carbide, synthetic amorphous silica, titanium dioxide. The LVIC-AAF and LVIC-S BREFs do not include any information on the emission levels of total inorganic nitrogen.
- At this stage of the LVIC BREF drawing up process (i.e. KoM), it does not seem necessary to specify whether a KEI is relevant for all or for specific types of production processes

(e.g. stand-alone production). The issue of types of production processes could be better addressed during the design phase of the plant-specific questionnaire.

EIPPCB proposal

- See Section 2.2.4.4.

2.2.4.2.6 Metals (Cr, Cu, Ni, Zn)

Original EIPPCB proposal

To include the metals 'Cr, Cu, Ni, Zn' as a KEI for the following production process:

- Soda ash

Summary of initial positions

- **4** out of 23 IPs agree with the proposal, **8** partly agree and **11** do not provide an opinion.
- The main generic comment of the IPs which agree or partly agree is as follows:
  - The contribution of the chemical sector to industrial emissions is low based on E-PRTR data (CEFIC).
- The main comments of the IPs which agree or partly agree, associated with the inorganic chemical production processes to be covered by the LVIC BREF, are summarised below.
  - The parameter is included in permits and monitored for the following inorganic chemical production processes:
    - Carbon black (BE);
    - Ferric chloride (BE);
    - Nitric acid (BE);
    - NPK (AT);
    - Sulphuric acid (BE).
  - Emission data were reported by the LVIC-AAF and LVIC-S BREFs for the following inorganic production processes (AT):
    - Phosphoric acid (Cr, Cu, Ni, Zn);
    - Sulphuric acid (Cu).
  - The parameter may be relevant for the following production processes:
    - Ammonia (FR);
    - Calcium carbide (ES);
    - Nitric acid (BE);
    - Inorganic phosphates (FR);
    - Soda ash (DE, IT, EEB):
      - pollutant load originates from processing of inorganic raw materials that are contaminated with metals;
      - other metals (Al, Ca, Cd, Fe, Hg, Mn and Pb) are relevant (DE, EEB).
    - Sodium chlorate (SE): chromium and its speciation (Cr+VI) is relevant;
    - Sulphuric acid (FR).
  - The parameter is not relevant for PCC (IMA).

EIPPCB assessment

- The CWW BREF provides BAT-AELs for direct emissions to water for the metals Cr, Cu, Ni and Zn, expressed in concentration (µg/l) as a yearly average, coupled with yearly mass flow thresholds (see Table 4.3). However, the table includes footnote ([5]) which reads: 'The BAT-AEL may not apply when the main pollutant load originates from the processing of large volumes of solid inorganic raw materials that are contaminated with metals (e.g. soda ash from the Solvay process, titanium dioxide)'.
- The CWW BREF includes a specific recommendation for future work to collect short-term emission data in order to assess the possibility of setting short-term BAT-AELs for emissions to water during the next review of the CWW BREF. However, the drawing up of the LVIC BREF seems to be a good opportunity to address this possibility in particular for the production of inorganic chemicals in the scope of the LVIC BREF, for which metals and related compounds generally seem to be a specific issue, e.g. production of soda ash and the production of titanium dioxide.

- Nickel is listed as priority hazardous substance according to Directive 2013/39/EU (as regards priority substances in the field of water policy).
- According to the LVIC-S BREF, sodium dichromate is an auxiliary substance for the production of sodium chlorate. Information from ECHA[34] indicates that the substance is used for the manufacture of chemicals. The substance is listed in Annex XIV to Regulation (EC) No 1907/2006. However, the last application date for the substance was 21 March 2016 and the Sunset date was 21 September 2017; it also seems that there are no authorised uses for the production of chemicals.
- According to the preliminary feedback provided with the IPs, relevant provisions on metals seem to be generally included in permits related, for example, to the following LVIC production processes:
  - NPK and CN;
  - phosphoric acid;
  - soda ash;
  - sulphuric acid;
  - titanium dioxide and related products (e.g. ferric chloride);

  and specific monitoring is also carried out.
- However, it is not clear why emissions to water for the parameter 'metals (Cr, Cu, Ni, Zn)' are relevant for the following production processes: carbon black, nitric acid. The LVIC-AAF and LVIC-S BREFs do not include any information on the emissions to water for metals (Cr, Cu, Ni, Zn).
- There is no indication in the LVIC-S BREF that emissions to water of metals are relevant for the production of PCC.
- For the assessments of Cd and Hg see Section 2.2.4.2.7 and for the assessments of 'V, Zn, Cr, Pb, Ni, Cu, As, Ti and Mn' see Section 2.2.4.2.8.

EIPPCB proposal

- See Section 2.2.4.4.

2.2.4.2.7 Metals (Cd, Hg)

Original EIPPCB proposal

To include the metals 'Cd and Hg' as a KEI for the following production process:

- Titanium dioxide (chloride and sulphate process routes).

Summary of initial positions

- **5** out of 23 IPs agree with the proposal, **8** partly agree and **10** do not provide an opinion.
- The main generic comments of the IPs which agree or partly agree are as follows:
  - Broaden the scope to all LVIC sectors to gather information. Cd and Hg are included in permits for several LVIC production processes. Cd and Hg are also priority hazardous substances according to the WFD. Hg emissions of the LVIC sector are relevant (in Flanders, Belgium) according to E-PRTR data. The chapter 'Recommendations for future work' of the CWW BREF includes the further collection of information on emissions of cadmium, lead and mercury during the next reviews of all chemical BREFs and is not limited to titanium dioxide production (BE).
  - Hg is an issue for E-PRTR activities 4.b (a) and 4.b (e). The contribution of the chemical sector to industrial emissions is low (2.6 %), out of which the main emitters are activities 4.b and 4.c (CEFIC).
- The main comments of the IPs which agree or partly agree, associated with the inorganic chemical production processes to be covered by the LVIC BREF, are summarised below.
  - The parameter is included in permits and monitored for the following inorganic chemical production processes:
    - NPK and CN (AT, DE);

[34] https://echa.europa.eu/de/substance-information/-/substanceinfo/100.031.070

- Phosphoric acid (DE);
- Superphosphates (DE);
- Titanium dioxide (DE).

- Emission data were reported by the LVIC-AAF and LVIC-S BREFs for the following inorganic production processes (AT):
  - Soda ash (AT);
  - Sulphuric acid (AT);
  - Superphosphates (AT);
  - Titanium dioxide (BE).
- The parameter may be relevant for the following production processes:
  - Soda ash based on E-PRTR data (EEB);
  - Sulphuric acid (FR);
  - Titanium dioxide (CZ, ES, SI).

EIPPCB assessment

- The CWW BREF does not provide BAT-AELs on emissions to water for metals such as Cd and Hg. However, it includes a specific recommendation for future work to collect information on emissions of Cd and Hg during the next reviews of all chemical BREFs.
- Cd and Hg are listed as priority hazardous substances according to Directive 2013/39/EU (as regards priority substances in the field of water policy).
- According to the preliminary feedback provided with the IPs, relevant provisions on metals seem to be generally included in permits and monitoring data could be available.
- For the assessments of Cr, Cu, Ni and Zn see Section 2.2.4.2.6 and for the assessments of 'V, Zn, Cr, Pb, Ni, Cu, As, Ti and Mn' see Section 2.2.4.2.8.

EIPPCB proposal

- See Section 2.2.4.4.

2.2.4.2.8 Metals (V, Zn, Cr, Pb, Ni, Cu, As, Ti and Mn)

Original EIPPCB proposal

To include the metals 'V, Zn, Cr, Pb, Ni, Cu, As, Ti and Mn' as a KEI for the following production process:

- Titanium dioxide (chloride and sulphate process routes)

Summary of initial positions

- **6** out of 23 IPs agree with the proposal, **5** partly agree, **1** disagrees and **11** do not provide an opinion.
- The main comments of the IPs which agree or partly agree, associated with the inorganic chemical production processes to be covered by the LVIC BREF, are summarised below.
  - The parameter is included in permits and monitored for the following inorganic chemical production processes:
    - Titanium dioxide (BE, DE).
  - Emission data were reported by the LVIC-AAF and LVIC-S BREFs for the following inorganic production processes (AT):
    - Soda ash (e.g. Pb, Cr).
  - The parameter may be relevant for the following production processes:
    - Soda ash based on E-PRTR data (EEB);
    - Superphosphates (DE);
    - Sulphuric acid (FR);
    - Titanium dioxide (BE, DE, FR).
- Permit data includes ELVs for the production of titanium dioxide for other metals:
  - Al, Ba, Sb (BE);
  - Al, Ca, Fe (DE);
  - Al, Sn (FR).
- The main comment of the IP which disagrees is as follows:
  - The contribution of the chemical sector to industrial lead emissions is low (0.13 %) (CEFIC).

EIPPCB assessment
• The LVIC-AAF and LVIC-S BREFs include emission data for metals for the production of soda ash and titanium dioxide (both chlorate and sulphate process routes). Therefore, it would be useful to collect updated information and to reflect in the new LVIC BREF the current performances of the installations concerned by the LVIC production processes, where relevant. • The metal lead and its compounds is listed as a priority hazardous substance according to Directive 2013/39/EU (as regards priority substances in the field of water policy). • According to the preliminary feedback provided with the IPs, relevant provisions on metals seem to be generally included in permits and monitoring data could be available. • For the assessments of Cr, Cu, Ni and Zn see Section 2.2.4.2.6 and for the assessments of Cd and Hg see Section 2.2.4.2.7.
EIPPCB proposal
• See Section 2.2.4.4.

2.2.4.3 Additional proposals

Original EIPPCB request
Request 9: TWG members are asked to submit or propose any additional candidate KEIs relevant for emissions to water, if any, accompanied by a rationale addressing the four criteria mentioned in Section 3.1. Information on emission limit values and on monitoring of these additional candidate KEIs is also expected to be provided.

The IPs and related EIPPCB assessments associated with Request 9, 'Additional candidate KEIs', are summarised in Sections 2.2.4.3.1 to 2.2.4.3.20, according to the LVIC production processes presented in 'Document 3 of the call for IPs', including a section on general issues:

- Ammonia production;
- Hydrofluoric acid production;
- Nitric acid production;
- Phosphoric acid production;
- Sulphuric acid production;
- Inorganic phosphates production;
- Sodium carbonate (soda ash) production;
- Calcium chloride production;
- Sodium chlorate production;
- Calcium carbide production;
- Carbon black production;
- Titanium dioxide (and related products) production;
- Ferrous sulphate production;
- Sodium silicate production;
- Synthetic amorphous silica production;
- AN and CAN production;
- NPK and CN production;
- Superphosphates production;
- Urea and UAN production;
- General issues.

The EIPPCB proposals for KEIs relevant for emissions to water, organised by LVIC production process, are tabled in Section 2.2.4.4, as a result of the EIPPCB assessments provided in Sections 2.2.4.2.1 to 2.2.4.2.8 and in Sections 2.2.4.3.1 to 2.2.4.3.20.

2.2.4.3.1 Production of ammonia

Original EIPPCB proposal
None.
Summary of initial positions
• To include 'Total inorganic nitrogen' as a KEI for the production of ammonia (DE, EEB).
EIPPCB assessment
• Concerning 'Total inorganic nitrogen', see also the assessments in Section 2.2.4.2.5. • The LVIC-AAF BREF includes emission levels for ammonia, expressed as specific emission to water (kg/t NH_3), related to the production process via partial oxidation. • In the BATC of the LVIC-AAF BREF, it is indicated that 'BAT is to remove NH_3 from process condensates, e.g. by stripping'. Therefore, it could be useful to collect data on the treatment of process condensates and possible emissions of ammonia to water. • The monitoring of the parameters 'Total nitrogen' and 'Total inorganic nitrogen' would include the monitoring of ammonia emissions to water. • According to the preliminary feedback provided with the IPs, the parameter 'Total inorganic nitrogen' seems to be included in permits in at least two MSs (AT, DE) and monitoring data could be available.
EIPPCB proposal
• See Section 2.2.4.4.

2.2.4.3.2 Production of hydrofluoric acid

Original EIPPCB proposal
None.
Summary of initial positions

• To include the following pollutants/parameters as KEIs for the production of hydrofluoric acid:
  o Sulphates:
  ▪ Emission data are reported by the LVIC-AAF BREF (DE).
  ▪ Based on expert judgement that the 'poorly' soluble salt calcium sulphate is a reaction product of the production process (EEB).
  o TSS:
  ▪ Emission data are reported by LVIC-AAF (DE).
  ▪ Based on expert judgement that the 'poorly' soluble salt calcium sulphate is a reaction product of the production process (EEB).
  o Fluorides:
  ▪ Fluorides were reported in the LVIC-AAF BREF (AT, DE).
  ▪ E-PRTR data (2018, 2019, 2020) show the relevance of fluorides emissions for the production of hydrofluoric acid (EEB).

EIPPCB assessment
• Concerning TSS and sulphates, see also the assessments in Sections 2.2.4.2.3 (TSS) and 2.2.4.2.4 (Sulphates). • The LVIC-AAF BREF includes some data on specific emission levels (expressed as kg/tonne HF) for fluorides, sulphates and suspended solids in liquid effluents from the production of hydrofluoric acid. Therefore, it would be useful to collect updated information and to reflect in the LVIC BREF the current performances of the installations concerned by this production. • According to the preliminary feedback provided with the IPs, the parameter 'fluorides' seems to be included in permits in at least two MSs (AT, DE) and monitoring data could

be available. • E-PRTR data (2018, 2019, 2020) include facilities producing hydrogen fluoride, reporting fluorides emission data.
EIPPCB proposal
• See Section 2.2.4.4.

2.2.4.3.3 Production of nitric acid

Original EIPPCB proposal
None.
Summary of initial positions
• To include 'Total nitrogen' as KEI for the production of nitric acid. The parameter is included in permits and monitoring data can be provided (DE, IT).
EIPPCB assessment
• Information submitted with the IPs shows that relevant provisions for total inorganic nitrogen exist in the permits issued by some MSs (e.g. DE, IT) and monitoring data might be available. • In the case of the production of nitric acid, monitoring 'Total nitrogen' and 'Total inorganic nitrogen' could be considered as equivalent.
EIPPCB proposal
• See Section 2.2.4.4.

2.2.4.3.4 Production of phosphoric acid

Original EIPPCB proposal
None.
Summary of initial positions
• To include the following pollutants/parameters as KEIs for the production of phosphoric acid: o Metals (including As, Cd, Hg) (AT, DE, EEB): ▪ Review emission levels included in the LVIC-AAF BREF. Data can be provided (BE, DE). o Total phosphorus (BE, DE, EEB): ▪ Review emission data in the LVIC-AAF BREF. Data can be provided (DE). o Fluorides (AT, BE, DE): ▪ Review emission data in the LVIC-AAF BREF (AT). Data can be provided (DE). o Orthophosphate (DE): ▪ The parameter is part of the KEI 'Total phosphorus'. It needs to be monitored according to the WFD.
EIPPCB assessment

- The LVIC-AAF BREF includes information on emissions to water for the following pollutants/parameters:
  - metals, e.g. As, Cd, Hg and others (grouped parameter);
  - fluorides;
  - total phosphorus.

  Therefore, it would be useful to review this information and to reflect in the new LVIC BREF the current performances of the installations concerned by this production process.
- The CWW BATC do not provide BAT-AELs on emissions to water for metals like Cd and Hg (and their compounds). However, there is a specific recommendation for future work to collect information on emissions of metals, including Cd and Hg, during the next reviews of all chemical BREFs.
- Cd and Hg (and their compounds) are listed as priority hazardous substances according to Directive 2013/39/EU.
- Orthophosphate is not included as a priority substance in Directive 2013/39/EC. Therefore, the monitoring of orthophosphate is not mandatory. Orthophosphate would be included in the parameter 'Total phosphorus'.

EIPPCB proposal

- See Section 2.2.4.4.

2.2.4.3.5 Production of sulphuric acid

Original EIPPCB proposal

None.

Summary of initial positions

- To include Cd as a KEI. The parameter is included in permits (BE).
- To include fluorides as a KEI. Identification of 'Top-emitters' based on E-PRTR data on emissions to water (EEB).

EIPPCB assessment

- Cadmium
  - Information on emissions to water for heavy metals, including Cd, is included in in the LVIC-AAF BREF. Therefore, it would be useful to review this information and to reflect in the new LVIC BREF the current performances of the installations concerned by this production process.
  - Information submitted with the IPs shows that relevant provisions exist in the permits.
  - Cadmium and its compounds are listed as a priority hazardous substance according to Directive 2013/39/EU.
  - The CWW BREF does not provide BAT-AELs on emissions to water for cadmium and its compounds. However, there is a specific recommendation for future work to collect information on emissions of cadmium, lead and mercury during the next reviews of all chemical BREFs.
- Fluorides:
  - Information from E-PRTR data (2020) indicates that the emissions of fluorides to water may represent a high share (34.4 %) of emissions from category 4(b) versus the emissions corresponding to all industrial activities. However, due to the granularity of the E-PRTR data, the emissions of the LVIC production processes in the scope of the LVIC BREF may be overestimated.
  - Information on fluorides emissions to water is not included in the LVIC-AAF BREF. There is no clear indication that sulphuric acid production contributes significantly to fluorides emissions, which instead seem to mainly originate from the production of fertilisers.

EIPPCB proposal
• See Section 2.2.4.4.

2.2.4.3.6 Production of inorganic phosphates

Original EIPPCB proposal
To include total phosphorus as a KEI for water for the production of inorganic phosphates.
Summary of initial positions
• To include metals 'Cd, Cr, Cu, Hg, Ni, Pb, Zn' as KEIs (BE, DE). • To include fluorides as a KEI. Identification of 'Top-emitters' based on the assessment of E-PRTR data (EEB). • To include orthophosphate as a KEI. The parameter is part of the KEI 'Total phosphorus'. It needs to be monitored according to the WFD (DE). • To include TOC (DE).
EIPPCB assessment
• It is indicated by the LVIC-S BREF that the production of 'inorganic phosphates' is carried out via a dry process. Emissions to water may arise from the end-of-pipe waste gas treatment, such as scrubbers. However, waste gas treatment by scrubbers is not applied universally. • According to the preliminary feedback provided with the IPs, it is not clear if emission data for metals and fluorides would be available. Due to the aggregated type of data provided for the E-PRTR requirements, it is not clear whether the E-PRTR data available refer to the production of 'inorganic phosphates' or other production processes with similar products (e.g. fertilisers such as NPK or superphosphates). • Information on emissions to water of fluorides is not included in the LVIC-AAF BREF. There is no clear indication that inorganic phosphates production contributes significantly to the emissions of the subsector, which seem mainly originate from the production of phosphoric acid and fertilisers. • Orthophosphate is not included as a priority substance in Directive 2013/39/EC. Therefore, the monitoring of orthophosphate is not mandatory. Orthophosphate would be included in the parameter Total phosphorus. • The parameter TOC is commonly used to measure the amount of organic compounds in water. It is not clear why and which organic compounds are relevant for the LVIC production processes covered by the scope of the LVIC BREF.
EIPPCB proposal
• See Section 2.2.4.4.

2.2.4.3.7 Production of sodium carbonate

Original EIPPCB proposal
To include metals 'Cr, Cu, Ni and Zn', suspended solids (TSS) and total inorganic nitrogen (N_{inorg}) as a KEI for the production of sodium carbonate (i.e. soda ash).
Summary of initial positions

• To include the following pollutants/parameters as KEI or candidate KEI for the production of soda ash:
  o Chlorides (as total) as KEI (BE, DE, EEB).
  o Metals: As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Ti and Zn as KEI candidate. Emissions originate from impurities in the limestone and brine feedstocks (BE, DE, IT and EEB).
  o Sulphates: as KEI candidate (BE, DE, FR). Information on emissions to water for sulphates is included in the LVIC-AAF BREF. Emission data from plants can be provided (DE).
  o Total phosphorous, as candidate KEI (DE).

- Total nitrogen, as candidate KEI. Identification of 'Top-emitters' based on the assessment of E-PRTR data (EEB).
- TSS, as candidate KEI (BE, DE, EEB). Based on expert judgement that large amounts of TSS are emitted (often containing heavy metals) from the production process (EEB).
- Ca, ammonium, Na, OH^-: quantities of waste water are significant ($8.7 m^3/t$) as reported by the LVIC-S BREF (BE).
- Al and Ca: emission data can be provided (DE).

EIPPCB assessment

- Concerning the parameters listed below, see the assessments provided in the indicated sections:
  - Chlorides (as total), see Section 2.2.4.2.1
  - Metals, see Sections 2.2.4.2.6, 2.2.4.2.7, 2.2.4.2.8
  - Sulphates, see Section 2.2.4.2.4
  - Total phosphorous, see Section 2.2.4.2.2
  - Total inorganic nitrogen, see Section 2.2.4.2.5
  - TSS, see Section 2.2.4.2.3

- The LVIC-S BREF includes information on emissions to water expressed as specific loads (g or kg/tonne soda ash) for heavy metals and other pollutants including e.g. ammonium, calcium, sodium and hydroxide (OH^-). Therefore, it would be useful to review this information and to reflect in the new LVIC BREF the current performances of the installations concerned by this production process.

EIPPCB proposal

- See Section 2.2.4.4.

2.2.4.3.8 Production of calcium chloride

Original EIPPCB proposal

None.

Summary of initial positions

- To include the following pollutants/parameters as KEI for the production of calcium chloride:
  - Cadmium: it is included in permits (BE).
  - Chlorides (as total): the production of calcium chloride is related to the production of soda ash (EEB).

EIPPCB assessment

- Concerning cadmium, see also the assessments provided in the Section 2.2.4.2.7.
- Concerning chlorides, see also the assessments provided in the Section 2.2.4.2.1.
- Calcium chloride is mentioned as a co-product of the production of soda ash by the LVIC-S BREF. The waste water may be treated to remove suspended solids and dissolved calcium chloride. A pure solution of calcium chloride can be obtained and by successive concentration steps the solution is concentrated up to around 78 % $CaCl_2$, to produce a white solid hydrated flake or prill.

EIPPCB proposal

- See Section 2.2.4.4.

2.2.4.3.9 Production of sodium chlorate

Original EIPPCB proposal
None.
Summary of initial positions
• To include chromium, including Cr(VI), as a KEI for the production of sodium chlorate. Sodium chlorate process waters may contain Cr(VI) (FI, SE). Cr (VI) is included as KEI in the permit for one plant (SE). • To include perchlorate as a KEI for the production of sodium chlorate, as perchlorate is or can be formed as a by-product in the sodium chlorate manufacturing process (SE).
EIPPCB assessment
• According to the LVIC-S BREF, sodium dichromate is an auxiliary substance for the production of sodium chlorate. Information from ECHA indicates that the substance is used for the manufacture of chemicals. The substance is listed in Annex XIV to Regulation (EC) No 1907/2006. However, the last application date for the use of the substance was 21 March 2016 and the Sunset date was 21 September 2017 and it seems that there are no authorised uses for the production of chemicals. • No further information on perchlorate has been provided with the IPs, e.g. if monitoring data might be available or any evidence associated with the environmental relevance of perchlorate.
EIPPCB proposal
• See Section 2.2.4.4.

2.2.4.3.10 Production of carbon black

Original EIPPCB proposal
None.
Summary of initial positions
• To include TSS as a KEI for the production of carbon black (CZ, IT).
EIPPCB assessment
• Concerning TSS, see also the assessments provided in Section 2.2.4.2.3. • No further explanatory information was provided with the IPs. Information in the LVIC-S BREF indicates potential emissions to waste water of suspended solids. However, no specific techniques to reduce emissions to water of TSS for the production of carbon black were identified.
EIPPCB proposal
• See Section 2.2.4.4.

2.2.4.3.11 Production of titanium dioxide (and related products)

Original EIPPCB proposal
To include the following substances/parameters as KEIs for emissions to water for the production of titanium dioxide: • Metals: As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Ti, V and Zn (for both chloride and sulphate process routes) • TSS • Chlorides (as total) (for chloride process route) • Sulphates (for sulphate process route).
Summary of initial positions
• To include the following parameters as KEIs for the production of titanium dioxide: o Total inorganic nitrogen (DE, IT, SI). The parameter is included in permits (IT, SI). o Total phosphorus (DE, IT, SI). The parameter is included in permits (IT, SI). o Alkali metal sulphates and chlorides (BE). o COD: the parameter is included in permits (IT, SI). o Fe: the parameter is included in permits (BE, CZ, IT, PL, SI). o Metals, including Cd, Cr, Cu, Fe, Hg, (DE).
EIPPCB assessment
• Concerning total inorganic nitrogen and total phosphorus, see also the assessments provided in Sections 2.2.4.2.5 (Total inorganic nitrogen) and 2.2.4.2.2 (Total phosphorus). • The LVIC-S BREF includes data on emission levels for emissions to water of metals and their compounds (e.g. Cd, Hg, Fe) for the chloride process route. • In the LVIC-S BREF, BAT-AELs for emissions to water, as specific loads, were concluded for the chloride process route, for the following pollutants/parameters: chlorides, hydrochloric acid, iron (and its compounds) and suspended solids. Due to insufficient reported data, no particular techniques were identified as being associated with the emissions of metals. According to the preliminary feedback provided with the IPs, metals seem to be included in permits and monitoring data could be provided. • The LVIC-S BREF includes emission levels for emissions to water for the sulphate process route for the following pollutants/parameters: metals and their compounds (e.g. Cd, Hg, Fe), sulphates and suspended solids. • In the LVIC-S BREF, BAT-AELs for emissions to water, as specific loads, were concluded for the sulphate process route, for the following pollutants/parameters: metals and their compounds (Cd, Hg, Fe), sulphates and suspended solids. Due to insufficient reported data, no particular techniques were identified as being associated with the emissions of other metals. According to the preliminary feedback provided with the IPs, metals seem to be included in permits and monitoring data could be provided. • Although, according to the preliminary feedback provided with the IPs, monitoring data could be provided for the pollutants/parameters total inorganic nitrogen, total phosphorus and COD, it is not clear why the emissions to water of these pollutants are relevant for production of titanium dioxide. • Concerning chlorides (as total) and sulphates, see also the assessments provided in Sections 2.2.4.2.1 (chlorides as total) and 2.2.4.2.4 (sulphates). • The parameters chlorides and sulphates would include the alkali metal sulphates and chlorides.
EIPPCB proposal
• See Section 2.2.4.4.

2.2.4.3.12 Production of ferrous sulphate

Original EIPPCB proposal
None.
Summary of initial positions
• To include sulphates as a KEI for the production of ferrous sulphates (EEB).
EIPPCB assessment
• Concerning sulphates, see also the assessments provided in Section 2.2.4.2.4. • Ferrous sulphate is a co-product of the production of titanium dioxide via the sulphate process route. It would therefore be consistent to refer to the EIPPCB proposal for KEIs relevant for emissions to water related to the production titanium dioxide (and related products), via the sulphate process route (see Section 2.2.4.3.11.
EIPPCB proposal
• See Section 2.2.4.4.

2.2.4.3.13 Production of sodium silicate

Original EIPPCB proposal
None.
Summary of initial positions
• To include fluorides as a KEI for the production of sodium silicate (EEB).
EIPPCB assessment
• The proposal of fluorides seems to be an editorial error. The rationale provided does not fit with the proposal.
EIPPCB proposal
• See Section 2.2.4.4.

2.2.4.3.14 Production of synthetic amorphous silica

Original EIPPCB proposal
To include chlorides (as total) as a KEI for the production of synthetic amorphous silica.
Summary of initial positions
• To include the following pollutants/parameters as KEIs for the production of synthetic amorphous silica: o Sulphates (EEB); o Total inorganic nitrogen (EEB); o TSS, based on emission data from German plants (DE).
EIPPCB assessment
• The proposal to include sulphates and total inorganic nitrogen seems to be an editorial error. The rationale accompanying this proposal seems to be better related to other types of LVIC production processes. • Concerning TSS, see also the assessments provided in Section 2.2.4.2.3.
EIPPCB proposal
• See Section 2.2.4.4.

2.2.4.3.15 Production of AN and CAN

Original EIPPCB proposal
None.
Summary of initial positions
• To include the following pollutants/parameters as KEIs for the production of AN and CAN: o Total inorganic nitrogen: ▪ the LVIC-AAF BREF includes information on emission levels (DE); ▪ the removal of nitrogen from waste water in the absence of an organic load excludes the use of biological waste water treatment, which calls for a different approach to abatement rates and emission levels (Fertilizers Europe); ▪ based on E-PRTR data (EEB). o TSS (Fertilizers Europe).
EIPPCB assessment
• Concerning Total inorganic nitrogen, see assessments provided in Section 2.2.4.2.5. • Concerning TSS, see the assessments provided in Section 2.2.4.2.3.
EIPPCB proposal
• See Section 2.2.4.4.

2.2.4.3.16 Production of NPK and CN

Original EIPPCB proposal
None.
Summary of initial positions
• To include the following pollutants/parameters as KEIs for the production of NPK and CN: o Chlorides (as total), based on emission data of German plants (DE). o Metals (including Cd and Co) (BE, DE, FI). o Total inorganic nitrogen (BE, DE, Fertilizers Europe, EEB): ▪ the LVIC-AAF BREF includes information on emission levels (DE); ▪ the removal of nitrogen from waste water in the absence of an organic load excludes the use of biological waste water treatment, which calls for a different approach to abatement rates and emission levels (Fertilizers Europe); ▪ based on E-PRTR data (EEB). o Total phosphorus (BE, DE, Fertilizers Europe, EEB). o TSS (DE, Fertilizers Europe). o Boron compounds (FI). o Fluorides: parameter is measured and included in permits (AT, BE, DE).
EIPPCB assessment
• Concerning the parameters listed below, see the assessments provided in the indicated sections: o Chlorides (as total), see Section 2.2.4.2.1. o Metals, see Sections 2.2.4.2.6, 2.2.4.2.7, 2.2.4.2.8. o Total inorganic nitrogen, see Section 2.2.4.2.5. o Total phosphorus, see Section 2.2.4.2.2. o TSS, see Section 2.2.4.2.3. • The LVIC-AAF BREF includes emission levels for emissions to water of fluorides, inorganic nitrogen compounds (as total inorganic nitrogen, ammonium, nitrites and nitrates), phosphates (as P_2O_5) and the metal 'cadmium'. Therefore, it would be useful to review this information and to reflect in the new LVIC BREF the current performances of the installations concerned by this production process.

- According to the preliminary feedback provided with the IPs, monitoring data seem to be available (in some MSs) for cadmium, chlorides, fluorides, total inorganic nitrogen, total phosphorus and suspended solids.
- Cobalt and boron compounds may be added as micro-nutrients in the final process steps for NPK production (e.g. granulation, drying, coating). It is not clear if emissions to water of these pollutants are relevant for this production process. Indeed, it is also not clear from the information submitted with the IPs if relevant monitoring data are available and could be provided.

EIPPCB proposal

See Section 2.2.4.4.

2.2.4.3.17 Production of superphosphates

Original EIPPCB proposal

None.

Summary of initial positions

- To include the following pollutants/parameters as KEIs for the production of superphosphates:
  - Heavy metals (including Cd, Hg), based on emission data from German plants (DE).
  - Cd (BE).
  - Total phosphorus (Fertilizers Europe), based on E-PRTR data (EEB).
  - Fluorides, as the LVIC-AAF BREF includes information on emission levels (AT, EEB).
  - Orthophosphate, since the parameter is part of the KEI 'Total phosphorus' and it needs to be monitored according to the WFD (DE).

EIPPCB assessment

- Concerning the parameters listed below, see also the assessments provided in the relevant sections:
  - Metals, see Sections 2.2.4.2.6, 2.2.4.2.7, 2.2.4.2.8.
  - Total phosphorus, see Section 2.2.4.2.2.
- The LVIC-AAF BREF includes emission levels for emissions to water of fluorides, inorganic nitrogen compounds (ammonium), phosphates (as P_2O_5) and metals such as Cd, Hg and Zn. Therefore, it would be useful to review this information and to reflect in the new LVIC BREF the current performances of the installations concerned by this production process.
- The metals Cd and Hg (and their compounds) are listed as priority hazardous substances according to Directive 2013/39/EU.
- According to the preliminary feedback provided with the IPs, monitoring data seem to be available for metals, fluorides, total inorganic nitrogen and total phosphorus.
- Orthophosphate is not included as priority substance in Directive 2013/39/EC, amending Directives 2000/60/EC and 2008/105/EC. Therefore, the monitoring of orthophosphate is not mandatory. Orthophosphate would be included in the parameter Total phosphorus.

EIPPCB proposal

See Section 2.2.4.4.

2.2.4.3.18 Production of urea and UAN

Original EIPPCB proposal

To include total inorganic nitrogen (N_{inorg}) as a KEI for the production of urea and UAN.

Summary of initial positions

To include as KEIs for the production of urea and UAN the following pollutants/parameters:
- Total inorganic nitrogen: based on E-PRTR data (EEB).
- Ammonia: the LVIC-AAF BREF includes BAT-AELs (BE, DE).

EIPPCB assessment

- The LVIC-AAF BREF includes BAT-AELs for the pollutants ammonia and urea (expressed as ppm w/w).
- The parameter total inorganic nitrogen (expressed as N) would include free ammonia, as well as ammonium (NH_4-N), nitrite (NO_2-N) and nitrate (NO_3-N).
- Concerning total inorganic nitrogen, see also the assessments provided in Section 2.2.4.2.5.
- The LVIC-AAF BREF does not indicate emissions to water for the UAN production process (see also assessments provided in in Section 2.2.4.2.5). At this stage of the LVIC BREF drawing up process (i.e. KoM), it does not seem necessary to specify whether a KEI is relevant for all or for specific types of production processes (e.g. stand-alone production). The issue of types of production processes could be better addressed during the design phase of the plant-specific questionnaire.
- The granularity of E-PRTR data does not allow differentiation between the production of urea and UAN.

EIPPCB proposal

- See Section 2.2.4.4.

2.2.4.3.19 Production of calcium carbide

Original EIPPCB proposal

None.

Summary of initial positions

- To include the following pollutants/parameters as KEIs for the production of calcium carbide:
  - Metals 'Cd, Cu, Hg, Ni, Pb, Zn', total inorganic nitrogen, total phosphorus, TSS, based on emission data available from German plants (DE).
  - Hydrocarbon index: the parameter is measured (direct discharges) and included in permits (AT).
  - Cyanides: based on information in the LVIC-S BREF and pointing to E-PRTR data for a specific plant (EEB).
  - Sulphite: the parameter is included as a KEI in the permits and measured (AT).
  - TOC (DE).

EIPPCB assessment

- Concerning the parameters listed below, see the assessments provided in the relevant sections:
  - Metals, see Sections 2.2.4.2.6, 2.2.4.2.7, 2.2.4.2.8.
  - Total inorganic nitrogen, see Section 2.2.4.2.5.
  - Total phosphorus, see Section 2.2.4.2.2.
  - TSS, see Section 2.2.4.2.3.
- In the LVIC-S BREF it is indicated that waste water from the production of calcium carbide arises when applying wet dedusting systems. Emission levels of pollutants/parameters such as cyanides, sulphites and suspended solids (expressed as filterable substances) are reported in the the LVIC-S BREF. Therefore, it would be useful to review this information and to reflect in the new LVIC BREF the current performances of the installations concerned by this production process.
- Although monitoring data could be provided, it is not clear why emissions of pollutants/parameters such as hydrocarbon index, metals 'Cd, Cu, Hg, Ni, Pb, Zn', total phosphorus, total inorganic nitrogen and TOC are relevant for the production of of calcium carbide.
- In general, the issues related to the pollutants/parameters such as hydrocarbon index,

suspended solids, total phosphorus, TOC seems to be better addressed by the next review of the CWW BREF. Indeed, there is a specific recommendation for future work to collect short-term emission data in order to assess the possibility of setting short-term BAT-AELs for emissions to water during the next review of the CWW BREF.
EIPPCB proposal
• See Section 2.2.4.4.

2.2.4.3.20 General issues

Original EIPPCB request
Request 9: TWG members are asked to submit or propose any additional candidate KEIs relevant for emissions to water, if any, accompanied by a rationale addressing the four criteria mentioned in Section 3.1. Information on emission limit values and on monitoring of these additional candidate KEIs is also expected to be provided.
Summary of initial positions
• To include the following substances/parameters as KEIs relevant for emissions to water for all LVIC production processes: o AOX: ▪ Specific ELVs for AOX are included in permits for the following production processes: calcium chloride, carbon black, ferric chloride, NPK, sulphuric acid, titanium dioxide (BE). o COD/TOC: ▪ To include COD (AT). ▪ To include COD/TOC as a KEI for all LVIC sectors. The parameter COD is included in all permits for LVIC installations proposed to be in the scope of the LVIC BREF. ELVs and mass flow thresholds need to be reviewed for all LVIC sectors (BE). o Fluorides: ▪ ELVs for fluorides are included in permits for the following production processes: NPK, inorganic phosphates, phosphoric acid. Information can be provided (BE). o Per- and polyfluoroalkyl substances (PFAS), individual PFAS and their degradation products (when available): ▪ PFOS is a priority hazardous substance, but other PFAS are also of importance and may be labelled as priority hazardous substances in the near future. Several PFAS are found in numerous LVIC installations across different subsectors; measurements are available (BE).
EIPPCB assessment
• AOX, COD, TOC: o Information submitted with the IPs shows that relevant provisions exist in the permits for certain production processes. o The CWW BREF provides BAT-AELs for direct emissions to water for the parameters AOX, COD and TOC, expressed in concentration (mg/l), as a yearly average, coupled with yearly mass flow thresholds (see Tables 4.1 and Table 4.3). However, the CWW BREF includes a specific recommendation for future work to collect short-term emission data in order to assess the possibility of setting short-term BAT-AELs for emissions to water during the next review of the CWW BREF. The parameters COD/TOC are commonly used to measure the amount of organic compounds in water. It is not clear why and which organic compounds are relevant for the inorganic production processes in the scope of the LVIC BREF. o The parameter AOX is commonly used to measure the amount of absorbable organically bound halogens, expressed as chlorides. It is not clear why and which organic compounds are relevant for the inorganic chemical production processes in the scope of the LVIC BREF. • Fluorides: o Information submitted with the IPs shows that relevant provisions exist in the permits for certain production processes.

○ The CWW BREF does not provide BAT-AELs on emissions to water for the parameter 'fluorides'. There is no specific recommendation for future work on whether and how to consider this parameter for the next chemical BREF reviews. The parameter fluorides does not seem relevant for all inorganic chemical production processes to be covered in the LVIC BREF. See the assessments provided for the inorganic chemical production processes addressed in Section 2.2.4.3.1 to Section 2.2.4.3.19. • PFAS: ○ PFAS have been identified as an emerging chemical risk in Europe by the EEA[35], due to their extreme persistence in the environment and toxicity properties in evaluations. ○ It would be useful to collect information on the usage of PFAS (as a group or as specific type), including their hazardousness characteristics and potential substitution. ○ From the information submitted with the IPs, emission and measurement data seem available from at least one MS (BE).
EIPPCB proposal
• See Section 2.2.4.3.

2.2.4.4 EIPPCB revised proposals of KEIs for emissions to water

The following table summarises the EIPPCB proposal of KEIs relevant for emissions to water organised by LVIC production process, as a result of the EIPPCB overall assessments in Sections 2.2.4.2.1 to 2.2.4.2.8 and in Sections 2.2.4.3.1 to 2.2.4.3.20.

The detailed list of the EIPPCB proposals organised by LVIC production process is provided after the table below.

LVIC production process	**EIPPCB original proposal**	**EIPPCB revised proposal**	
	Pollutants/Parameters		
	KEI	**KEI**	**Candidate KEI**
Ammonia	-	▪ Total inorganic nitrogen	-
Hydrofluoric acid	-	▪ Fluorides	▪ Sulphates ▪ TSS
Nitric acid	-	▪ Total inorganic nitrogen	-
Phosphoric acid	-	▪ Total phosphorus ▪ Fluorides ▪ Cr, Cu, Ni and Zn ▪ Hg, Cd	-
Sulphuric acid	-	▪ Hg, Cd ▪ Cr, Cu, Ni and Zn ▪ As, Mn, Pb, Ti, V	-
Inorganic phosphates ([1]) Only feed phosphates – feed-grade DCP product.	▪ Total phosphorus	▪ Total phosphorous	-
Soda ash	▪ TSS ▪ Total inorganic nitrogen ▪ Cr, Ni, Cu, Zn	▪ TSS ▪ Total inorganic nitrogen ▪ Cr, Cu, Ni and Zn ▪ Hg, Cd ▪ As, Mn, Pb, Ti, V ▪ Chlorides (as total)	▪ Ammonium ▪ Calcium ▪ Sodium

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PCC	▪ TSS	▪ TSS	-
Calcium chloride	-	-	▪ TSS
Sodium chlorate	-	-	-
Calcium carbide	-	▪ Cyanides ▪ Sulphite	-
Carbon black	-	-	-
Titanium dioxide (1) chloride process route (2) sulphate process route	▪ As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Ti, V and Zn (1) (2) ▪ TSS (1) (2) ▪ Chlorides (as total) (1) ▪ Sulphates (2)	▪ As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Ti, V and Zn (1) (2) ▪ TSS(1) (2) ▪ Chlorides (as total) (1) ▪ Sulphates (2)	-
Ferrous sulphates	-	As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Ti, V and Zn TSS Sulphates	-
Sodium silicate	-	-	-
Synthetic amorphous silica (pyrogenic process route)	▪ Chlorides (as total)	▪ Chlorides (as total)	-
AN and CAN	-	▪ Total inorganic nitrogen	-
NPK and CN	-	▪ Chlorides (as total) ▪ Total phosphorus ▪ Total inorganic nitrogen ▪ Cr, Cu, Ni and Zn ▪ Hg, Cd	▪ Fluorides
Superphosphates	-	▪ Total phosphorus ▪ Total inorganic nitrogen ▪ Hg, Cd ▪ As, Mn, Pb, Ti, V	▪ Fluorides
UREA and UAN	▪ Total inorganic nitrogen	▪ Total inorganic nitrogen	-
Legend: KEI: To derive BAT-AELs. Candidate KEI: To decide at a later stage if BAT/BAT-AELs should be derived.			

A detailed list of the EIPPCB proposals organised by LVIC production process can be found below.

Table 24 – Production of ammonia - KEIs relevant for emissions to water

Original EIPPCB proposal
None.
EIPPCB revised proposal
• To include 'Total inorganic nitrogen' as a KEI for emissions to water for the production of ammonia.

Table 25 - Production of hydrofluoric acid - KEIs relevant for emissions to water

Original EIPPCB proposal
None.
EIPPCB revised proposal
• To include fluorides as a KEI for emissions to water for the production of hydrofluoric acid. • To collect data for TSS and sulphates and the TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs on TSS and sulphates for emissions to water should be derived.

Table 26 - Production of nitric acid - KEIs relevant for emissions to water

Original EIPPCB proposal
None.
EIPPCB revised proposal
• To include total inorganic nitrogen as a KEI for emissions to water for the production of nitric acid.

Table 27 - Production of phosphoric acid - KEIs relevant for emissions to water

Original EIPPCB proposal
None.
EIPPCB revised proposal
• To include the following substances/parameters as KEIs for emissions to water for the production of phosphoric acid: o Total phosphorus; o Fluorides; o Cr, Cu, Ni, Zn; o Hg, Cd.

Table 28 - Production of sulphuric acid - KEIs relevant for emissions to water

Original EIPPCB proposal
None.
EIPPCB revised proposal
• To include the following substances/parameters as KEIs for emissions to water for the production of sulphuric acid: o Hg, Cd; o Cr, Cu, Ni, Zn; o As, Mn, Pb, Ti, V.

Table 29 - Production of inorganic phosphates - KEIs relevant for emissions to water

Original EIPPCB proposal
• To include total phosphorus as a KEI for emissions to water for the production of inorganic phosphates.

EIPPCB revised proposal
To confirm the original EIPPCB proposal: • To include total phosphorus as a KEI for emissions to water for the production of inorganic phosphates.

Table 30 - Production of sodium carbonate (i.e. soda ash) - KEIs relevant for emissions to water

Original EIPPCB proposal
• To include the following substances/parameters as KEIs for emissions to water for the production of soda ash: o Metals: Cr, Ni, Cu, Zn; o Total inorganic nitrogen (N_{inorg}); o Suspended solids (TSS).
EIPPCB revised proposal
To revise the original EIPPCB proposal: • To include the following substances/parameters as KEIs for emissions to water for the production of sulphuric acid: o Metals: Cr, Ni, Cu, Zn, Hg, Cd, As, Mn, Pb, Ti, V; o Total inorganic nitrogen (N_{inorg}); o Suspended solids (TSS); o Chlorides (as total). • To collect data for the following substances/parameters and the TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs for emissions to water should be derived: o Ammonium; o Calcium; o Sodium.

Table 31 - Production of calcium chloride - KEIs relevant for emissions to water

Original EIPPCB proposal
None.
EIPPCB revised proposal
• To collect data for TSS and the TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs on TSS for emissions to water should be derived.

Table 32 - Production of sodium chlorate - KEIs relevant for emissions to water

Original EIPPCB proposal
None.
EIPPCB revised proposal
• Not to include any KEI for emissions to water for the production of sodium chlorate.

Table 33 - Production of calcium carbide - KEIs relevant for emissions to water

Original EIPPCB proposal
None.
EIPPCB revised proposal
• To include the following substances/parameters as KEIs for emissions to water for the production of calcium carbide:

○ Cyanides; ○ Sulphite.

Table 34 - Production of carbon black - KEIs relevant for emissions to water

Original EIPPCB proposal
None
EIPPCB revised proposal
• Not to include any KEI for emissions to water for the production of carbon black.

Table 35 - Production of titanium dioxide (chloride process route) - KEIs relevant for emissions to water

Original EIPPCB proposal
• To include the following substances/parameters as KEIs for water emissions for the production of titanium dioxide: ○ Metals: As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Ti, V, Zn; ○ TSS; ○ Chlorides (as total).
EIPPCB revised proposal
To confirm the original EIPPCB proposal: • To include the following substances/parameters as KEIs for emissions to water for the production of titanium dioxide: ○ Metals: As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Ti, V, Zn; ○ TSS; ○ Chlorides (as total).

Table 36 - Production of titanium dioxide (sulphate process route) - KEIs relevant for emissions to water

Original EIPPCB proposal
• To include the following substances/parameters as KEIs for water emissions for the production of titanium dioxide: ○ Metals: As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Ti, V, Zn; ○ TSS; ○ Sulphates.
EIPPCB revised proposal
To confirm the original EIPPCB proposal: • To include the following substances/parameters as KEIs for emissions to water for the production of titanium dioxide: ○ Metals: As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Ti, V, Zn; ○ TSS; ○ Sulphates.

Table 37 - Production of ferrous sulphate - KEIs relevant for emissions to water

Original EIPPCB proposal
None.
EIPPCB revised proposal
• To refer to the EIPPCB proposal of KEIs for emissions to water for the production of titanium dioxide via the sulphate process route.

Table 38 - Production of sodium silicate - KEIs relevant for emissions to water

Original EIPPCB proposal
None.
EIPPCB revised proposal
• Not to include any KEI for emissions to water for the production of sodium silicate.

Table 39 - Production of synthetic amorphous silica - KEIs relevant for emissions to water

Original EIPPCB proposal
• To include chlorides (as total) as a KEI for emissions to water for the production of synthetic amorphous silica.
EIPPCB revised proposal
To confirm the original EIPPCB proposal. • To include chlorides (as total) as a KEI for emissions to water for the production of synthetic amorphous silica.

Table 40 - Production of AN and CAN - KEIs relevant for emissions to water

Original EIPPCB proposal
None
EIPPCB revised proposal
• To include Total inorganic nitrogen as a KEI for emissions to water for the production of AN and CAN.

Table 41 - Production of NPK and CN - KEIs relevant for emissions to water

Original EIPPCB proposal
None.
EIPPCB revised proposal
• To include the following substances/parameters as KEIs for emissions to water for the production of NPK and CN: o Chlorides (as total); o Total phosphorus; o Total inorganic nitrogen; o Cr, Cu, Ni, Zn; o Hg, Cd. • To collect data for fluorides and the TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT/BAT-AELs for emissions to water should be derived.

Table 42 - Production of superphosphates - KEIs relevant for emissions to water

Original EIPPCB proposal
None
EIPPCB revised proposal

- To include the following substances/parameters as KEIs for emissions to water for the production of superphosphates:
  - Total phosphorus;
  - Total inorganic nitrogen;
  - Hg, Cd, As, Mn, Pb, Ti, V.
- To collect data on fluorates and the TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT/BAT-AELs for fluorates emissions to water should be derived.

Table 43 - Production of urea and UAN - KEIs relevant for emissions to water

Original EIPPCB proposal
• To include total inorganic nitrogen (N_{inorg}) as a KEI for emissions to water for the production of urea and UAN.
EIPPCB revised proposal
To confirm the original EIPPCB proposal: • To include total inorganic nitrogen (N_{inorg}) as a KEI for emissions to water for the production of urea and UAN.

Table 44 – All LVIC chemical production processes - KEIs relevant for emissions to water

Original EIPPCB proposal
None.
EIPPCB revised proposal
• To collect data and information on PFAS for the LVIC production processes covered by the LVIC BREF, with the aim to gather information on their potential remaining uses, their usage quantities, their emissions and their substitution with less harmful (e.g. fluorine-free) alternatives. • The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT/BAT-AELs for PFAS emissions to water should be derived.

2.2.5 Consumption of water and amount of water discharged

Original EIPPCB proposal

Proposal 14: The EIPPCB proposes to include specific water consumption and waste water discharge as KEIs.

Summary of initial positions

Specific water consumption

- **6** out of 23 IPs agree with the proposal, **9** partly agree, **4** disagree and **4** do not provide an opinion.

- The main comments of the IPs which agree or partly agree are as follows:
  - It will be necessary to collect a sufficiently robust set of information, representative for each LVIC sector (PT).
  - Comparability of data may be problematic due to water recycling, steam generation, particularly for integrated plants (AT, DE, CEFIC).
  - Water consumption / waste water discharge need to be defined including type of water, e.g. process water, cooling water (FI, EUROFER).
  - System boundaries need to be clearly defined (DE, ES, CEFIC, EUROFER), e.g. type of cooling process or product (DE, ES, IT).
  - The environmental impact of water consumption depends on the availability of water, which fluctuates across European regions (IMA).
  - It may not be necessary to set a BAT-AEPL for both parameters, water consumption / waste water discharge. The TWG may choose the appropriate choice for each production process (SE).

- The main comment of the IPs which disagree is as follows:
  - Comparability of data between different production processes may be problematic (CZ, PL, SK, Euromines).

Waste water discharge

- **7** out of 23 IPs agree with the proposal to include waste water discharge, **7** partly agree, **4** disagree and **5** do not provide an opinion.

- The main comments of the IPs which agree or partly agree are as follows:
  - Quantity of waste water is not relevant, only the load of the pollutant (FI).
  - It will be necessary to collect a sufficiently robust set of information, representative for each LVIC sector (PT).
  - Waste water needs to be defined. To clarify if it includes cooling water or water purge from air coolers (IT, CEFIC).
  - System boundaries needs to be clearly defined (DE).
  - It may not be necessary to set a BAT-AEPL for both parameters, water consumption/waste water discharge. The TWG may choose the appropriate choice for each production process (SE).

- The main comments of the IPs which disagree are as follows:
  - Waste water discharge is not a KEI (CZ, SK). It is specific for each production process (CZ).
  - Waste water discharge needs to be defined (Euromines).
  - The environmental impact of water usage varies per region. Cooling water use is usually balanced with cooling water discharge. To clarify if specific waste water discharge includes cooling water (Fertilizers Europe).

EIPPCB assessment

- The water consumption and the waste water discharge are largely addressed by the LVIC-AAF and LVIC-S BREFs for the specific production processes and it could be useful to review this information.
- Several parameters may affect the derivation of BAT-AEPLs for specific water consumption such as methodologies used for monitoring and calculation, (process/plant/installation) boundaries, process conditions, applied production processes. In the event that specific water consumption is considered a KEI, these parameters need to be clearly defined during the questionnaire development process.
- Based on the IPs submitted, it is not clear if a robust data set on specific water consumption at process level would be available (see Request 21, Section 3.3.3.2).
- Plant-specific information to be collected for distinguishing between cooling water and process water would be better addressed during the phase of questionnaire design.
- According to the information submitted with the IPs, techniques to reduce water consumption and waste water discharge seem to be applied in the LVIC sector (see Request 11, Section 3.2.1).

EIPPCB proposal

To modify the original EIPPCB proposal as follows:

- To include specific water consumption and specific waste water discharge as KEIs and to collect data through plant-specific questionnaires.
- The TWG to identify the contextual information (e.g. applied techniques, type of processes, product specifications, methods used for monitoring and calculation, plant configuration and boundaries defined, level of aggregation of consumption data, water recycling rate) needed to understand and compare the data collected through plant-specific questionnaires.
- The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs on specific water consumption and/or on waste water discharge should be derived.

2.2.6 Consumption and selection of raw materials

Original EIPPCB proposal and request

Proposal 15: The EIPPCB proposes to include specific materials consumption as KEIs.

Summary of initial positions

- **7** out of 23 IPs agree with the proposal, **9** partly agree, **3** disagree and **4** do not provide an opinion.

- The main comments of the IPs which agree or partly agree related to the production processes are as follows:
  - It will be necessary to collect a sufficiently robust set of information, representative for each LVIC sector (PT).
  - The definition of raw materials is not clear. Limit data collection to main material flows (Fertilizers Europe).
  - Materials consumption is specific for each LVIC sector and may even be specific for different products for one LVIC sector, such as synthetic amorphous silica (SE).
  - Not applicable to sulphuric acid production from waste gases, e.g. coke oven gas (SE, EUROFER).
  - Materials consumption is considered CBI (ES, IT, SK, Fertilizers Europe).

- The main comment of the IPs which disagree is as follows:
  - Materials consumption is specific for each LVIC sector (CZ, EUROMINES, IMA).

EIPPCB assessment

- Given the high number of materials including chemicals potentially used in LVIC activities,

it would be useful for the TWG to define a list of relevant materials used/consumed. As a starting point, the information included in the LVIC-AAF and LVIC-S BREFs regarding materials consumption for specific LVIC production processes could be reviewed.
- In the event that the consumption of raw materials is considered a KEI, and regarding the wide range of possible combinations (e.g. nature of raw materials considered, production processes carried out), factors/parameters affecting the specific raw material consumption need to be clearly defined during the questionnaire development process in order to collect comparable and representative data.
- Confidentiality issues associated with data to be collected are addressed in Section 2.3.1.5.

EIPPCB proposal

To slightly modify the original EIPPCB proposal as follows:
- To include raw materials consumption as KEIs.
- The TWG to define a list of relevant raw materials for each LVIC production process based on a review of the information included in the LVIC-AAF and LVIC-S BREFs.
- To collect data (at plant level) on specific raw materials consumption through plant-specific questionnaires.
- The TWG to identify during the questionnaire development phase the contextual information (e.g. applied techniques, type of processes used, product specifications, plant configuration and definition of boundaries, level of aggregation of consumption data) needed to understand and compare the data collected through plant-specific questionnaires.

2.2.7 Energy efficiency

Original EIPPCB proposal and requests

Proposal 16: The EIPPCB proposes to include specific energy consumption as a KEI for the energy-intensive production processes of the inorganic chemicals identified below:
- ammonia (including hydrogen production);
- calcium carbide;
- carbon black;
- nitric acid;
- sodium carbonate (soda ash);
- urea and urea ammonium nitrate (UAN).

Summary of initial positions

- **4** out of 23 IPs agree with the proposal, **7** partly agree, **1** disagrees and **11** do not provide an opinion.

- The main comments of the IPs which agree or partly agree related to the production processes are as follows:
  - Energy is considered relevant for all LVIC sectors (BE, EEB).
  - It will be necessary to collect a sufficiently robust set of information, representative for each LVIC sector (PT, SE).
  - The definition of energy is not clear. Boundaries need to be defined in the data collection through questionnaires (CEFIC). It is not clear how to consider exchange of energy in integrated plants or by industrial symbiosis (CEFIC).
  - Energy consumption is specific for each LVIC sector (CZ).
  - Energy consumption may be considered CBI (Fertilizers Europe).

- The main comment of the IPs which disagree is as follows:
  - Energy consumption is not relevant for titanium dioxide production (SI).

EIPPCB assessment

- Energy consumption may be considered relevant for the LVIC sector and is addressed by the LVIC-AAF and LVIC-S BREFs for the specific production processes and it could be useful to review this information.
- There are several parameters that may affect the derivation of BAT-AEPLs for the specific

energy consumption such as: methodologies used for monitoring and calculation, system boundaries defined, process conditions (e.g. type of process, type of fuel/energy used). Therefore the TWG may focus on energy-intensive production processes as indicated (ammonia, calcium carbide, carbon black, nitric acid, soda ash, urea and UAN).

- The chemical industry is complex and diverse. For the production processes identified, information is available, e.g. on the production processes used, the energy consumption of the processes, GHG emissions and a list of technologies that could be applied in the processes and that could improve their performance. The identified production processes would cover a high proportion of the total energy use (at least 75 % for all production processes included in a recent study[36]) by the chemical and petrochemical sector.
- In the event that the specific energy consumption is considered a KEI for specific production processes, and regarding the wide range of possible combinations (e.g. production processes carried out), contextual information and parameters which may affect the specific energy consumption need to be clearly defined during the questionnaire development process in order to collect comparable and representative data.

EIPPCB proposal

To modify the original EIPPCB proposal as follows:

- To include specific energy consumption as a KEI for the energy-intensive production processes of the inorganic chemicals identified below:
  - ammonia (including hydrogen production);
  - calcium carbide;
  - carbon black;
  - nitric acid;
  - sodium carbonate (soda ash);
  - urea and urea ammonium nitrate (UAN).

- To collect data on specific energy consumption at plant and process level through plant-specific questionnaires.

- The TWG to identify the contextual information (e.g. e.g. applied energy efficiency techniques, type of processes, type of energy used (including fuel types), methods used for monitoring and calculation, plant configuration and boundaries defined, level of aggregation of consumption data) needed to understand and compare the data collected through plant-specific questionnaires.

- The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AEPLs on the specific consumption of energy should be derived.

2.2.8 Residues/waste generation

Original EIPPCB proposal and request

Proposal 17: The EIPPCB proposes to include generation of residues/wastes as a KEI and to collect data and contextual information on their recovery, reuse, recycling and/or disposal for the preliminary list of relevant production processes of the inorganic chemicals identified below:

- inorganic phosphates;
- soda ash;
- calcium chloride;
- ferrous chloride.

[36] Boulamanti A; Moya Rivera J. Energy efficiency and GHG emissions: Prospective scenarios for the Chemical and Petrochemical Industry. EUR 28471 EN. Luxembourg (Luxembourg): Publications Office of the European Union; 2017. JRC105767

Summary of initial positions

- **5** out of 23 IPs agree with the proposal, **7** partly agree, **2** disagree and **9** do not provide an opinion.
- The main comments of the IPs which agree or partly agree related to the production processes are as follows:
  - Waste is considered relevant for all LVIC sectors. Delete 'for the preliminary list of relevant production processes of the inorganic chemicals identified below' (BE, NL, EEB).
  - To include in the list of relevant production processes the production of ammonia, considering exhausted catalysts containing hazardous substances (IT) and the production of titanium dioxide considering titanogypsum (FR).
  - It will be necessary to collect a sufficiently robust set of information, representative for each LVIC sector (PT).
  - It is not clear what is meant by 'waste, residues' and how to deal with the internal use of by-products and materials out of product specification in integrated plants or by industrial symbiosis. 'Residues' are not legally defined and could be interpreted as covering by-products. Either refer to wastes and by-products or to waste only (CEFIC).
  - System boundaries needs to be defined for the purposes of the data collection through questionnaires (CEFIC).
- The main comment of the IPs which disagree is as follows:
  - Residues/waste generation is not relevant for titanium dioxide production (CZ, SL).

EIPPCB assessment

- It is not clear why waste generation should be considered a KEI for all LVIC production processes taking into account the information in the LVIC-AAF and LVIC-S BREFs.
- The 'Guidance on the interpretation of key provisions of Directive 2008/98/EC on waste', issued by DG ENV, could be taken into account for the definition of 'waste, residues and by-products'.
- There are several parameters that may affect the derivation of BAT-AEPLs for the specific waste generation and recycling of waste/residues such as:
  - the type of waste/residues;
  - origin of each relevant waste/residue;
  - product specifications and other contextual information.
- The relevant parameters/information will need to be defined and taken into consideration during the questionnaire development process (e.g. EU waste code, hazard status, final destination, associated process step, handling on site or off site, etc.)
- The generation of residues/wastes may be considered a KEI for the production of titanium dioxides. As described by the LVIC-S BREF the following residues/wastes are generated:
  - waste solid metal chlorides and by-product, e.g. $FeCl_2$ (by the chloride process route);
  - from sulphuric acid recycling, neutralisation of strong/weak sulphuric acid to produce gypsum (by the sulphate process route).
- The generation of residues/wastes may be considered a KEI for the replacement of catalysts for ammonia synthesis (as addressed by the LVIC-S BREF) Catalysts vary considerably with plant design. The LVIC-AAF BREF indicates for ammonia production that catalysts at the end of life are removed for valuable metal recovery.

EIPPCB proposal

To slightly modify the original proposal as follows:

- To include generation of residues/wastes as a KEI and to collect data (at plant level) and contextual information on waste/residue types, specific quantities and management (e.g. recovery, reuse, recycling and/or disposal) for the following production processes:
  - inorganic phosphates;
  - soda ash;
  - calcium chloride;
  - ferrous chloride;
  - ammonia;
  - acids (HNO_3, H_2SO_4);
  - carbon black;

- fertilisers (NPK and CN, superphosphates);
- soda ash;
- sodium silicate;
- titanium dioxide and related products ($CaCl_2$, $FeCl_2$, $FeCl_3$).

- The TWG to decide during the questionnaire design which relevant detailed (contextual) information will be collected for those LVIC processes.

2.3 Information and data collection

2.3.1 Environmental performance levels

In order to evaluate the environmental performance of techniques (or combinations of techniques), plant-specific data will be collected during the BREF drawing up process.

As per the BREF Guidance, the collected data will be used to derive 'environmental performance levels associated with BAT' (i.e. the so-called BAT-AEPLs, which include BAT-AELs), where there is a sound basis for doing so (see Section 3.3 of the BREF Guidance).

The choice of the units (e.g. mg/Nm^3, mg/l, g/t) to be used in the BAT conclusions for expressing BAT-AE(P)Ls has a strong implication for the data collection. **The TWG should agree at an early stage of the BREF drawing up process on the units to be used so that the data collection can effectively be done to provide the necessary data for the assessment of the techniques to consider in the determination of BAT (i.e. 'BAT candidates') and for the appropriate derivation of BAT conclusions including the relevant BAT-AEPLs (including BAT-AELs)**.

2.3.1.1 Expression of BAT-AELs for emissions to air and water

Original EIPPCB proposal
EIPPCB Proposal 18: • To generally express BAT-AELs for channelled emissions to air and to water in concentrations, and/or, if deemed appropriate coupled with abatement efficiencies. • To clearly define (during the drafting of the questionnaire(s)) all parameters influencing emission concentrations, loads or abatement efficiencies (e.g. type and quantity of products/raw materials, boundaries of the process/system, direct/indirect discharge, sources and characteristics of waste gases and waste waters, specific operating conditions associated with the manufacture of products).
Summary of initial positions
• **11** out of 23 IPs agree with the proposal, **10** partly agree and **2** do not provide any opinion. • The main comments and alternative proposals of the IPs which agree or partly agree are as follows: o Contextual information would be needed for setting adequate monitoring requirements for specific loads (EEB). o Data should be collected as performance data for BAT-AEPL derivation (EEB) where appropriate (DE) and the TWG to decide later on BAT-AELs. o To use specific loads where useful and common (CZ, ES, IT, SL). An example would be the production of soda ash (ES). o To combine expressions as concentrations or specific loads with abatement efficiencies if appropriate (IT). o To keep consistency with the mass flow concept of the WGC BREF (FR, Fertilizers Europe). o Material consumption is considered to be CBI (CZ).
EIPPCB assessment
• In the LVIC-AAF and LVIC-S BREFs different approaches were concluded to express BAT-AELs for emissions to air and water for specific production processes. These approaches include concentrations (e.g. emissions to air for phosphoric acid in mg/Nm^3), specific loads (e.g. emissions to air for nitric acid as kg N_2O/tonne 100 % HNO_3) or conversion rate combined with concentration (e.g. SO_2 emissions to air for sulphuric acid production). The concept of conversion rate is similar to abatement efficiency as it relates to the conversion in the absorption tower. • In recent BREFs, for emissions to air and water, units expressed as concentration of

pollutant (e.g. mg/Nm^3) are mainly used but load units have also been used in some cases.
- The contextual information that needs to be collected in order to have a better understanding of data on emissions is proposed to be defined during the drafting of the questionnaire (see Section 3.3.3.1). A non-exhaustive list of such parameters/characteristics includes the process type and its main operational parameters, operating regime, process boundaries, applied integrated techniques and applied abatement techniques.
- A possible consideration of distinction between major and minor emission sources should take into consideration the particularities of the installations concerned, mainly in terms of applied processes and expected level of emissions. This is an aspect that may be further discussed during the questionnaire development stage.

EIPPCB proposal

To slightly modify the EIPPCB proposal as follows:

- To generally express BAT-AELs for channelled emissions to air and to water in concentrations, and/or, if deemed appropriate coupled with abatement efficiencies.
- To clearly define (during the drafting of the questionnaire(s)) all relevant information influencing emission concentrations or abatement efficiencies (e.g. techniques used, reference conditions, type and quantity of products/raw materials, boundaries of the process/system, direct/indirect waste water discharge, sources and characteristics of waste gases and waste waters, specific operating conditions associated with the LVIC production processes).

2.3.1.2 Averaging periods for BAT-AELs related to emissions to air

Original EIPPCB proposal

Proposal 19: For channelled emissions to air, the EIPPCB proposes to generally express BAT-AELs as short-term averages, e.g. as hourly or daily averages (for continuous measurements) or as averages over the sampling period (for periodic measurements).

Summary of initial positions

- **15** out of 23 IPs agree with the proposal, **5** partly agree, **1** disagrees and **2** do not provide an opinion.

- The main comments of the IPs which agree or partly agree are as follows:
  - In the case of titanium dioxide, channelled emissions to air for SO_2 are expressed in the current LVIC-S BREF and the IED as loads on a yearly basis (CZ, SI).
  - Some emissions are technically difficult to monitor continuously (Fertilizers Europe).
  - Provisions for batch processes are needed (Fertilizers Europe).
- SK seems to disagree, but provided no comment.

EIPPCB assessment

- IED Annex VII includes technical provisions relating to installations producing titanium dioxide. Part 2, point 3(a) includes emission limit values for SO_2 and SO_3 as a specific load as an annual average (i.e. 6 kg per tonne of titanium dioxide produced as an annual average).
- The LVIC-S BREF includes total emissions for air for the production process routes:
  - Chloride process: dust, SO_2, HCl;
  - Sulphate process: dust, SO_2, H_2S.
- The BAT-AELs would apply in addition to the provisions of the IED. In recent BREFs, e.g. the WGC BREF, BAT-AELs were generally expressed as short-term averages, e.g. as hourly or daily averages (for continuous measurements) or as averages over the sampling period (for periodic measurements).
- The derivation of BAT-AELs may take into account batch processes. The LVIC-S BREF indicates that certain production steps use batch processes, e.g. the fertiliser UAN may be

produced in batch processes. The type(s) of production processes will be included as relevant information to be collected via the plant-specific questionnaire(s).
EIPPCB proposal
To keep the proposal unchanged: • For channelled emissions to air, to generally express BAT-AELs as short-term averages, e.g. as hourly or daily averages (for continuous measurements) or as averages over the sampling period (for periodic measurements).

2.3.1.3 Averaging periods for BAT-AELs related to emissions to water

Original EIPPCB proposal
EIPPCB Proposal 20: For emissions to water, the EIPPCB proposes to generally express BAT-AELs as daily averages, obtained via 24-hour flow-proportional composite samples and in the case of batch discharges as average values over the release duration obtained via flow-proportional composite samples. The TWG is to decide at a later stage which other sampling techniques could be considered appropriate.
Summary of initial positions
• **11** out of 23 IPs agree with the proposal, **6** partly agree, **2** disagree and **2** do not provide an opinion. • The main comments of the IPs which agree or partly agree are as follows: o Data are not available since German legal requirements refer to 2 hour composite samples or qualified composite samples. It is proposed to take DE monitoring data into account (DE). o Some emissions to water are expressed as 'load' on a yearly basis (CZ, SI). • The main comments of the IPs which disagree are as follows: o Flow-portional sampling should not be obligatory for each subsector/installation and depends on the type of installation and waste water discharge (amount, pollutants, local situation etc.) (Euromines). o BAT-AELs should be reviewed in the CWW BREF (SK).
EIPPCB assessment
• The minimum monitoring frequency will be decided by the TWG at a later stage of the review process based on the collected data. • All available data at the plant level, either for self-monitoring or for compliance monitoring purposes, may be useful for the LVIC BREF drawing up process. • Several recent BREFs use averaging periods associated with BAT-AELs for emissions to water for batch discharges expressed as average values over the release duration taken as flow-proportional composite samples. In addition, the possibility to use time-proportional composite samples or spot samples for specific cases was mentioned. • The interface with the CWW BREF is discussed in Section 2.1.2.1.
EIPPCB proposal
To keep the proposal unchanged: • For emissions to water, to generally express BAT-AELs, in the case of continuous discharges as daily averages, obtained via 24-hour flow-proportional composite samples and in the case of batch discharges as average values over the release duration obtained via flow-proportional composite samples. The TWG to decide at a later stage which other sampling techniques could be considered appropriate.

2.3.1.4 Environmental performance data on consumption (energy, water, other raw materials), residues/waste generation and recycling

Original EIPPCB request

Request 19: TWG members are asked to provide their opinion on which units are the most appropriate for collecting data on the consumption of energy, water and other raw materials as well as on residues/waste generation and recycling for the inorganic chemical production processes proposed to be covered in the LVIC BREF as specified in Table 2.1[37].

Summary of initial positions

- **Energy consumption**
  - All production processes: (unit) kWh. It is suggested to also use kWh for other energy carriers besides electrical energy such as fuels and heat typically expressed in MJ (SE).
  - Ammonia: MJ/t, as daily average (ES).
  - Calcium carbide: as daily average (SK).
  - Ferrous sulphate: GJ/t, as yearly average (CZ, CEFIC).
  - Hydrofluoric acid: GJ/t, as monthly average (IT), or kWh/t (CEFIC).
  - Nitric acid: GJ/t, as monthly average (IT).
  - Soda ash: GJ/t, as monthly average (IT, CEFIC).
  - Sodium chlorate: kWh, as monthly average (SE); kWh/t (ES, FI, CEFIC).
  - Sodium silicate: MJ/t, as monthly average (CZ) or yearly average (CEFIC).
  - Sulphuric acid: MWh, as monthly average (FI, IT) or GJ/t or kWh/t, as monthly average (CZ).
  - Synthetic amorphous silica: MWh/t, as monthly average (CEFIC).
  - Titanium dioxide: GJ/t, as yearly average (CZ, SI, CEFIC) or MJ/t, as monthly average (IT, PL).

- **Water consumption**
  - Ferrous sulphate: m^3/t, as yearly average (CZ, CEFIC).
  - Hydrofluoric acid: m^3/t, as monthly average (IT), m^3/year (CEFIC).
  - Nitric acid: m^3/t, as monthly average (IT).
  - Sodium silicate: m^3/t, as monthly average (CZ, CEFIC).
  - Sodium chlorate: m^3/t, as daily average (SE), no information on typical averaging period (ES, FI, CEFIC).
  - Sodium silicate: m^3/t, as monthly average (CZ), as yearly average (CEFIC).
  - Sulphuric acid: m^3, as monthly average (FI, IT) or m^3/t, as monthly average (CZ).
  - Synthetic amorphous silica: m^3/t, as monthly average (CEFIC).
  - Titanium dioxide: m^3/t, as yearly average (CZ, SI, CEFIC).

- **Raw material consumption:**
  - Calcium carbide: typical averaging period is the daily average (SK).
  - Ferrous sulphate: kg/t, as yearly average (CZ, CEFIC).
  - Hydrofluoric acid: t/t, as monthly average (IT); kg/t (CEFIC).
  - Nitric acid: t/t, as monthly average (IT).
  - NPK and CN: t/t, as daily average (ES).
  - Soda ash: t/t, as yearly average (IT, CEFIC), other (ES).
  - Sodium silicate: kg/t, as monthly average (CZ), as yearly average (CEFIC).
  - Sulphuric acid: ton, kg, m^3, as monthly average (IT); kg/t, as monthly average (CZ).
  - Titanium dioxide: kg/t, as yearly average (CZ, SI, CEFIC); t/t monthly (PL).
- **Waste water reuse**
  - Ferrous sulphate: m^3/t, as yearly average (CZ, CEFIC).
  - Nitric acid: m^3/t, as monthly average (IT).
  - NPK and CN: t/t, as daily average (ES).
  - Sulphuric acid: m^3/t, as yearly average (CZ).

[37] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

- Titanium dioxide: m^3/t, as yearly average (CZ, SI, CEFIC), as monthly average (PL).

- **Waste/residue generation**
  - Ferrous sulphate: kg/t, as yearly average (CZ, CEFIC).
  - Nitric acid: kg/t, as yearly average (IT, CEFIC) or t/t, other type (ES).
  - Soda ash: t/t, as yearly average (IT, CEFIC), other type (ES).
  - Sulphuric acid: kg/t, as yearly average (CZ).
  - Synthetic amorphous silica: t/t, as monthly average (CEFIC).
  - Titanium dioxide: kg/t, as yearly average (CZ, SI, CEFIC); t, as yearly average (IT).

- **Recycling of waste**
  - Ferrous sulphate: kg/t, as yearly average (CZ, CEFIC).
  - Nitric acid: t/t, as monthly average (IT).
  - Sulphuric acid: kg/t, as monthly average (CZ).
  - Titanium dioxide: kg/t, as yearly average (CZ, SI, CEFIC).

EIPPCB assessment

- According to the preliminary feedback provided with the IPs, it is not clear if data on environmental performance will be available and sufficiently representative for all the LVIC production processes.

- **Energy consumption**
  - Typical units seem to be kWh, MJ/t or GJ/t.
  - Typical averaging periods seem to be daily, monthly, yearly average(s).

- **Water consumption:**
  - The typical unit seems to be m^3/t.
  - Typical averaging periods seem to be monthly or yearly average(s).

- **Raw material consumption**
  - Typical units seem to be kg/t or t/t.
  - Typical averaging periods seem to be monthly or yearly average(s).

- **Waste water reuse**
  - The typical unit seems to be m^3/t.
  - Typical averaging periods seem to be monthly or yearly average(s).

- **Waste/residue generation**
  - Typical units seem to be kg/t or t/t.
  - Typical averaging periods seem to be monthly or yearly average(s).

- **Recycling of waste**
  - Typical units seem to be kg/t or t/t.
  - Typical averaging periods seem to be monthly or yearly average(s).

EIPPCB proposal

- To collect data on the specific energy consumption of the processes/plants as the ratio of the respective energy consumption divided by a suitable activity rate figure and expressed as yearly averages.
- To collect data on the specific water consumption of the plants as the ratio of the total water consumption divided by a suitable activity rate figure and expressed as yearly averages. These data may be complemented by data on specific water discharge (as the ratio of the total waste water discharged divided by a suitable activity rate figure, expressed as yearly averages).
- To collect data (as contextual information) on the water recycling rate of the plants as a percentage and expressed as yearly averages.
- To collect data on the specific consumption of the key raw materials (to be identified during

the drafting of the questionnaire) as the ratio of the total consumption at plant level divided by a suitable activity rate figure and expressed as yearly averages.
- To collect data on the specific quantity of waste reused/recycled/sent for disposal as the ratio of the total waste quantity reused/recycled/sent for disposal, divided by a suitable activity rate figure and expressed as yearly averages.
- To collect data on the waste recycling rate of the plants as a percentage and expressed as yearly averages.
- The TWG to decide at the initial stage of the questionnaire development phase on key data features, e.g. suitable activity rate units, operating parameters.

2.3.1.5 Confidentiality issues

Original EIPPBC proposal and request

Proposal 22: The EIPPCB proposes to:
- to design the questionnaire(s) in a way that avoids requesting confidential data as much as possible so that all data provided by operators can be posted directly onto BATIS by Member States' representatives and shared with the whole TWG;
- to decide during the questionnaire development on the type and format of potentially confidential information that needs to be collected;
- that the Member States' representatives in the TWG:
  - submit the versions of the questionnaires containing the confidential information directly to the EIPPCB via email;
  - post the versions of the questionnaires containing the non-confidential information onto BATIS;
- that in the event that certain data are considered CBI, the TWG is to agree on specific measures (e.g. confidentiality agreements, approval of plant operators, code of conduct) on how data collected as CBI can be discussed and analysed, e.g. in closed physical and/or web-based TWG meetings, so as to ensure both the greatest possible participation of TWG members while protecting the legitimate economic interests of plant operators.

Summary of initial positions

Proposal 22 - First bullet point
- **19** out of IPs agree, **2** partly agree, **1** disagrees and **2** do not provide an opinion.

- The main comments of the IPs which agree or partly agree are as follows:
  - To collect only non-confidential data to be used for BAT-AEL derivation. Deriving BAT-AELs from confidential data is not possible as contextual information is missing (DE).
  - Confidentiality issues need to be agreed within the TWG (ES, IT).
  - To collect confidential data and to post them as an anonymised dataset (EUROMETAUX).

- The main comment of the IP which disagrees is as follows:
  - The wording 'confidential data' needs to be improved with at least a reference to the BREF Guidance Nr. 5.3 (EEB).

Proposal 22 - Second bullet point
- **19** out of IPs agree, **2** partly agree, **1** disagrees and **2** do not provide an opinion.

- The main comments of the IPs which agree or partly agree are as follows:
  - Examples of data to be considered CBI were provided, e.g. consumption data (ES, IT).
  - To use the same good practice adopted for the WGC BREF questionnaire design, allowing the automatic generation of the non-confidential version of the questionnaire (BE).

- The main comment of the IP which disagrees is as follows:
  - To collect only non-confidential data to be used for BAT-AEL derivation. Deriving BAT-AELs from confidential data is not possible as contextual information is missing (DE).

Proposal 22 - Third bullet point

- **19** out of IPs agree, **2** partly agree, **1** disagrees and **2** do not provide an opinion.

- The main comment of the IPs which agree or partly agree is as follows:
  - The proposed approach is good, provided that the scope and meaning applied by the TWG complies with the law (EEB).

- The main comment of the IP which disagrees is as follows:
  - To collect only non-confidential data to be used for BAT-AEL derivation. Deriving BAT-AELs from confidential data is not possible as contextual information is missing (DE).

Proposal 22 - Forth bullet point

- **17** out of IPs agree with the forth bullet point of the proposal, **2** partly agree, **2** disagrees and **2** do not provide an opinion.

- The main comments of the IPs which agree or partly agree are as follows:
  - To discuss CBI in the TWG by physical meeting. Confidentiality could be better ensured than by using virtual meetings (EUROFER).
  - MS representatives are as civil servants committed to the rule of law. Therefore, signing confidentiality agreements or taking similar measures is redundant (AT).

- The main comment of the IP which disagrees is as follows:
  - To collect only non-confidential data to be used for BAT-AEL derivation. Deriving BAT-AELs from confidential data is not possible as contextual information is missing (DE).

EIPPCB assessment

- Trying to avoid the collection of CBI will facilitate both the questionnaire development and the access of the TWG to all the data collected. In the event that it is not possible to avoid the collection of CBI, this will be decided at the TWG level, early on during the questionnaire drafting phase.
- The transparency of the information exchange was discussed by the IED Article 13 Forum on 6 June 2013. Since then, the established practice in the Sevilla process is to post the non-confidential questionnaire versions in BATIS including the plant name and location. This ensures transparency and allows the cross-checking of the information provided.
- In addition, at the meeting of the IED Article 13 Forum of 6 June 2013 it was decided that any confidentiality claims should be fully justified, with a mechanism for checking why they were granted and what the risks of sharing such data would be. The confidential information needed could be agreed by the TWG during the information exchange process for the questionnaire development. The Member States' representatives would then need to ensure, as part of the quality check, that these data are submitted separately to the EIPPCB and that the questionnaires without confidential data are posted on BATIS.
- In some cases, it might be possible to avoid the collection of confidential data by using drop-down menus with predefined ranges for the relevant parameter (e.g. for production capacity).
- During the review or drawing up of recent BREFs, different practical solutions were followed for the collection and management of confidential information, such as:
  - the fields in the questionnaires containing confidential data may be marked with a different background colour; a separate sheet of the questionnaire may be used;
  - the questionnaire version containing the non-confidential information is posted onto

BATIS whereas the questionnaire version containing the parts claimed to be confidential may be submitted directly (and only) to the EIPPCB via email and not shared with the whole TWG on BATIS.

- Experience from recent BREFs (e.g. WGC, CER) shows that there are ways to overcome potential issues related to the access of TWG members to the CBI collected.

EIPPCB proposal

To slightly modify the original EIPPCB proposal as follows:

- To design the questionnaire in a way that avoids requesting data considered CBI as much as possible so that all data provided by operators can be posted directly onto BATIS by Member States' representatives and thus shared with the whole TWG.
- The TWG to decide during the questionnaire development phase about the type and format of potentially confidential information that needs to be collected.
- In the event that certain data are considered CBI:
  - The Member States' representatives in the TWG to: i) submit the versions of the questionnaires containing the confidential information directly to the EIPPCB via email, and ii) post the versions of the questionnaires containing the non-confidential information onto BATIS.
  - The TWG to agree on specific measures (e.g. confidentiality agreements, approval of plant operators, code of conduct) on how data collected as CBI can be discussed and analysed, e.g. in closed physical and/or web-based TWG meetings, so as to ensure the largest possible participation of TWG members, while protecting the legitimate economic interests of plant operators and minimising the risk of disclosure.

2.4 Next steps

This section aims to present the next steps of the LVIC BREF drawing up process related to the collection of data and information.

The process to prepare the questionnaire and collect information is presented in Section 3.3. The tentative timeline associated with this process is presented in the table below. This information will allow in particular the elaboration of the chapter(s) of the LVIC BREF on the emission and consumption levels associated with the inorganic chemical production processes covered by the BREF itself.

In addition to the collection of plant-specific data and information via questionnaires, it is necessary to collect bulk information in order to draw up the other chapters of the LVIC BREF, namely:

- general information on the inorganic chemical production processes covered in the scope of the BREF;
- information on the processes and techniques applied in the above-mentioned inorganic chemical production processes;
- information on techniques to consider in the determination of BAT in the above-mentioned inorganic chemical production processes and on any relevant emerging techniques.

EIPPCB proposal

Table: Tentative timeline of the data and information collection

Step	Tentative time
EIPPCB to issue the first draft questionnaire template	End of February 2023
TWG feedback on the first draft questionnaire	End of March 2023
EIPPCB to issue the second draft questionnaire	End of April 2023
TWG feedback on the second draft questionnaire – Workshop on the questionnaire finalisation (if necessary)	End of May 2023
TWG to provide proposals of well-performing plants for the data collection via questionnaire	End of May 2023
EIPPCB to compile the list of well-performing plants and to check its completeness; if necessary, EIPPCB to ask TWG members to amend/complete the list	June 2023
EIPPCB to issue the third draft questionnaire	End of June 2023
Questionnaire testing	July 2023
EIPPCB to issue the final questionnaire to the TWG and distribution to the participating plants through the Member States' representatives	Early July 2023
TWG to provide bulk information in order to draw up the LVIC BREF, namely information on applied processes and techniques, on the techniques to consider for the determination of BAT and on emerging techniques.	June 2023
Submission of filled-in questionnaires in BATIS	November 2023

3 ITEMS NOT FOR DISCUSSION AT THE KICK-OFF MEETING

3.1 Scope

3.1.1 Hydrogen production directly associated with the LVIC activities and related process techniques adopted

Original EIPPCB request
Request 1: The TWG is asked to provide information on plants (by filling in the corresponding cells in Document 3) where hydrogen production is directly associated with the inorganic chemical production processes specified in Table 2.1[38] and the related process techniques adopted (i.e. steam reforming or electrolysis).
Summary of initial positions
• **12** IPs submitted information on plants where hydrogen production is directly associated with the inorganic chemical production processes specified in Table 2.1[30] and the related process techniques adopted (i.e. steam reforming or electrolysis). • This information is summarised in Section 4.1 (Annex 1).
EIPPCB assessment
• According to the preliminary feedback provided by the TWG, the production of hydrogen directly associated with the inorganic chemical production processes to be covered in the LVIC BREF is carried out by steam reforming, electrolysis or partial oxidation.
EIPPCB proposal
• See Proposal 2, discussed in Section 2.1.

3.1.2 Independently operated waste water treatment plants or on-site waste water treatment plants

Original EIPPCB request
Request 2: The TWG is asked to provide information on plants (by filling in the corresponding cells in Document 3) in which either: • the treatment of waste water from the inorganic chemical production processes (see Table 2.1[30]) covered by the LVIC BREF is carried out by independently operated waste water treatment plants (point 6.11 of Annex I to the IED); or • the treatment of waste water from the inorganic chemical production processes (see Table 2.1[30]) covered by the LVIC BREF is carried out by an on-site waste water treatment plant (together with waste water arising from different origins).
Summary of initial positions
• **12** IPs submitted information on plants where the treatment of waste water is carried out by independently operated WWTPs or by on-site WWTP (together with waste water arising from different origins). • This information is summarised in Section 4.2 (Annex 2).
EIPPCB assessment
• According to the preliminary feedback provided with the IPs, with regard to the treatment of waste water arising from certain types of production of large volume inorganic chemicals, there seem to be cases where: o the treatment is carried out by independently operated WWTPs (point 6.11 of Annex I

[38] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

to the IED); o the treatment is carried out by an on-site WWTP.
EIPPCB proposal
• See Proposal 3 and Proposal 4, discussed in Section 2.1.1.

3.1.3 Information on plants where process furnaces/heaters are used

Original EIPPCB request
Request 3: TWG members are asked (by filling in the corresponding cells in Document 3): • to check/complete the list (preliminary list provided in Annex 2) of inorganic chemical production processes which involve the use of process furnaces/heaters and which are to be covered by the LVIC BREF (see Table 2.1[39]); and • to categorise the process furnaces/heaters concerned according to their application (i.e. direct heating, indirect heating and dual use).
Summary of initial positions
• **12** IPs submitted information on plants where process furnaces/heaters are used. • This information is summarised in Section 4.3 (Annex 3).
EIPPCB assessment
• According to the preliminary information provided by the TWG, the inorganic chemical production processes (covered by the LVIC BREF) which involve the use of process furnaces/heaters (of type: direct heating, indirect heating and dual use) are the following: o ammonia (direct heating, indirect heating); o AN and CAN (direct heating, indirect heating); o calcium carbide (direct heating); o calcium chloride (direct heating); o carbon black (direct heating, indirect heating, dual use); o ferrous sulphate (dual-use); o hydrofluoric acid (direct heating, indirect heating); o inorganic phosphates (direct heating, indirect heating, dual use); o nitric acid (direct heating, indirect heating); o NPK and CN (direct heating, indirect heating); o phosphoric acid (direct heating, indirect heating); o sodium carbonate (direct heating); o sodium chlorate (direct heating, indirect heating); o sodium silicate (direct heating, indirect heating, dual-use); o sulphuric acid (direct heating, indirect heating); o superphosphates (indirect heating); o synthetic amorphous silica (direct heating, indirect heating); o titanium dioxide (direct heating, dual-use); o urea and UAN (indirect heating).
EIPPCB proposal
• See Proposal 8, discussed in Section 2.1.3.3.

3.1.4 WI BREF

Original EIPPCB request
Request 4: TWG is asked to provide information (by filling in the corresponding cells in Document 3) on the thermal treatment of process off-gases associated with the inorganic

[39] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

chemical production processes to be covered by the LVIC BREF (see Table 2.1[40]).
Summary of initial positions
• **8** IPs submitted information on thermal treatment of process off-gases associated with inorganic chemical production processes to be covered by the LVIC BREF. • This information is summarised in Section 4.4 (Annex 4).
EIPPCB assessment
• Information submitted with IPs indicates that, in the context of the LVIC BREF, the thermal treatment of gaseous effluents from chemical installations seems to be relevant for the following production processes: o ammonia; o calcium carbide; o carbon black; o hydrofluoric acid; o nitric acid; o phosphoric acid; o sodium chlorate; o synthetic amorphous silica; o titanium dioxide and related products. • It may be useful to collect data and information on the thermal treatment of process off-gases associated with the above-listed inorganic chemical production processes to be covered by the LVIC BREF.
EIPPCB proposal
• To collect data and information on thermal treatment of gaseous effluents from the following inorganic chemical production processes: o ammonia; o calcium carbide; o carbon black; o hydrofluoric acid; o nitric acid; o phosphoric acid; o sodium chlorate; o synthetic amorphous silica; o titanium dioxide and related products.

3.1.5 EFS BREF

Original EIPPCB proposal
Proposal 11: The EIPPCB proposes to exclude emissions from the storage, transfer and handling of materials from the scope of the LVIC BREF (see Table 2.1[41]).
Summary of initial positions
• **10** out of **23** IPs agree with the proposal, **7** partly agree, **4** disagree and **2** do not provide an opinion. • The main comments of the IPs which either agree or partly agree are as follows: o Given the hazardous properties (e.g. ammonia, ammonium nitrate) and the large scale of some of the products (e.g. fertilisers), a dedicated approach is appropriate at least for the process related to transfer and handling operations. To include emissions from the process related to transfer and handling of materials in the scope of the LVIC BREF

[40] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).
[41] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

(AT).
  - Include emissions from storage, transfer and handling that are directly associated with the chemical production processes (similarly to the WGC BREF) (CZ, DE, SI, FERTILIZERS EUROPE).
  - The general and categorical exclusion seems excessive. For example, in the "Soda ash plants" the specificity of the process for solid handling and dusts could be better addressed in the LVIC BREF (IT).
  - This issue should be discussed in detail during the KoM since the revision of the EFS BREF may be further postponed or even cancelled (PL).

- The main comments of the IPs which disagree are as follows:
  - Only exclude emissions to air from the storage, transfer and handling of liquids, liquefied gases and solids, where these are not directly associated with an LVIC activity (BE).
  - The WGC BREF excluded emissions from the storage, transfer and handling when these are not directly associated with a chemical activity. For consistency, the LVIC BREF should cover storage, transfer and handling when these are directly associated activities. Diffuse emissions from storage and transport is already identified in the LVIC-AAF BREF for some processes (e.g. superphosphate). The WGC BREF showed that diffuse emissions from storage are a major part of total emissions. It is expected that it is the same for some LVIC processes (e.g. dust from bulk storage of fertilisers, or ammonia) (FR).
  - The EFS BREF does not clarify its delimitation to LVIC. It does not refer to any LVIC-relevant aspects in a specific way. Therefore, storage, transfer or handling (of raw materials, products or waste) linked to the LVIC BREF should not be excluded upfront from the scope (EEB).
  - Emissions from storage need to be covered in the LVIC BREF (CEFIC).

EIPPCB assessment

- General principles and techniques for preventing and reducing emissions arising from the storage, transfer and handling of liquids, liquefied gases and solid materials, including chemicals (such as ammonia, fertilisers), are covered by the EFS BREF and overlaps should be avoided in the drawing up of the LVIC BREF.
- Depending on the inorganic chemical sector, the storage, transfer and handling activities, might constitute a relevant source of emissions due to type/volume of raw materials, intermediates, products involved.
- The complexity and diversity of the plants' characteristics (e.g. in terms of layout, level of integration and interconnection of the production processes and other related activities on site, emission management and treatment systems in place) might not always allow the identification and differentiation of the share of the pollutant load arising from the storage and handling activities when these are directly associated with the inorganic chemical production processes covered by the scope of the LVIC BREF (e.g. if emissions from storage are channelled into a common abatement system).

EIPPCB proposal

To slightly change the original EIPPCB proposal as follows:

- To include emissions from the storage, transfer and handling of materials only where these are directly associated with the inorganic chemical production processes covered by the scope of the LVIC BREF.

3.1.6 ICS BREF

Original EIPPCB proposal

Proposal 12: The EIPPCB proposes to exclude emissions from cooling systems from the scope of the LVIC BREF.

Summary of initial positions
• **13** out of **23** IPs agree with the proposal, **6** partly agree, **2** disagree and **2** do not provide an opinion. • The main comments of the IPs which either agree or partly agree are as follows: o Use the formulation of the WGC BREF, where indirect cooling is excluded: "Emissions to air from indirect cooling systems. This may be covered by the BAT conclusions for Industrial Cooling Systems (ICS)." (BE). o The ICS BREF does not cover all cooling systems. It would have to be ascertained that a relevant cooling system is covered under the ICS BREF and that excluding it from the LVIC BREF does not lead to a lower level of environmental protection (EEB). o To include cooling operations which form an integral part of the production process (FERTLIZERS EUROPE). o Emissions from cooling systems fall in the scope of the LVIC BREF only in very specific cases (as soda ash plants), not properly addressed in other BREFs (IT). o Specifics of cooling systems should be taken into account for all the industries listed in the LVIC-S BREF (SI). o This issue should be discussed in detail during the KoM since the revision of the EFS BREF may be further postponed or even cancelled (PL). • The main comment of the IPs which disagree is as follows: o Emissions from cooling systems need to be covered in the LVIC BREF (CEFIC, EUROMINES).
EIPPCB assessment
• The TWG broadly supported the proposal. • A wide variety of cooling systems are available and used in common ways across the chemical industry. Generic aspects of cooling systems are covered in detail by the ICS BREF and overlaps should be avoided in the drawing up of the LVIC BREF. • The proposal refers to 'emissions'. Other relevant issues (e.g. water/energy consumption) associated with the application of cooling systems within the individual LVIC production processes (in the scope of the LVIC BREF) are addressed in Sections 2.2.2.4 and 2.2.2.5.
EIPPCB proposal
To keep the original EIPPCB proposal unchanged: • To exclude emissions from cooling systems from the scope of the LVIC BREF.

3.1.7 Other proposals for the scope of the LVIC BREF

Original EIPPCB Proposal(s)
• In addition to EIPPCB Proposal 1, the TWG provided other proposals for the scope including a rationale.
Summary of initial positions
• To include in the scope of the LVIC BREF plants producing metal catalysts (using nitrates) and antimony oxides (considered as LVIC-S plants according to the permit issued by the local competent authorities), to be addressed in a generic Chapter (FR). • To consider the possibility to cover in the LVIC BREF the production of inorganic pesticides (Cu, Sn, S compounds) falling in the 4.4 IPPC category and the production of chromic acid and chromium salts (IT). • To include in the scope of the LVIC BREF the production of potassium sulphate fertilizers (FI, Fertilizers Europe, Euromines).
EIPPCB assessment
• In line with the work programme discussed by the IED Article 13 Forum, the LVIC BREF should close the first review cycle for chemical BREFs under the IED, addressing the inorganic chemical production processes in the LVIC-AAF BREF and the LVIC-S BREF,

while considering the scope and information extent of the WGC BREF as well as of other relevant BREFs, in order to ensure consistency and to avoid overlaps due to the legally binding status of the associated BAT conclusions adopted under the IED. Any remaining gaps could be covered by the next BREF review cycle.

- According to the agreed strategy underpinning the first review cycle for chemical BREFs under the IED, the WGC BREF and the CWW BREF are meant to cover emissions to air and water from the whole chemical sector, unless stated otherwise. The production of metal catalysts, antimony oxides, inorganic pesticides (Cu, Sn, S compounds), chromic acid and chromium salts are not explicitly excluded from the scope of these BREFs.
- Although potassium sulphate is a fertilizer, it is not addressed in the LVIC-AAF BREF (e.g. see Figure 7.1), because the production process seems to differ considerably from other production processes for NPK.
- Low number of installations would make it difficult to collect enough data to set robust BAT. Therefore, there might not be any added value to address specific production processes in the LVIC BREF when the benefit of process-specific BATs will be limited to a small number of installations.

EIPPCB proposal

- Not to include in the Scope of the LVIC BREF the following inorganic chemical productions:
  - metal catalysts, antimony oxides, inorganic pesticides (Cu, Sn, S compounds), chromic acid and chromium salts, potassium sulphate.

3.2 Key environmental issues (KEIs) for the LVIC BREF

3.2.1 Use of water mass balance and techniques to reduce water consumption and waste water discharge

Original EIPPCB request
Request 10: TWG members are asked to provide information regarding the use of water mass balances as a tool for water management.
Summary of initial positions

• The preliminary feedback provided with the IPs is summarised below:
  o The use of water mass balances is indicated in the LVIC-AAF BREF for the following production processes:
  ▪ AN and CAN (DE).
  ▪ NPK and CN (DE, ES).
  ▪ Phosphoric acid (DE).
  ▪ Superphosphates (DE).
  o Water balances are included in permits:
  ▪ Hydrofluoric acid (IT).
  ▪ Soda ash plants with discharge of waste water of more than 5 000 m^3/d. Data can be provided (DE).
  ▪ Titanium dioxide (DE) plants with discharge of waste water of more than 25 000 m^3/d. Data can be provided (DE).
  o Water balances are used by operators as a tool for water management for the production of carbon black (CEFIC).
  o Water mass balances are used to evaluate the origin of pollutants for the production of sulphuric acid (ES).

EIPPCB assessment

• Information associated with the use of the water mass balance would help to identify relevant sources of waste water for a specific production processes and could serve as an input for definitions of water consumption, waste water discharge and the system boundaries regarding specific water consumption and waste water discharge (see Proposal 14, discussed in Section 2.2.2.3).
• The use of water mass balances is indicated in the LVIC-AAF BREF for the following production processes:
  o NPK;
  o sulphuric acid;
  o superphosphates.
• According to the preliminary feedback provided within the IPs, it is not clear if a robust data set on water mass balances would be available for all LVIC production processes.

EIPPCB proposal
• To collect information on the use of water mass balances (and associated contextual information) as a tool for water management.

Original EIPPCB request
Request 11: TWG members are asked to provide information regarding the techniques to reduce water consumption and waste water discharge used in the inorganic chemical production processes (see Table 2.1[42]) proposed to be covered by the LVIC BREF.

[42] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

Summary of initial positions
• Preliminary information on techniques to reduce water consumption and waste water discharge provided within the IPs are summarised below, by production process: o Ammonia (AT, Fertilizers Europe): recycling of process condensates (Fertilizers Europe). o AN and CAN: recycling of process condensates (BE), with reference to the LVIC-AAF BREF (DE). Concentration of ammonium nitrate by evaporation allows recovery of process waters and use in dual pressure plants (SK, Fertilizers Europe). o Calcium carbide: use of dry cooling systems or closed loop cooling systems, counter current washing systems for product and reuse of washing water including treatment (AT). o Carbon black (BE): use of process condensates to generate steam and use of rainwater to generate demineralised water. o Hydrofluoric acid: recycling of process waters (IT). o Nitric acid: concentration of nitric acid allows recovery of process waters (Fertilizers Europe) and the use of open loop cooling towers (IT). o NPK and CN (BE, DE): reduction of waste water discharge from scrubbers, recycling and reuse of scrubbing and washing waters with reference to the LVIC-AAF BREF (DE). o Phosphoric acid: reuse of entrainment separators with reference to the LVIC-AAF BREF (AT, DE), use of indirect cooling systems (AT). o Sodium silicate: reuse of process waters, and use of rainwater (SE). o Sulphuric acid: crossflow. Water from gas drying is used for dilution of sulphuric acid. Data can be provided (SE). o Superphosphates: recycling of scrubbing liquids with reference to the LVIC-AAF BREF (DE). o Synthetic amorphous silica: use of ultrafiltration and reverse osmosis (CEFIC). o Titanium dioxide: use of the following techniques: leak detection systems recycling process water when possible and separation of waste water streams (process water, rainwater) (SI). o Urea and UAN: recycling of scrubbing liquors with reference to the LVIC-AAF BREF (DE).
EIPPCB assessment
• Information on techniques to reduce water consumption and waste water discharge provided with the IPs can be preliminarily used for better designing the plant-specific questionnaire for the purpose of the data collection.
EIPPCB proposal
• The TWG to provide information on techniques to reduce water consumption and waste water discharge in the LVIC production processes to update the LVIC BREF.

3.2.2 Consumption and selection of raw materials

Original EIPPCB request
Request 12: TWG members are asked to provide information regarding the techniques to reduce specific materials consumption used in the inorganic chemical production processes (see Table 2.1[43]) proposed to be covered by the LVIC BREF.
Summary of initial positions
• Preliminary information on techniques to reduce specific materials consumption provided within the IPs are summarised below, by production process: o AN and CAN: reuse of products in the production process, if they do not meet specifications of the product (BE). o Calcium chloride: recovery of calcium chloride from gypsum containing sludges, use of high-quality raw materials (BE, SE).

[43] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

- Ferrous sulphate: process optimisation (IT).
- Nitric acid: catalyst regeneration (BE).
- NPK and CN: reuse of products in the production process, if they do not meet specifications of the product and use of struvites as raw material (AT, BE, ES).
- Phosphoric acid: reuse of products in the production process, if they do not meet specifications of the product. Various techniques to produce phosphoric acid are available (BE, DE).
- Soda ash: use of vertical shaft kilns for the production of lime of process gases with high CO_2 content (IT).
- Sulphuric acid: various techniques to produce sulphuric acid are available, e.g. use of liquid sulphur or NFM waste gases as raw materials (BE, SE).
- Titanium dioxide and related products: use of ores with high titanium content and process optimisation and control (BE, IT).

EIPPCB assessment

- According to the preliminary feedback provided with the IPs, information on techniques to reduce materials consumption seems to be available for certain LVIC production processes and could be preliminary used for better designing the plant-specific questionnaire for the purpose of the data collection.

EIPPCB proposal

- The TWG to provide information on techniques to reduce specific raw materials consumption used in the LVIC production processes as an input to collect data through the plant-specific questionnaires.

3.2.3 Energy efficiency

Original EIPPCB request

Request 13: For the inorganic chemical production processes (see Table 2.1[44]) proposed to be covered by the LVIC BREF, TWG members are asked to provide information regarding:

- the most common type of energy sources (including the type of fuels) used;
- a description of the techniques used to increase energy efficiency; and
- related monitoring practices of energy consumption.

Summary of initial positions

- Preliminary set information has been made available for the following production processes:
  - Ammonia (BE, ES, Fertilizers Europe)
  - AN and CAN (AT, BE)
  - Carbon black (BE, SE)
  - Hydrofluoric acid (AT, IT)
  - Hydrogen (AT)
  - Nitric acid (BE, IT, Fertilizers Europe)
  - NPK and CN (BE)
  - Phosphoric acid (BE)
  - Soda ash (BE, ES, IT)
  - Sodium silicate (AT, CEFIC)
  - Sulphuric acid (AT, BE, DE, SE)
  - Synthetic amorphous silica (BE, CEFIC)
  - Titanium dioxide (AT, BE, IT, SI)

EIPPCB assessment

- According to the preliminary feedback provided with the IPs, information on the type of energy sources, techniques to increase energy-efficiency and monitoring of energy consumption seems to be available for certain LVIC production processes.

[44] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

EIPPCB proposal
• The TWG to provide information on information on the type of energy sources, techniques to increase energy-efficiency and monitoring of energy consumption as an input to collect data through plant-specific questionnaires.

3.2.4 Decarbonisation

Original EIPPCB request
Request 14: TWG members are asked to provide information on development and application of any decarbonisation, carbon capture, utilisation and storage (CCUS) and/or electrification technique which (as 'BAT candidate' or emerging technique) may be relevant to the drawing up of the LVIC BREF.
Summary of initial positions
• Preliminary information on BAT candidates and emerging techniques provided within the IPs are summarised below, per production processes: o Ammonia: improved CO_2 removal, use of green hydrogen (by water electrolysis using green energy), carbon capture and utilisation (BE, DE, IT, Fertilizers Europe). o Carbon black: microwave pyrolysis (IT). o Soda ash: use of biofuels for generation of electricity and steam (DE). o Sodium silicate: information not specified, however driving force to implement projects is ETS (CEFIC). o Synthetic amorphous silica: electrical furnaces/ dryers, use of biofuels to generate electrical energy or use of green hydrogen (CEFIC). o Titanium dioxide and related products: use of gas turbines (BE, DE). o Urea and UAN: carbon capture and utilisation (Fertilizers Europe). o Crosscutting techniques: carbon capture and utilisation, use of green hydrogen, techniques to reduce N_2O, substitution of fossil fuels and techniques to improve energy efficiency (AT, BE, DE).
EIPPCB assessment
• According to the preliminary feedback provided with the IPs, information on development and application of techniques relevant to decarbonisation, carbon capture, utilisation and storage (CCUS) and/or electrification seems to be available for certain LVIC production processes.
EIPPCB proposal
• The TWG to provide information on development and application of any decarbonisation, carbon capture, utilisation and storage (CCUS) and/or electrification technique(s) to be included in the subsections associated with each LVIC production process in the LVIC BREF (where relevant).

Original EIPPCB request
Request 15: TWG members are requested to provide information regarding techniques adopted to control, monitor and minimise diffuse emissions, where relevant, from natural gas distribution pipelines/systems associated with the chemical production processes proposed to be covered by the LVIC BREF.
Summary of initial positions
• Preliminary information on techniques related to diffuse methane emissions has been made available for the following LVIC production processes: o Ammonia: use of high-integrity equipment (Fertilizers Europe). o Carbon black: waste gas treatment for waste gases from fuels conditioning (BE). o Cross-cutting technique: 'non-gasketed compact flange joints'. Information can be provided (SE).

EIPPCB assessment
• According to the preliminary feedback provided with the IPs, information on techniques related to diffuse methane emissions seems to be available for certain LVIC production processes. • It would be useful to review information in the LVIC-AAF and LVIC-S BREFs and to collect new information.
EIPPCB proposal
• The TWG to collect information on techniques adopted to control, monitor and minimise diffuse emissions (where relevant) from natural gas distribution pipelines/systems associated with the LVIC production processes covered by the LVIC BREF.

3.2.5 Residues/waste generation, circular economy and industrial symbiosis

Original EIPPCB request
Request 16: TWG members are asked to provide information regarding the techniques facilitating industrial symbiosis to reuse, recycle and add value to residues or by-products generated by the inorganic chemical production processes (see Table 2.1) proposed to be covered by the LVIC BREF.
Summary of initial positions
• Preliminary information on techniques to facilitate industrial symbiosis to reuse, recycle and add value to residues or by-products generated by the LVIC production processes to be covered by the LVIC BREF has been made available for the following production processes: o Ammonia: recycling of catalysts and hydraulic fluids (AT). o Calcium chloride (AT, BE, SE). o Carbon black: optimisation of the conditioning of the fuel; reuse of waste waters from scrubbing of soot (BE, CZ). o Nitric acid: recycling of catalysts (AT, BE). o NPK and CN: reuse of materials in the process step granulation. Two fertilisers are produced as by-products from the production of hydrogen cyanide (AT, BE). o Phosphoric acid: gypsum can be used for production of fertilisers and construction materials. Filter cakes can be used in the cement industry (BE). o Sodium carbonate: valorisation of limestone and suspended solids (ES, IT). o Sodium silicate: waste after certification may be used as raw material (BE, CEFIC). o Titanium dioxide and related products: use of by-products such as valorisation of $FeCl_2$, recycling of spent acid, use of spent acid to produce fertilisers and gypsum (BE, CZ, IT, SI).
EIPPCB assessment
• According to the preliminary feedback provided with the IPs, information on techniques to facilitate industrial symbiosis to reuse, recycle and add value to residues or by-products seems to be available for certain LVIC production processes.
EIPPCB proposal
• The TWG to collect information on applied techniques for the reduction of generated waste/residues and for the promotion of circularity of LVIC production processes. • To collect information on techniques that promote industrial symbiosis.

3.3 Information and data collection

3.3.1 EU installations carrying out the inorganic chemical production processes covered by the LVIC BREF

Original EIPPCB request
Request 17: TWG members are asked to provide the total number of installations carrying out the inorganic chemical production processes specified in Table 2.1[45] and permitted under the relevant activities of point 4 of Annex I to the IED (by filling in Document 3).
Summary of initial positions
• **14** MSs submitted information on installations carrying out the inorganic chemical production processes specified in Table 2.1[37] as core activity/ies and permitted under the relevant activities of point 4 of Annex I to the IED. • This information is summarised in Section 4.5 (Annex 5).
EIPPCB assessment
• In addition to the summary tables submitted by the MSs, additional information on the same type of installations has also been provided by several industrial associations concerned, leading to some inconsistencies between the two data sets. • At the moment, it is difficult to directly compare the number of installations provided within the above-mentioned summary tables with the total number of installations (in operation) in the EU permitted under the relevant activities of point 4 of Annex I to the IED as per the MS reporting to the IED, due to the granularity of the data available.
EIPPCB proposal
• To collect data from well-performing plants carrying out the inorganic chemical production processes permitted under the relevant activities of points 4 and 6.11 of Annex I to the IED, as discussed in Section 2.1.

3.3.2 Selection of plants/installations for the plant-specific data collection

Original EIPPCB request
Request 18: For the purpose of data collection, TWG members are asked to propose well-performing plants carrying out the inorganic chemical production processes specified in Table 2.1 for the data collection (by filling in Document 3).
Summary of initial positions
• Proposals for installations were submitted by nine MSs (AT: 9, CZ: 14, ES: 9, FI: 7, IT: 4, PL: 20, PT: 7, SI: 1 and SK: 9). A summary table is provided in Section 4.6 (Annex 6). • In addition to the above indicated proposals submitted by the MSs, lists of installations have also been provided by several industrial associations concerned, leading to redundancies as well as to discrepancies between the two data sets.
EIPPCB assessment
• The selection of plants/installations that will participate in the data collection should take into account their representativeness in terms of applied processes and plant configurations. • Several of the proposed installations/plants carry out more than one chemical production process (as part of integrated chemical sites). This should be considered in the drafting of the questionnaire, due to the possible complexity of the interconnections and interdependence between chemical installations and in relation to the precise identification of, for example,

[45] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

system boundaries, release points for emissions to air and to water.
EIPPCB proposal
• The TWG to submit or complete proposals of well-performing (including best-performing) plants/installations to be involved in the data collection (see Section 2.4).

3.3.3 Questionnaire for gathering plant-specific data and information

3.3.3.1 Data collection procedure

This section refers to Request 20 and Proposal 21 of the call for the expression of IPs.

To ensure transparency, the main IPs provided in Request 20 and Proposal 21 were summarised and assessed by the EIPPCB individually.

However, the EIPPCB proposal is tabled at the end of Proposal 21, as a result of the EIPPCB overall assessments provided in both Request 20 and Proposal 21.

Original EIPPCB request
Request 20: TWG members are invited to provide their initial positions regarding content and format for the questionnaire template(s) as well as other important considerations on the drafting of questionnaire templates.
Summary of initial positions
• According to the preliminary feedback provided with the IPs, the main considerations on the drafting of questionnaire templates can be summarised as follows: o To design the questionnaire in order to include all LVIC sectors (EEB). o To customise the questionnaire(s) according to LVIC sectors and production processes (DE, IT, SI, CEFIC, EEB). To allow the collection of contextual information (AT). o To consider confidential business information (CZ, CEFIC). o To specify the monitoring requirements in the case of channelled emissions to air (FI, IT). o In the case of emissions to water, to collect data on abatement efficiency and specify where water emissions are monitored (AT). o In the case of energy, to set proper system boundaries to ensure comparability of the data (AT).
EIPPCB assessment
• Taking into account the diversity of the LVIC production processes to be covered by the LVIC BREF, the development of sector-specific worksheets in the questionnaire seems to be necessary. • The content and format of the questionnaire, including sector-specific worksheets, will be addressed during the phase of questionnaires design.

Original EIPPCB proposal
EIPPCB Proposal 21: • to follow the established BREF process for the collection of plant/installation-specific data via questionnaires including the following: o the preparation of the draft questionnaire by the EIPPCB followed by the commenting of the whole TWG, if necessary in several iterations; o the organisation of a questionnaire workshop to finalise the questionnaire; o the testing of the draft final questionnaire by a selected (small) number of plants/installations; o the preparation of the final questionnaire by the EIPPCB;

- the distribution of the final questionnaire through Member States' representatives;
- the filling in of the questionnaires by the plants/installations;
- the collection of the filled-in questionnaires by Member States' representatives;
- the quality check of the filled-in questionnaires by Member States' representatives (possibly) with the help of a checklist that the TWG and the EIPPCB could have developed;
- the submission of the quality-checked questionnaires to the TWG by Member States' representatives:
  - for the non-confidential version: submission to the TWG via BATIS;
  - for the confidential version: submission to the EIPPCB via email;

- that the TWG decides on the content and format of the questionnaire during the preparation as described above;
- to collect data for the reference years 2022, 2021, 2020, 2019 and possibly 2018 (if data are more representative than for 2020 and 2021 due to the COVID pandemic) or, if such data are not available, for the last 3 years for which data are available.

Summary of initial positions

- **15** out of **23** IPs agree with the proposal, **2** partly agree, **none** disagree and **6** do not provide an opinion.

- The main comments and alternative proposals of the IPs which agree or partly agree are as follows:
  - To generally apply measures to ensure the quality of the data collected through questionnaires (DE, EEB). To make available other type of information such as permits, inspection reports (EEB).
  - To develop sector-specific questionnaires (PT, CEFIC, EEB), e.g. for soda ash (ES, IT). For soda ash production data were collected (in 2018, ES) (IT).
  - The checklist to be used for double-checking the filled in questionnaires should be sector-specific (PT, CEFIC).
  - The quality check of the filled-in questionnaires by a checklist is not sufficient to avoid incorrect data. It is suggested to provide additional guidance and share best practices among MSs regarding the quality check of questionnaires (EEB).
  - MSs should collaborate with industry regarding the distribution, the quality-check and the submission of questionnaires and make available a 'direct copy' to the TWG (IT).
  - To consider 2023 (FI), 2022, 2021, 2020, 2019 and possibly 2018 (BE) for the data collection. To adapt/extend the reference years if the monitoring frequency is less than 1 year, e.g. every 3 years (PT). To discard data sets with incomplete data for all 3 years (EEB).
  - To collect only non-confidential data for the BAT-AEL derivation. Deriving BAT-AELs from confidential data is not possible as contextual information is missing (DE).
  - To collect the filled-in questionnaires via industry. Based on past experiences, data collection by MSs seems to be partial and not representative (EUROMETAUX).

EIPPCB assessment

- Taking into account the diversity of the LVIC production processes to be covered by the LVIC BREF, the development of sector-specific worksheets in the questionnaire as well as a sector-specific quality checklist seems to be necessary.
- The proposed procedure for the data collection is the same one that has been used in all recent BREFs (drawing up of new BREFs and update of existing BREFs).
- As indicated in the call for IPs, the final plant-specific questionnaire will be sent to, filled in by and returned by operators, followed by a first quality check of the filled-in data and information by the corresponding MS representatives. This quality check by MS representatives (foreseen in Section 4.2.2 of the BREF Guidance) is considered of paramount importance for the correct setting of BAT and BAT-AEPLs. The TWG could discuss and share experiences on best practices to ensure the data quality check, during the questionnaire development stage. This may also include the opportunity to outline the content and characteristics of the possible checklist(s) to be used by the competent

authorities as useful tool(s) for the quality check.

- The reference years for which data will be collected may take into account the following factors:
  - as per the BREF Guidance (Section 5.2.3), the data provided should be from recent years (especially emission and consumption data);
  - the applied monitoring frequencies for the parameters concerned;
  - the impact of the COVID pandemic period on the representativeness of the data to be collected.
- Based on the factors above and on the estimated time period for launching the data collection, data from 2023 may not be fully available.

EIPPCB proposal

To slightly modify the original EIPPCB proposal as follows:

- To follow the established BREF process for the collection of plant/installation-specific data via questionnaires including the following:
  - the preparation of the draft questionnaire – including sector-specific worksheets – by the EIPPCB followed by the commenting of the whole TWG, if necessary in several iterations;
  - the organisation of a questionnaire workshop to finalise the questionnaire – including sector-specific worksheets;
  - the testing of the draft final questionnaire – including sector-specific worksheets – by a selected (small) number of plants/installations;
  - the preparation of the final questionnaire by the EIPPCB;
  - the distribution of the final questionnaire through Member States' representatives;
  - the filling in of the questionnaires by the plants/installations;
  - the collection of the filled-in questionnaires by Member States' representatives;
  - the quality check of the filled-in questionnaires by Member States' representatives (possibly) with the help of a checklist that the TWG and the EIPPCB could have developed;
  - the submission of the quality-checked questionnaires to the TWG by Member States' representatives:
    - for the non-confidential version: submission to the TWG via BATIS;
    - for the confidential version: submission to the EIPPCB via email;
  - the TWG decides on the content and format of the questionnaire – including sector-specific worksheets – during the preparation as described above;
  - to collect data for the reference years 2022, 2021, 2020, 2019 and possibly 2018 (if data are more representative than for 2020 and 2021 due to the COVID pandemic) or, if such data are not available, for the last 3 years for which data are available.

3.3.3.2 Collection of data at plant/process level

Original EIPPCB request

Request 21: TWG members are invited to provide their initial positions on collecting data with a view to evaluating the environmental performance of each process. To this end, initial positions will focus in particular on the following aspects:

- at what level (e.g. plant/process step) the monitoring is performed; and
- for which parameter (e.g. emissions to air or water, consumption of energy, raw materials and water, residues/waste generation); and
- for which processes carried out in the plant/installation.

Summary of initial positions

- The main generic comment provided with the IPs is the following:
  - Parameters are monitored at process level for all production processes. Ensure this contextual information is kept (DE).

- The main comments of the IPs specifically associated with the inorganic chemical production processes to be covered in the LVIC BREF are summarised below.

Ammonia

- Emissions to air, energy consumption (IT), water and raw materials consumption are monitored at process level (SK).
- Emissions to air (CZ, ES), emissions to water (CZ, ES), (energy, water, raw materials) consumption data (CZ, ES), generation of waste (CZ) are monitored at installation/plant level.

AN and CAN

- Emissions to air (SK, IT), consumption of water and raw materials (SK) are monitored at process level.
- Emissions to water are monitored at installation/plant level (SK).

Calcium carbide

- Emissions to air are monitored at process level (SK).
- Consumption of raw materials is monitored at process level (SK).

Calcium chloride

- Emissions to air are monitored at installation/plant level (SK).

Carbon black

- Emissions to air are monitored at installation/plant level (CZ).
- Consumption data of energy (including fuels consumption during tail gas combustion), raw materials, water and generation of residues/waste are monitored at installation/plant level (CZ).

Ferrous sulphate

- Emissions to air/water are monitored at installation/plant level (CZ, CEFIC).
- Consumption data of energy, raw materials, water, and generation of residues/waste generation are monitored at installation/plant level (CZ, CEFIC).

Hydrogen

- Emissions to air/water are monitored at installation/plant level (CZ).
- Consumption data of energy is monitored at process level. Consumption of energy, raw materials, water and generation of residues/waste generation are monitored at installation/process level (SE).

Inorganic phosphates

- Emissions to air are monitored at process level (FI, CEFIC).

Nitric acid

- Emissions to air are monitored at process level (CZ, FI, IT, SE, SK) or installation/plant level (ES).
- Emissions to water are monitored at installation/plant level (IT, SK).
- Consumption of water is monitored at installation/plant level (IT).
- Consumption of energy is monitored at installation/plant level (ES, IT).
- Consumption of raw materials is monitored at process level (SK) or installation/plant level (ES).

NPK and CN

- Emissions to air are monitored at process level (ES, FI, IT, SK).
- Emissions to water are monitored at process level (ES) or installation/plant level (SK).
- Consumption of water and raw materials is monitored at process level (SK).

Phosphoric acid

- Emissions to air are monitored at process level (FI).
- Generation of residues is monitored at process level (FI).

Soda ash

- Consumption data of energy, water and raw materials and generation of waste are monitored at installation/plant level (IT, CEFIC).

Sodium chlorate

- Many parameters, according to the LVIC-S BREF (FI), are monitored at installation/plant level (ES).

Sulphuric acid

- Emissions to air are monitored at process level (ES, FI) or at installation/plant level (FI).

EIPPCB assessment

- For most of the LVIC production processes to be covered in the LVIC BREF, it may be useful to collect data at the process level. This depends on the availability of monitoring data at process level, which seems to be the case according to the preliminary feedback provided with the IPs. This issue needs to be further discussed and analysed during the questionnaire development stage in order to ensure that 1) sufficient data are available in order to derive BAT conclusions and BAT-AEPLs at process level and 2) the questionnaire does not become complex and 'heavy' without real added value.

EIPPCB proposal

- The TWG to decide during the questionnaire drafting phase if data and contextual information will be collected at process level and for which LVIC production processes, based on the foreseen data availability.

3.4 Structure (and contents) of the BREF and BAT conclusions

Original EIPPCB proposal

Proposal 24: To use the structure (and contents) presented below for drawing up the LVIC BREF.

Section	Heading	Subheading
	Preface	
	Scope	
1	Background information	LVIC as part of the chemical industry Economic trends in LVIC
2	Generic LVIC production process	TBD
3	Hydrogen	General information Applied processes and techniques Current emission and consumption levels Techniques to consider in the determination of BAT Emerging techniques
4	Ammonia	
5	Hydrofluoric acid	
6	Nitric acid	
7	Phosphoric acid	
8	Sulphuric acid	
9	Inorganic phosphates	
10	Soda ash, calcium chloride and refined sodium bicarbonate	
11	Sodium chlorate	
12	Precipitated calcium carbonate	
13	Calcium carbide	
14	Carbon black	
15	Titanium dioxide, ferrous chloride and ferrous sulphate	
16	Sodium silicate (water glass)	
17	Synthetic amorphous silica	
18	Ammonium nitrate and calcium ammonium nitrate	
19	Nitrogen-, phosphorus- or potassium-based fertilisers (simple or compound fertilisers) and calcium nitrate	
20	Superphosphates	
21	Urea and urea ammonium nitrate	
22	Best Available Techniques (BAT) conclusions for Large Volume Inorganic Chemicals	General BAT conclusions Product/Process-specific BAT conclusions Description of the techniques
23	Concluding remarks and recommendations for future work	
	Glossary	
	References	
	Annexes	

Summary of initial positions

- **14** out of 23 IPs agree with the proposal, 7 partly agree, **none** disagree and **2** do not provide an opinion.

- The main comments of the IPs which agree or partly agree are as follows:
  - Not only hydrogen production directly associated with the production of ammonia should be included; hydrogen production directly associated with other chemical production and production of green hydrogen should also be included (CZ).
  - With regards to hydrogen, it is suggested to keep the proposed scope of the LVIC

BREF and only cover hydrogen production related to ammonia (FI, IT, PL, CEFIC, Fertilizers Europe) and sodium chlorate (IT, CEFIC).

- It is premature to address deliberate H_2 production (i.e. production of H_2 as the final desired product) in any BREF before sufficiently mature technologies and their operating data are available (EUROFER).
- The production of potash (SOP) should be included in Section 19. Section 3 should only address hydrogen production covered by LVIC activities (FI, IT).
- The section on sulphuric acid should discriminate processes depending on the source of SO_2 (e.g. dedicated section on sulphuric acid production from non-ferrous metals refining off-gas) and whether they operate in a steady state or non-steady state (EUROMETAUX).

EIPPCB assessment

- The proposed structure of the LVIC BREF pins down the main articulation of the expected document. A more detailed structure of the LVIC-BREF, taking into account the diversity and the peculiarity of each production processes, needs to be elaborated at a later stage (i.e. drafting of D1) of the drawing up of the LVIC BREF.
- Hydrogen production, as a directly associated activity or as a stand-alone process, is discussed in the Section 2.1 (see Proposal 2).
- The proposal to include potash (SOP, potassium sulphate) in the scope of LVIC BREF is discussed in Section 2.1.4.

EIPPCB proposal

- To slightly modify the initial proposal and to generally use it for the drafting of the LVIC BREF.

Section	Heading	Subheading
	Preface	
	Scope	
1	Background information	LVIC as part of the chemical industry Economic trends in LVIC
2	Generic LVIC production process	TBD
3	Hydrogen	General information Applied processes and techniques Current emission and consumption levels Techniques to consider in the determination of BAT Emerging techniques
4	Ammonia	
5	Hydrofluoric acid	
6	Nitric acid	
7	Phosphoric acid	
8	Sulphuric acid	
9	Inorganic phosphates	
10	Soda ash, calcium chloride(*) and refined sodium bicarbonate	
11	Sodium chlorate	
12	Precipitated calcium carbonate	
13	Calcium carbide	
14	Carbon black	
15	Titanium dioxide, ferric chloride, ferrous chloride and ferrous sulphate	
16	Sodium silicate (water glass)	
17	Synthetic amorphous silica	
18	Ammonium nitrate and calcium ammonium nitrate	
19	Nitrogen-, phosphorus- or potassium-based fertilisers (simple or compound fertilisers) and calcium nitrate	
20	Superphosphates	
21	Urea and urea ammonium nitrate	
22	Best Available Techniques (BAT) conclusions for Large Volume Inorganic Chemicals	General BAT conclusions Product/Process-specific BAT conclusions Description of the techniques

23	Concluding remarks and recommendations for future work	
	Glossary	
	References	
	Annexes	

(*) This includes the description of production of calcium chloride produced via different process routes other than from soda ash manufacture, i.e. as a co-product of magnesia (MgO) production, through the acid-limestone production process.

Note

The detailed structure and layout of the descriptive subsections associated with each LVIC production process will be decided when drafting D1, according to the plant-specific data and bulk information collected.

3.5 Techniques to consider in the determination of BAT and emerging techniques

3.5.1 Techniques to consider in the determination of BAT in the current LVIC-AAF and LVIC-S BREFs

Original EIPPCB request
Request 22: TWG members are asked to evaluate the 'Applied processes and techniques', the 'Techniques to consider in the determination of BAT' and the 'Emerging techniques' already identified in the LVIC-AAF and LVIC-S BREFs and to indicate in the corresponding section of Document 3 the following information: • any obsolete techniques, i.e. that are no longer used; • which technique descriptions require updating (and which part of the information needs to be updated, e.g. description, emission/consumption information, applicability, economics); • what information can be provided; • any emerging techniques, which could now be considered, BAT candidates.
Summary of initial positions
• Unless otherwise stated, most techniques included in current LVIC-AAF and LVIC-S BREFs are not considered obsolete. Those that were explicitly mentioned as obsolete are summarised in Annex 8, Section 4.8. • Regarding emerging techniques, the preliminary feedback provided with the IPs is shown in Annex 7, Section 4.7.
EIPPCB assessment
• The techniques described in the current LVIC-AAF and LVIC-S BREFs seem to be mostly still relevant, although many require updating. Additionally, new techniques could be added based on the information provided through the IPs received and the bulk information collection during the LVIC BREF drawing up process.
EIPPCB proposal
• To take into account the preliminary feedback received for the drafting of the plant-specific data collection questionnaire and the drafting of the LVIC BREF, regarding the 'Techniques to consider in the determination of BAT' for the sector-specific chapters. • The TWG to provide any relevant updates using the standard 10-heading template (see Section 2.4 for a tentative timeline).

3.5.2 Generic techniques in the ENE, EFS and ICS BREFs

Original EIPPCB proposal
Proposal 23: The EIPPCB proposes to refer to 'horizontal' BREFs for generic techniques, namely: • the ENE BREF for generic techniques related to energy efficiency; • the EFS BREF for generic techniques to reduce emissions from the storage, transfer and handling of materials; • the ICS BREF for generic techniques associated with indirect cooling with water.
Summary of initial positions
• **8** out of **23** IPs agree with the proposal, **6** partly agree, **1** disagrees and **8** do not provide an opinion. • The main comments of the IPs which either agree or partly agree are as follows: o To generally cover the aspects of the EFS and ICS BREFs in the individual sectors as

these sectors are quite different from each other and hence a 'customised' approach is needed. Generic BAT-AELs and BAT might not fully consider the differences in the processes. We suggest to collect data as detailed as possible and distinguished by the individual sectors in order to get the full picture of the differences in the processes (CEFIC).
    - To derive BAT and BAT-AELs for directly associated emissions in the LVIC BREF to provide all in one document facilitating permit writing by authorities (DE).
    - The WGC TWG decided to include diffuse emissions from storage. For consistency, emissions from storage should also be included in the LVIC BREF. Other TWGs have taken similar decisions (see Section 1.2 of WT KoM report). The WGC BREF has shown that diffuse emissions are a very important share of the total emissions in the chemical sector. The EFS BREF is a generic BREF and might not be the most appropriate option to cover specific emissions from the LVIC sector. The planning for the revision of the EFS BREF is uncertain. (FR).
    - If there is a technique used only in a specific production process covered by the LVIC BREF, it should be better included in the LVIC BREF (ES, SI, Euromines).
    - Regarding soda ash plants, these horizontal BREFs (on energy, indirect cooling and storage) do not apply because equipment is very specific due to incomplete chemical reactions based on thermodynamical equilibrium and high scaling (crusts), as well as specific outside storages for raw materials (limestone) (IT).

- The main comment of the IP which disagrees is as follows:
    - It is proposed to include techniques directly in the LVIC BREF, as the mentioned BREFs are outdated (CZ).

EIPPCB assessment

- In order to avoid duplication, the LVIC BREF should only include information on techniques that are sector-specific. However, BAT conclusions may include generic techniques related to energy efficiency, storage, transfer and handling of materials as well as to industrial cooling systems that may be also mentioned in the ENE, EFS or ICS BREFs.
- Clear references and design of the data collection would ease discussions for deriving BAT and BAT-AEPLs.
- Other references could be made according to the decisions to be taken on the scope of the LVIC BREF and the interface with other BREFs/regulations.

EIPPCB proposal

To slightly modify the original EIPPCB proposal as follows:

- To refer to 'horizontal' BREFs for generic techniques, namely:
    - the ENE BREF for generic techniques related to energy efficiency;
    - the EFS BREF for generic techniques to reduce emissions from the storage, transfer and handling of materials;
    - the ICS BREF for generic techniques associated with indirect cooling with water;

  and to include in the LVIC BREF only techniques that are specific to the LVIC production processes.

3.5.3 Additional techniques

Original EIPPCB request

Request 23: TWG members are asked to evaluate the preliminary list of additional techniques which may be included in the LVIC BREF and to indicate in the corresponding section of Document 3:

- techniques which may be considered as BAT candidates or emerging techniques;
- what information can be provided on those techniques;
- any other relevant technique that is missing in the proposed list(s) ('BAT candidate' or

‘emerging technique’).

Summary of initial positions

- The TWG was given a list of 21 additional techniques, in a list which was built using information provided by the TWG members and information screened in EU databases.
- **9** out of **23** IPs added comments to the additional techniques list in the proposal, **3** IPs mentioned additional techniques and **13** do not provide an opinion. The IPs are summarised in Section 4.9 (Annex 9).
- Some main comments on the list of proposed additional techniques to be included in the LVIC BREF were the following:
  - The majority of these projects offer interesting techniques which should be observed during the LVIC BREF drawing up process.
  - On the green hydrogen production projects: alkaline electrolysis could reach high TRL (8/9) relatively soon; the majority of projects tackle polymer electrolyte membrane (PEM) electrolysis to upscale production to megawatts and their TRL is generally between 4 and 6; there is one high-temperature electrolyser (HTE) system at megawatt scale at a biorefinery project aiming at TRL 8 by the end of the project; and green hydrogen production via photoelectrocatalysis (PEC) is at lower TRL with a demo plant scheduled for 2025 (TRL 6-8).
  - Other hydrogen production: groundbreaking one-step process technology using hydrocarbons such as biogas, biomass or natural gas, a prototype generator was tested in 2020 but no operational experiences available (CEFIC). On biogas reforming project: follow-up with two large projects on membranes and membrane reactors (CEFIC).
  - On the ammonia projection projects: many had comments that they are not relevant for industrial-scale ammonia production (IT) while others were of the opinion that they are interesting techniques to follow their development (EEB).
  - On phosphoric acid production with waste utilisation: one French plant indicated that this technique could be applicable to their process (FR) but at the same time CZ indicated that the process is not able to yield food-grade phosphoric acid.
  - The methane pyrolysis project is disruptive (lower temperatures) but still at a very low TRL 1-3 (CEFIC).
  - Some IPs’ comments reflected that listing of research projects with end dates in the future goes beyond the scope of the current IED (EUROFER).
- 8 new projects and/or relevant techniques were added to the list on the following topics: hydrogen (4), monitoring (1), phosphates (1), NPK (1) and sulphuric acid (1).

EIPPCB assessment

- The data collection will allow clarification of whether or not the additional techniques are used by the plants. It is noted that:
  - one of the techniques was identified as ‘not relevant’ by all IPs;
  - two techniques were identified as ‘emerging technique’ by the majority of IPs;
  - two techniques were identified as ‘BAT Candidate’ by the majority of IPs;
  - 10 techniques were identified as ‘under development’ by the majority of IPs;
  - for the remaining 6 techniques, the rationale/information submitted with the IPs does not allow a clear decision about their status.
- A number of additional techniques proposed by some IPs indicate overall environmental benefits for LVIC installations. There may be merit in including these techniques in the forthcoming data/information collection.
- Information on the additional techniques mentioned above (those included in the list of 21 techniques sent to the TWG and those proposed with the IPs) needs to be collected and assessed by the TWG.

EIPPCB proposal

- To take into account all the available information for the drafting of the LVIC BREF.
- The TWG to provide information on any additional techniques relevant for the LVIC production processes covered by the LVIC BREF, using the standard 10-heading template (see Section 2.4 for a tentative timeline).

4 ANNEXES

4.1 Annex 1 [Request 1]
Information on plants where hydrogen production is directly associated with the inorganic chemical production processes specified in Table 2.1[46] and the related process techniques adopted.

4.2 Annex 2 [Request 2]
Information on plants where the treatment of waste water is carried out by independently operated waste water treatment plants or by on-site waste water treatment plants.

4.3 Annex 3 [Request 3]
Information on plants where process furnaces/heaters are used.

4.4. Annex 4 [Request 4]
Information on the thermal treatment of process off-gases associated with the inorganic chemical production processes to be covered by the LVIC BREF.

4.5 Annex 5 [Request 17]
Information on installations carrying out the inorganic chemical production processes to be covered by the LVIC BREF.

4.6 Annex 6 [Request 18]
Preliminary list of well-performing plants carrying out the inorganic chemical production processes to be covered by the LVIC BREF.

4.7 Annex 7 [Request 22]
Summary of initial positions on emerging techniques in the current LVIC-AAF and LVIC-S BREFs.

4.8 Annex 8 [Request 22]
List of obsolete techniques in the current LVIC-AAF and LVIC-S BREFs.

4.9 Annex 9 [Request 23]
Summary of initial positions on additional techniques to consider for the LVIC BREF.

4.10 Annex 10
Compiled list of proposed KEIs for emissions to air.

4.11 Annex 11
Compiled list of proposed KEIs for emissions to water.

[46] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

4.1 Annex 1 [Request 1]: Information on plants where hydrogen production is directly associated with the inorganic chemical production processes specified in Table 2.1[47] and the related process techniques adopted

MS/ Stakeholder	No.	Plant name	EU Registry on Industrial Sites [Inspire ID]	Type of hydrogen production process	Information available
BE	1	BASF Antwerpen_Ammoniak	vl00112120000187	Steam reforming	NI
BE	2	Evonik Antwerpen - B	vl00125118000187	Other	NI
CZ	1	Partial oxidation unit	NP	Partial oxidation	The hydrogen is also used in other installation (i.e. refinery sector) than chemical production of inorganic substances in LVIC BREF.
DE	1	Steam reforming ammonia production	SKW Piesteritz	Steam reforming	yes
DE	2	Partial oxidation ammonia production	NP	Partial oxidation	NI
DE	3	Production of "green" hydrogen (ammonia)	CF industries, Donaldsville, Louisiana (2023)	Electrolysis	Technique description attached to DE IP [uploaded on BATIS]
DE	4	Production of "green" hydrogen (ammonia)	Neom, KSA (2025)	Electrolysis	Technique description attached to DE IP [uploaded on BATIS]
DE	5	Raffinerie Heide (fuels)	Heide, Germany	Electrolysis	Technique description attached to DE IP [uploaded on BATIS]
ES	1	Amoniaco Puertollano	001585000	Steam reforming	NI
ES	2	Amoniaco Palos	001587000	Steam reforming	NI
ES	3	Ammonia Sabiñanigo	003458000	Electrolysis	Hydrogen comes from sodium chlorate and chlor-alkali production plants.
ES	4	Sodium chlorate Sabiñanigo	003458000	Electrolysis	Hydrogen is also obtained in the sodium chlorate manufacturing process by electrolysis.

[47] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

FI	1	Kemira, Joutseno	NP	Electrolysis	Yes
FI	2	Kemira, Äetsä	NP	Electrolysis	Yes
FI	3	Kemira, Kuusankoski	NP	Electrolysis	Yes
FR	1	Borealis Ottmarshein	NP		NI
FR	2	KemOne - Fos sur mer	NP		NI
IT	1	Rivoira Operations srl	NP	Steam reforming	NI
IT	2	SOL GAS PRIMARI S.R.L.	NP	Steam reforming	NI
IT	3	Yara Italy, Ferrara, Ammonia	NP	Steam reforming	NI
PL	1	Grupa Azoty Kędzierzyn - Ammonia	NP	Partial oxidation	NI
PL	2	Grupa Azoty Police - Ammonia	NP	Steam reforming	NI
PL	3	Grupa Azoty Tarnow - Ammonia	NP	Steam reforming	NI
PL	4	Grupa Azoty Puławy - Ammonia I	NP	Partial oxidation	NI
PL	5	Grupa Azoty Puławy - Ammonia II	NP	Steam reforming	NI
PT	1	Sociedade Portuguesa do Ar Líquido "ARLIQUIDO", Lda	PT.APA00052076.INST	Steam reforming	In this case the hydrogen production is not associated with ammonia production.
PT	2	HyChem, Química Sustentável S.A.	PT.APA00046959.INST	Electrolysis	In this case the hydrogen production is a by-product from the sodium chlorate production process.
SE	1	Nouryon Pulp and Performance Chemicals AB, Kloratfabrik	NP	Electrolysis	Hydrogen is a by-product from electrochemical manufacturing of sodium chlorate. For additional information of permit, please refer to the file "SE - Additional information Annual environmental report, ref 2" [uploaded on BATIS].

SE	2	Nouryon Pulp and Performance, Albyfabriker	NP	Electrolysis	Hydrogen is a by-product from electrochemical manufacturing of sodium chlorate. For additional information of permit, please refer to the file "SE - Additional information Annual environmental report, ref 1" [uploaded on BATIS].
SE	3	Nouryon Pulp and Performance, Albyfabriker	NP	Steam reforming	For additional information of permit, please refer to the file "SE - Additional information Annual environmental report, ref 1" [uploaded on BATIS].
SE	4	Nouryon Pulp and Performance, Albyfabriker	NP	Partial oxidation	For additional information of permit, please refer to the file "SE - Additional information Annual environmental report, ref 1" [uploaded on BATIS].
SK	1	Ammonia	NP	Steam reforming	Yes, IPCC
Fertilizers Europe	1	Borealis Grandpuits	NP	Steam reforming	NI
Fertilizers Europe	2	Borealis Grand Quevilly	NP	Steam reforming	NI
Fertilizers Europe	3	Borealis Linz	NP	Steam reforming	NI
Fertilizers Europe	4	Borealis Linz	NP	Steam reforming	NI
Fertilizers Europe	5	Borealis Ottmarsheim	NP	Steam reforming	NI
Fertilizers Europe	6	Duslo Šaľa	NP	Steam reforming	NI
Fertilizers Europe	7	Yara Sluiskil	NP	Steam reforming	NI
Fertilizers Europe	8	Yara Le Havre	NP	Steam reforming	NI
Fertilizers Europe	9	Yara Brunsbüttel	NP	Steam reforming	NI
Fertilizers Europe	10	Yara Ferrara	NP	Steam reforming	NI

Fertilizers Europe	11	Yara Tertre	NP	Steam reforming	NI
Fertilizers Europe	12	BASF Antwerpen	NP	Steam reforming	NI
Fertilizers Europe	13	Nitrogenművek Pétfürdő	NP	Steam reforming	NI
Fertilizers Europe	14	Fertiberia Amoniaco Puertollano	NP	Steam reforming	NI
Fertilizers Europe	15	Fertiberia Amoniaco Palos	NP	Steam reforming	NI
Fertilizers Europe	16	ANWIL S.A.	NP	Steam reforming	Ammonia installation has a possibility to use hydrogen from brine electrolysis
Fertilizers Europe	17	Grupa Azoty Tarnow	NP	Steam reforming	NI
Fertilizers Europe	18	Yara Porsgrunn	NP	Steam reforming	NI
CEFIC (Sodium Chlorate Sector Group)	1	JOUTSENO, JOUTSENO, FINLAND	NP	Electrolysis	NI
CEFIC (Sodium Chlorate Sector Group)	2	SAASTAMALA, AETSA, FINLAND	NP	Electrolysis	NI
CEFIC (Sodium Chlorate Sector Group)	3	KUUSANKOSKI, KUUSANKOSKI, FINLAND	NP	Electrolysis	NI
CEFIC (Sodium Chlorate Sector Group)	4	ELECTROQUIMICA DE HERNANI, HERNANI, SPAIN	NP	Electrolysis	NI
CEFIC (Sodium Chlorate Sector Group)	5	OULU, FINLAND	NP	Electrolysis	NI
CEFIC (Sodium Chlorate Sector Group)	6	ALBY, SWEDEN	NP	Electrolysis	NI

CEFIC (Sodium Chlorate Sector Group)	7	STOCKVIK, SWEDEN	NP	Electrolysis	NI
CEFIC (Sodium Chlorate Sector Group)	8	AMBES, FRANCE	NP	Electrolysis	NI
CEFIC (Sodium Chlorate Sector Group)	9	JARRIE, FRANCE	NP	Electrolysis	NI
NP: Not provided. **NI: Not indicated.**					

4.2 Annex 2 [Request 2]: Information on plants where the treatment of waste water is carried out by independently operated waste water treatment plants or by on-site waste water treatment plants

MS/ Stakeholder	No.	Plant (Name)	EU Registry on Industrial Sites [InspireID]	Type of Production process	Type of WWTP	Information available
BE	1	BASF Antwerpen_Ammoniak	vl00112120000187	Ammonia	independently operated	NI
BE	2	BASF Antwerpen_Zwavelzuur en Oleum	vl00112120000187	Sulphuric acid	independently operated	NI
BE	3	BASF Antwerpen_salpeterzuurinst SZ5	vl00112120000187	Nitric acid	independently operated	NI
BE	4	BASF Antwerpen_cyclohexanon en soda	vl00112120000187	Sodium carbonate (soda ash)	independently operated	NI
BE	5	BASF Antwerpen_caprolactam	vl00112120000187	NPK and CN	independently operated	NI
BE	6	Eurochem_SZ_2_3_4	vl01865835000170	Nitric acid	independently operated	NI
BE	7	Eurochem_NPK	vl01865835000170	NPK and CN	independently operated	NI
BE	8	Eurochem_nitrofosforzuur	vl01865835000170	Phosphoric acid	independently operated	NI
BE	9	Eurochem_ESM1	vl01865835000170	AN and CAN	on-site	NI
BE	10	Eurochem_ESM2	vl01865835000170	AN and CAN	on-site	NI
BE	11	Lanxess Antwerpen - MTEXIII deel A (zwavelzuurbedrijf)	vl01856089000144	Sulphuric acid	independently operated	NI
BE	12	Lanxess Antwerpen - MTEXIII deel E/F (ammoniumsulfaat)	vl01856089000144	NPK and CN	independently operated	NI
BE	13	Evonik Antwerpen - B	vl00125118000187	NPK and CN	independently operated	NI
BE	14	Evonik Silica Belgium	vl01762557000122	Synthetic amorphous	on-site	NI

				silica		
BE	15	Umicore Hoboken	vl01852224000788	Sulphuric acid	independently operated	NI
BE	16	Umicore Hoboken	vl01852224000788	Nitric acid	independently operated	NI
BE	17	Tessenderlo Chemie Ham sulfaat zwavelzuur	vl01748409000252	Sulphuric acid	on-site	NI
BE	18	Tessenderlo Chemie Ham Calciumchloride	vl01748409000252	Nitric acid	on-site	NI
BE	19	Tessenderlo Chemie Tessenderlo 2	vl01748409000151	Titanium dioxide (& related products)	on-site	NI
BE	20	Nyrstar Belgium - Balen	vl01856512000269	Sulphuric acid	on-site	NI
BE	21	Prayon Benelux	vl00121088000195	NPK and CN	on-site	NI
BE	22	INOVYN MANUFACTURING BELGIUM	vl00097391000128	Sulphuric acid	on-site	NI
BE	23	BMS Micro-Nutrients	vl01755488000133	NPK and CN	on-site	NI
BE	24	Silmaco	vl00347047000124	Sodium silicate	on-site	NI
BE	25	Kronos Europe	vl00488458000284	Titanium dioxide (& related products)	on-site	NI
BE	26	PVS Chemicals Belgium	vl00585736000163	Sulphuric acid	on-site	NI
BE	27	Rain Carbon 939	vl00086339000182	Sulphuric acid	on-site	NI
BE	28	Imerys Graphite and Carbon Belgium	vl01830755000185	Carbon black	on-site	NI
BE	29	Molymet Belgium 940	vl01750207000134	Sulphuric acid	on-site	NI

CZ	1	Energy Supply Unit (ORLEN Unipetrol RPA s.r.o.)	NP		independently operated	ORLEN Unipetrol RPA s.r.o. has its own wastewater treatment plant, which treats wastewater from all chemical plants operated by ORLEN Unipetrol RPA (e.g. hydrogen, ammonia, carbon black production, refinery, steam cracker, polyolefins production, aromatic production).
CZ	2	PRECHEZA a.s.	NP	Titanium dioxide (& related products)	on-site	NI
CZ	3	PRECHEZA a.s.	NP	Sulphuric acid	on-site	NI
CZ	4	PRECHEZA a.s.	NP	Other	on-site	NI
CZ	5	Vodní sklo a.s. - Neštěmice	NP	Sodium silicate	on-site	NI
CZ	6	Vodní sklo a.s. - Střekov	NP	Sodium silicate	independently operated	NI
CZ	7	Vodní sklo a.s. - Brno	NP	Sodium silicate	independently operated	NI
DE	1	Venator Uerdingen GmbH, Krefeld	06-05-100-9008609	Titanium dioxide (& related products)	independently operated	NI
DE	2	CURRENTA GmbH & Co. OHG, Leverkusen	06-05-300-9046797	Titanium dioxide (& related products)	independently operated	NI
DE	3	CURRENTA GmbH & Co. OHG, Leverkusen	06-05-300-9046797	Synthetic amorphous silica	independently operated	NI
DE	4	Evonik Operations GmbH, Rheinfelden (Werk Nord, Untere Kanalstr. 3)	06-08-4243978	Titanium dioxide (& related products)	on-site	NI

DE	5	Evonik Operations GmbH, Rheinfelden (Werk Süd, Friedrichstr. 48)	06-08-4244052	Synthetic amorphous silica	on-site	NI
DE	6	Wacker Chemie AG, Burghausen	06-09-171-0009-0B01	Synthetic amorphous silica	on-site	NI
DE	7	Grace GmbH, Worms	07-04-6048443	Synthetic amorphous silica	on-site	NI
DE	8	Grace Silica GmbH, Düren	06-05-300-9000097	Synthetic amorphous silica	on-site	NI
ES	1	Industrias Químicas del Ebro S.A	002768000	Synthetic amorphous silica	on-site	NI
ES	2	Industrias Químicas del Ebro S.A	002768000	Sodium silicate	on-site	NI
ES	3	Silicatos de Malpica(SIMAL)	004661000	Sodium silicate	on-site	NI
ES	4	Ercros-Sabiñánigo	003458000	Ammonia	on-site	NI
ES	5	Ercros - Flix	003080000	Inorganic phosphates	on-site	NI
ES	6	UBE Corporation Europe SAU	001593000	Sulphuric acid	on-site	NI
ES	7	UBE Corporation Europe SAU	001593000	NPK and CN	on-site	NI
ES	8	Ercros Sabiñánigo	003458000	Sodium chlorate	on-site	NI
ES	9	CARBURO DEL CINCA, SA	000396000	Calcium carbide	on-site	NI
FI	1	Yara Kokkola, Feed phosphate	NP	Inorganic phosphates	independently operated	NI
FI	2	Yara Kokkola, Potassium Sulphate production	NP	Other	independently operated	NI
FI	3	Yara Siilinjärvi, sulphuric acid production	NP	Sulphuric acid	on-site	Yes [NP]

FI	4	Yara Siilinjärvi, phosphoric acid production	NP	Phosphoric acid	on-site	Yes [NP]
FI	5	Yara Siilinjärvi, NPK fertilizer production	NP	NPK and CN	on-site	Yes [NP]
FI	6	Yara Siilinjärvi, AN fertilizer production	NP	AN and CAN	on-site	Yes [NP]
FI	7	Yara Siilinjärvi, Nitric acid production	NP	Nitric acid	on-site	Yes [NP]
FI	8	Yara Uusikaupunki, nitric acid production	NP	Nitric acid	on-site	Yes [NP]
FI	9	Yara Uusikaupunki, NPK fertilizer production	NP	NPK and CN	on-site	Yes [NP]
FI	10	Kemira, Pori	NP	Titanium dioxide (& related products)	on-site	Yes [NP]
FR	1	Tronox (Thann)	NP	Titanium dioxide (& related products)		Yes [NP]
FR	2	KemOne (Fos)	NP	Hydrofluoric acid		Yes [NP]
FR	3	Axens (Salindres)	NP	Other		Yes [NP]
FR	4	Borealis (Ottmarsheim)	NP	Nitric acid		Yes [NP]
FR	5	Adisseo (Saint Clair)	NP	Sulphuric acid		Yes [NP]
FR	6	Borealis (Grandpuits)	NP	Ammonia		Yes [NP]
FR	7	Solvay (Dombasle)	NP	Sodium carbonate (soda ash)		Yes [NP]

IT	1	Hydrofluoric acid plant	NP	Hydrofluoric acid	on-site	Alkeemia provides a neutralisation and a following settling. The resulting waste water effluent, pretreated, is then sent to an external plant that provides the necessary final treatment of the waste water.
IT	2	Radici Chimica S.p.A.	IT.281002008	Nitric acid	on-site	NI
IT	3	Venator Scarlino Plant	NP	Titanium dioxide (& related products)	on-site	NI
IT	4	Yara Italy, Ferrara, Ammonia	NP	Ammonia	independently operated	NI
IT	5	Yara Italy, Ferrara, Urea	NP	Urea and UAN	independently operated	NI
IT	6	Yara Italy, Ravenna, CAN	NP	AN and CAN	independently operated	NI
IT	7	Yara Italy, Ravenna, Nitric acid	NP	Nitric acid	independently operated	NI
IT	8	Yara Italy, Ravenna, NPK	NP	NPK and CN	independently operated	NI
IT	9	NUOVA SOLMINE SPA - Scarlino (GR)	NP	Sulphuric acid	on-site	NI
IT	10	NUOVA SOLMINE SPA - Serravalle (AL)	NP	Sulphuric acid	on-site	NI
PL	1	Grupa Azoty Kędzierzyn	NP	Ammonia	on-site	NI
PL	2	Grupa Azoty Kędzierzyn	NP	Nitric acid	on-site	NI
PL	3	Grupa Azoty Kędzierzyn	NP	NPK and CN	on-site	NI
PL	4	Grupa Azoty Kędzierzyn	NP	AN and CAN	on-site	NI
PL	5	Grupa Azoty Kędzierzyn	NP	Urea and UAN	on-site	NI

PL	6	Grupa Azoty Police	NP	Phosphoric acid	on-site	NI
PL	7	Grupa Azoty Police	NP	Titanium dioxide (& related products)	on-site	NI
PL	8	Grupa Azoty Police	NP	Sulphuric acid	on-site	NI
PL	9	Grupa Azoty Tarnow	NP	AN and CAN	on-site	NI
PL	10	Grupa Azoty Tarnow	NP	Sulphuric acid	on-site	NI
PL	11	Grupa Azoty Tarnow	NP	Ammonia	on-site	NI
PL	12	Grupa Azoty Pulawy	NP	Ammonia	on-site	NI
PL	13	Grupa Azoty Pulawy	NP	Ammonia	on-site	NI
PL	14	Grupa Azoty Pulawy	NP	Nitric acid	on-site	NI
PL	15	Grupa Azoty Pulawy	NP	Sulphuric acid	on-site	NI
PL	16	Grupa Azoty Pulawy	NP	AN and CAN	on-site	NI
PL	17	Grupa Azoty Pulawy	NP	Urea and UAN	on-site	NI
PL	18	Grupa Azoty Pulawy	NP	Urea and UAN	on-site	NI
PL	19	Grupa Azoty Pulawy	NP	AN and CAN	on-site	NI
SE	1	Norcarb Engineered Carbons AB	NP	Carbon black	on-site	"SE - Additional information Annual environmental report, ref 4" [uploaded on BATIS]
SE	2	Nouryon Pulp and Performance	NP	Sodium chlorate	independently operated	"SE - Additional information Annual environmental report, ref 1" [uploaded on BATIS]

SE	3	Nouryon Pulp and Performance	NP	Sodium chlorate	on-site	"SE - Additional information Annual environmental report, ref 1" [uploaded on BATIS]
SE	4	Boliden Rönnskär	SE.CAED/10011274.Site	Sulphuric acid	on-site	"SE - Additional information Annual environmental report, ref 5" [uploaded on BATIS]
SK	1	Ammonia (ČP4)	NP	Ammonia	independently operated	IPPC
SK	2	Urea (MČ3)	NP	Urea and UAN	independently operated	IPPC
SK	3	Nitric acid (KD2)	NP	Nitric acid	independently operated	IPPC
SK	4	Nitric acid (KD3)	NP	Nitric acid	independently operated	IPPC
SK	5	Nitric acid (Strážske)	NP	Nitric acid	independently operated	IPPC
SK	6	CAN (Strážske)	NP	AN and CAN	independently operated	IPPC
SK	7	Liadok	NP	NPK and CN	independently operated	IPPC
SK	8	UGL	NP	NPK and CN	independently operated	IPPC
IMA	1	Cales de Llierca S.A. (17853 Argelaguer /Spain)	ES_386	Other	on-site	The treatment of wastewater from the inorganic chemical production processes (see Table 2.1[48]) covered by the LVIC BREF is carried out by an on-site wastewater treatment plant (together with wastewater arising from different origins)

[48] LVIC Call for IPs, Document 2 (Seville, 18 February 2022).

IMA	2	Calmit GmbH (AT-4820 Bad Ischl/ Austria)	NP	Other	on-site	the treatment of waste water from the inorganic chemical production processes (see Table 2.1[45]) covered by the LVIC BREF is carried out by an on-site waste water treatment plant (together with waste water arising from different origins)
IMA	3	Omya Netherlands BV, Moerdijk	NP	Other	on-site	NI
IMA	4	Omya GmbH, Golling	NP	Other	on-site	NI
Fertilizers Europe	1	Nitric Acid Plant	NP	Nitric acid	Other	NI
Fertilizers Europe	2	Ammonia I	P022715	Ammonia	on-site	Integrated IPPC permission
Fertilizers Europe	3	Ammonia II	P022715	Ammonia	on-site	Integrated IPPC permission
Fertilizers Europe	4	Nitric acid	P022715	Nitric acid	on-site	Integrated IPPC permission
Fertilizers Europe	5	Sulphuric acid	P022715	Sulphuric acid	on-site	Integrated IPPC permission
Fertilizers Europe	6	AN	P022715	AN and CAN	on-site	Integrated IPPC permission
Fertilizers Europe	7	Urea	P022715	Urea and UAN	on-site	Integrated IPPC permission
Fertilizers Europe	8	UAN	P022715	Urea and UAN	on-site	Integrated IPPC permission
Fertilizers Europe	9	CAN	P022715	AN and CAN	on-site	Integrated IPPC permission
Fertilizers Europe	10	Phosphoric Acid Plant	NP	Phosphoric acid	on-site	NI
Fertilizers Europe	11	Titanium Dioxide Plant	NP	Titanium dioxide (& related products)	on-site	NI

Fertilizers Europe	12	Sulphuric Acid Plant	NP	Sulphuric acid	on-site	NI
Fertilizers Europe	13	Ammonia	NP	Ammonia	on-site	Integrated IPPC permission
Fertilizers Europe	14	Nitric Acid	NP	Nitric acid	on-site	Integrated IPPC permission
Fertilizers Europe	15	Nitrogen fertilisers	NP	NPK and CN	on-site	Integrated IPPC permission
Fertilizers Europe	16	Ammonium Nitrate	NP	AN and CAN	on-site	Integrated IPPC permission
Fertilizers Europe	17	Urea and urea ammonium nitrate	NP	Urea and UAN	on-site	Integrated IPPC permission
CEFIC (HF)	1	some	NP	Hydrofluoric acid		Some plants treat the waste water together with other streams from other sources. In addition to this, some plants do have very simple treatment facilities.
CEFIC (Sodium Chlorate Sector Group)	1	ARKEMA FRANCE Jarrie	NP	Sodium chlorate	on-site	5.5<pH<8.5 Cr6+ <0.1 mg/L Cr3+ < 3 mg/L ClO- < 10 mg/L Fe < 5 mg/L
CEFIC (INCOPA)	1	all INCOPA plants	NP	other		NI
CEFIC (IFP)	1	Yara Kokkola	NP	Inorganic phosphates	independently operated	NI
CEFIC (TDMA)	1	all TiO2 plants	NP	Titanium dioxide (& related products)		NI
CEFIC (CEES)	1	Industrias Químicas del Ebro S.A	NP	Synthetic amorphous silica	on-site	NI

CEFIC (CEES)	2	Industrias Químicas del Ebro S.A	NP	Sodium silicate	on-site	NI
CEFIC (CEES)	3	Silicatos de Malpica(SIMAL)	NP	Sodium silicate	on-site	NI
CEFIC (CEES)	4	PQ Silicas Eijsden	NP	Sodium silicate	on-site	NI
CEFIC (CEES)	5	PQ Silicas Winschoten	NP	Sodium silicate	on-site	NI
CEFIC (CEES)	6	PQ Dehnitz	NP	Sodium silicate	on-site	NI
CEFIC (CEES)	7	PQ Lamotte	NP	Sodium silicate	independently operated	NI
CEFIC (CEES)	8	Wöllner GmbH	NP	Sodium silicate	independently operated	NI
CEFIC (CEES)	9	Vodní sklo a.s. - Neštěmice	NP	Sodium silicate	on-site	NI
CEFIC (CEES)	10	Vodní sklo a.s. - Střekov	NP	Sodium silicate	independently operated	NI
CEFIC (CEES)	11	Vodní sklo a.s. - Brno	NP	Sodium silicate	independently operated	NI
CEFIC (CABOT)	1	Cabot GmbH, Rheinfelden	NP	Synthetic amorphous silica	independently operated	NI

NP: Not provided.
NI: Not indicated.

4.3 Annex 3 [Request 3]: Information on plants where process furnaces/heaters are used

MS/ Stakeholder	No.	Plant (Name)	EU Registry on Industrial Sites [please provided the InspireID]	Type of Production process	Type of Process furnace/heater	Information available
BE	1	BASF Antwerpen_Zwavelzuur en Oleum	vl00112120000187	Sulphuric acid	direct heating	NI
BE	2	Eurochem_ESM2	vl01865835000170	AN and CAN	indirect heating	NI
BE	3	Eurochem_ESM1	vl01865835000170	AN and CAN	indirect heating	NI
BE	4	Eurochem_nitrofosforzuur	vl01865835000170	Phosphoric acid	indirect heating	NI
BE	5	Evonik Silica Belgium	vl01762557000122	Synthetic amorphous silica	indirect heating	NI
BE	6	BMS Micro-Nutrients	vl01755488000133	NPK and CN	indirect heating	NI
BE	7	Silmaco	vl00347047000124	Sodium silicate	indirect heating	NI
BE	8	PVS Chemicals Belgium	vl00585736000163	Sulphuric acid	direct heating	NI
BE	9	Imerys Graphite and Carbon Belgium	vl01830755000185	Carbon black	direct heating	NI
BE	10	Lanxess Antwerpen - MTEXIII deel A (zwavelzuurbedrijf)	vl01856089000144	Sulphuric acid	direct heating	NI
BE	11	Lanxess Antwerpen - MTEXIII deel E/F (ammoniumsulfaat)	vl01856089000144	NPK and CN	indirect heating	NI
BE	12	BASF Antwerpen_Ammoniak	vl00112120000187	Ammonia	indirect heating	NI
BE	13	BASF Antwerpen_Cyclohexanon en soda	vl00112120000187	Sodium carbonate (soda ash)	direct heating	NI
BE	14	BASF Antwerpen_salpeterzuurinstallatie SZ5	vl00112120000187	Nitric acid	direct heating	NI

BE	15	Tessenderlo Chemie Ham sulfaat zwavelzuur	vl01748409000252	Sulphuric acid	direct heating	NI
BE	16	Prayon Benelux	vl00121088000195	NPK and CN	indirect heating	NI
BE	17	BMS Micro-Nutrients	vl01755488000133	NPK and CN	indirect heating	NI
BE	18	Kronos Europe	vl00488458000284	Titanium dioxide (& related products)	dual-use	NI
BE	19	1 process furnace/heater	NP	Ammonia	NI	input Walloon Region
BE	20	1 process furnace/heater	NP	Nitric acid	NI	input Walloon Region
BE	21	2 process furnaces/heaters	NP	Sulphuric acid	NI	input Walloon Region
BE	22	6 process furnaces/heaters	NP	Inorganic phosphates	NI	input Walloon Region
BE	23	1 process furnace/heater	NP	AN and CAN	NI	input Walloon Region
BE	24	3 process furnaces/heaters	NP	NPK and CN	NI	input Walloon Region
CZ	1	Partial oxidation unit - production of carbon black CHEZACARB (Beverly furnace)	NP	Carbon black	indirect heating	The production of CHEZACARB (carbon black) is included in the integrated permit for partial oxidation unit.
CZ	2	Pre-heater in ammonia production unit	NP	Ammonia	indirect heating	NI
CZ	3	PRECHEZA a.s.	NP	Titanium dioxide (& related products)	dual-use	NI
CZ	4	PRECHEZA a.s.	NP	Sulphuric acid	indirect heating	NI
CZ	5	PRECHEZA a.s.	NP	Ferrous sulphate	dual-use	NI
CZ	6	PRECHEZA a.s.	NP	Other	dual-use	NI

CZ	7	CS CABOT, spol. s r.o. - 1 Integrated permit (3 furnace black production units) in Czech rep.	NP	Carbon black		NI
DE	1	Steam reforming ammonia	NP	Ammonia	indirect heating	NI
DE	2	Partial oxidation ammonia	NP	Ammonia	indirect heating	NI
DE	3	Thermal H3PO4	NP	Phosphoric acid	direct heating	NI
DE	4	HF	NP	Hydrofluoric acid	indirect heating	NI
DE	5	Superphosphates	NP	Superphosphates	indirect heating	NI
DE	6	NPK fertilisers	NP	NPK and CN	direct heating	NI
ES	1	Industrias Químicas del Ebro S.A	002768000	Synthetic amorphous silica	direct heating	Drying
ES	2	Industrias Químicas del Ebro S.A	002768000	Sodium silicate	direct heating	Tank furnaces.
ES	3	Silicatos de Malpica(SIMAL)	004661000	Sodium silicate	direct heating	Revolving furnaces.
ES	4	Ercros-Flix	003080000	Inorganic phosphates	direct heating	NI
ES	5	UBE Corporation Europe SAU	001593000	Sulphuric acid	direct heating	NI
ES	6	Amoniaco Palos	001587000	Ammonia	direct heating	NI
ES	7	CARBURO DEL CINCA, SA	000396000	Calcium carbide	direct heating	NI
FI	1	Yara Finland, Kokkola, Potassium Sulphate	NP	Other	direct heating	Yes
FI	2	Yara Feed Phosphates, Finland, Kokkola, Feed phosphates	NP	Inorganic phosphates	direct heating	Yes
FI	3	Yara Finland, Siilinjärvi, sulphuric acid	NP	Sulphuric acid	indirect heating	Yes
FI	4	Yara Finland, Siilinjärvi, NPK fertilizer	NP	NPK and CN	direct heating	Yes

FI	5	Yara Finland, Siilinjärvi, Nitric acid	NP	Nitric acid	indirect heating	Yes
FI	6	Yara Finland Uusikaupunki, NPK	NP	NPK and CN	direct heating	Yes
FI	7	Yara Finland, Uusikaupunki, Nitric acid	NP	Nitric acid	indirect heating	Yes
FI	8	Kemira, Pori	NP	Titanium dioxide (& related products)	direct heating	Yes
FR	1	Borealis (Ottmarsheim)	NP	Nitric acid		Yes
FR	2	Adisseo (Saint Clair)	NP	Sulphuric acid		Yes
FR	3	Innospec	NP	Sulphuric acid		Yes
FR	4	Weylchem	NP	Sulphuric acid		Yes
FR	5	Borealis (Grand Quevilly)	NP	Ammonia		Yes
FR	6	Borealis (Grandpuits)	NP	Ammonia		Yes
FR	7	Tronox (Thann)	NP	Titanium dioxide (& related products)		Yes
FR	8	Imerys	NP	Other		Yes
FR	9	Timac Agro (Le Tréport)	NP	NPK and CN		Yes
FR	10	Timac Agro (Saint Malo)	NP	Superphosphates		Yes
FR	11	Timac Agro (Tarnos)	NP	NPK and CN		Yes
FR	12	Timac Agro (Tonnay)	NP	Superphosphates		Yes
FR	13	Orion (Fos)	NP	Carbon black		Yes
FR	14	Jinwang	NP	Inorganic phosphates		Yes

FR	15	Novabion	NP	Sodium silicate		Yes
FR	16	Axens	NP	Other		Yes
IT	1	Hydrofluoric acid plant	NP	Hydrofluoric acid	direct heating	Direct drying of fluorspar
IT	2	Hydrofluoric acid plant	NP	Hydrofluoric acid	indirect heating	Heating of reactor to supply the necessary energy to the reactors
IT	3	Venator Scarlino Plant	NP	Titanium dioxide (& related products)	direct heating	NI
IT	4	Gas Dryer - CaCl2	IT794	Calcium Chloride	direct heating	IPPC Permit n. DM 0000038 20 Jan 2022
IT	5	Yara Italy, Ferrara, Ammonia	NP	Ammonia	indirect heating	NI
IT	6	Yara Italy, Ferrara, Urea	NP	Urea and UAN	indirect heating	NI
IT	7	Yara Italy, Ravenna, CAN	NP	AN and CAN		NI
IT	8	Yara Italy, Ravenna, Nitric acid	NP	Nitric acid	indirect heating	NI
IT	9	Yara Italy, Ravenna, NPK	NP	NPK and CN	direct heating	NI
IT	10	NUOVA SOLMINE SPA - Scarlino (GR)	NP	Sulphuric acid	direct heating	NI
IT	11	NUOVA SOLMINE SPA - Serravalle (AL)	NP	Sulphuric acid	direct heating	NI
PL		Grupa Azoty Kędzierzyn	NP	Ammonia	indirect heating	NI
PL		Grupa Azoty Police	NP	Titanium dioxide (& related products)	direct heating	NI
PL		Grupa Azoty Police	NP	NPK and CN	-	Drum dryers
PL		Grupa Azoty Tarnow	NP	Ammonia	indirect heating	NI

PL		Grupa Azoty Puławy	NP	Ammonia	indirect heating	NI
PL		Grupa Azoty Puławy	NP	Ammonia	indirect heating	NI
SE	1	Norcarb Engineered Carbons AB	NP	Carbon black	dual-use	"SE - Additional information Annual environmental report, ref 4" [uploaded on BATIS]
SE	2	Nouryon Pulp and Performance, Albyfabriker	NP	Sodium chlorate	direct heating	"SE - Additional information Annual environmental report, ref 1" [uploaded on BATIS]
SE	3	Nouryon Pulp and Performance, Albyfabriker	NP	Sodium chlorate	indirect heating	"SE - Additional information Annual environmental report, ref 1" [uploaded on BATIS]
SE	4	Nouryon Pulp and Performance, Bohus	NP	Synthetic amorphous silica	direct heating	The production of Silica sol in the Nouryon plant involves an autoclave to dissolve the raw glass (sodium silicate) that is the raw material for the silica sol process, at 150°C. The silica sol process does not contain any other process steps where temperatures reach beyond 100°C. SE - Additional information Annual environmental report, ref 3" [uploaded on BATIS]
SK	1	Ammonia (ČP4)	NP	Ammonia	indirect heating	IPPC
SK	2	Calcium carbide	NP	Calcium carbide	direct heating	NI
IMA	1	Cales de Llierca S.A. (17853 Argelaguer /Spain)	ES_386	Other	direct heating	dryers different technologies
IMA	2	Calmit GmbH (AT-4820 Bad Ischl/ Austria)	NP	Other	direct heating	dryers different technologies
IMA	3	Omya GmbH, Golling	NP	Other	direct heating	NI
ICBA	1	CS Cabot (Valasske-Mezirici - Czech Republic)	CZ.MZP.Z723/CZ92460364.FACILITY	Carbon black	NI	NI

ICBA	2	Cabot Italiana SpA (Ravenna - Italy)	IT.CAED/481232012.FACILITY	Carbon black	NI	NI
ICBA	3	Cabot Carbone Sas (Lillebonne - France)	FR.CAED/3810.FACILITY	Carbon black	NI	NI
ICBA	4	Cabot BV (Botlek Rotterdam - The Netherland)	NL.RIVM/000011024.FACILITY	Carbon black	NI	NI
ICBA	5	Birla Carbon Italy (Trecate - Italy)	IT.CAED/280692006.FACILITY	Carbon black	NI	NI
ICBA	6	Birla Carbon Hungary Kft. (Tiszaújváros - Hungary)	HU.OKIR/100430355.FACILITY	Carbon black	NI	NI
ICBA	7	Birla Carbon Spain Sl (Gajano - Spain)	ES.CAED/003483000.FACILITY	Carbon black	NI	NI
ICBA	8	Orion Engineered Carbons S.r.l. (Ravenna - Italy)	IT.CAED/481232015.FACILITY	Carbon black	NI	NI
ICBA	9	Norcarb Engineered Carbons AB (MALMÖ - Sweden)	SE.CAED/10017658.Facility	Carbon black	NI	NI
ICBA	10	Orion Engineered Carbons Sp. z o.o. (Jasło - Poland)	PL.MŚ/000000460.FACILITY	Carbon black	NI	NI
ICBA	11	Orion Engineered Carbons GmbH Werk Kalscheuren (Köln - Germany)	3000214067	Carbon black	NI	NI
ICBA	12	KG Deutsche Gasrußwerke GmbH & Co. (Dortmund - Germany)	not participated in E-PRTR reporting yet - first year is 2022	Carbon black	NI	NI
Fertilizers Europe	1	Borealis Grandpuits Ammonia	NP	Ammonia	indirect heating	Include process combustion unit
Fertilizers Europe	2	Borealis Grand Quevilly Ammonia	NP	Ammonia	indirect heating	Include process combustion unit
Fertilizers Europe	3	Borealis Grand Quevilly Ammonium Nitrate	NP	AN and CAN	direct heating	NI
Fertilizers Europe	4	Borealis LINZ Ammonia 1	NP	Ammonia	indirect heating	Include process combustion unit
Fertilizers Europe	5	Borealis LINZ Ammonia 2	NP	Ammonia	indirect heating	Include process combustion unit
Fertilizers Europe	6	Borealis LINZ NPK	NP	NPK and CN	direct heating	NI
Fertilizers Europe	7	Borealis Ottmarsheim Ammonia	NP	Ammonia	indirect heating	Include process combustion unit

Fertilizers Europe	8	Duslo Šaľa	NP	Ammonia	NI	NI
Fertilizers Europe	9	Yara Sluiskil	NP	Ammonia	NI	NI
Fertilizers Europe	10	Yara Le Havre	NP	Ammonia	NI	NI
Fertilizers Europe	11	Yara Brunsbüttel	NP	Ammonia	NI	NI
Fertilizers Europe	12	Yara Ferrara	NP	Ammonia	NI	NI
Fertilizers Europe	13	Yara Tertre	NP	Ammonia	NI	NI
Fertilizers Europe	14	BASF Antwerpen	NP	Ammonia	NI	NI
Fertilizers Europe	15	Nitrogenmüvek Pétfürdő	NP	Ammonia	NI	NI
Fertilizers Europe	16	Fertiberia Amoniaco Puertollano	NP	Ammonia	NI	NI
Fertilizers Europe	17	Fertiberia Amoniaco Palos	NP	Ammonia	NI	NI
Fertilizers Europe	18	ICL Ludwigshafen	NP	NPK and CN	NI	NI
Fertilizers Europe	19	Yara Ravenna	NP	NPK and CN	NI	NI
Fertilizers Europe	20	ICL Amsterdam	NP	Superphosphates	NI	NI
Fertilizers Europe	21	Duslo Strážske	NP	NPK and CN	NI	NI
Fertilizers Europe	22	Yara Uusikaupunkki	NP	NPK and CN	NI	NI

Fertilizers Europe	23	Yara Montoir	NP	NPK and CN	NI	NI
Fertilizers Europe	24	Lovochemie Lovosice	NP	NPK and CN	NI	NI
Fertilizers Europe	25	Yara Siilinjärvi	NP	NPK and CN	NI	NI
Fertilizers Europe	26	Grupa Azoty Tarnow I	P022715	Ammonia	indirect heating	NI
Fertilizers Europe	27	Grupa Azoty Tarnow II	P022715	Ammonia	indirect heating	NI
Fertilizers Europe	28	Grupa Azoty Police	NP	NPK and CN	NI	NI
Fertilizers Europe	29	Yara Kokkola	NP	Other	NI	NI
Fertilizers Europe	30	Yara Köping	NP	AN and CAN	NI	NI
Fertilizers Europe	31	Yara Porsgrunn	NP	NPK and CN	NI	NI
Fertilizers Europe	32	Yara Glomfjord	NP	Ammonia	NI	NI
Fertilizers Europe	33	Yara Rostock	NP	NI	NI	NI
Fertilizers Europe	34	Yara Ambes	NP	Ammonia	indirect heating	NI
Fertilizers Europe	35	ANWIL S.A.	NP	AN and CAN	direct heating	NI
Fertilizers Europe	36	ANWIL S.A.	NP	NI	NI	NI

CEFIC HF	1	all AHF / HF producing plants	NP	Hydrofluoric acid	NI	All the kilns are heated by furnace heaters, either direct or indirect, same applies for the fluorspar drying equipment
CEFIC Sodium Chlorate Sector Group	1	ELECTROQUIMICA DE HERNANI, HERNANI, SPAIN	NP	Sodium chlorate	indirect heating	NI
CEFIF INCOPA	1	Kemira Pori	NP	other	direct heating	(for dried ferric sulphate (7.5.4.4.3) - data available (need more time)
CEFIF INCOPA	2	Venator	NP	other	NI	NI
CEFIF INCOPA	3	all plants processing by-products from TiO2 production		other	NI	NI
CEFIC IFP	1	Timab Industries Saint-Malo (PHOSPHEA)	NP	Inorganic phosphates	dual-use	NI
CEFIC IFP	2	Fosfatos de Cartagena (PHOSPHEA)	NP	Inorganic phosphates	indirect heating	NI
CEFIC IFP	3	Yara Kokkola	NP	Inorganic phosphates	indirect heating	NI
CEFIC TDMA	1	all TiO2 plants	NP	Titanium dioxide (& related products)	dual-use	NI
CEFIC CEES	1	Industrias Químicas del Ebro S.A	NP	Synthetic amorphous silica	direct heating	Drying
CEFIC CEES	2	Industrias Químicas del Ebro S.A	NP	Sodium silicate	direct heating	Tank furnaces
CEFIC CEES	3	Silicatos de Malpica(SIMAL)	NP	Sodium silicate	direct heating	Revolving furnaces
CEFIC CEES	4	PQ Silicas Eijsden	NP	Sodium silicate	indirect heating	hydrothermal process
CEFIC CEES	5	PQ Silicas Maastricht	NP	Sodium silicate	indirect heating	hydrothermal process
CEFIC CEES	6	PQ Dehnitz	NP	Sodium silicate	direct heating	furnace
CEFIC CEES	7	PQ Lamotte	NP	Sodium silicate	direct heating	furnace

CEFIC CEES	8	PQ Silicas Winschoten	NP	Sodium silicate	direct heating	furnace
CEFIC CEES	9	Wöllner GmbH	NP	Sodium silicate	direct heating	Tank furnaces
CEFIC CEES	10	Wöllner Austria GmbH	NP	Sodium silicate	indirect heating	hydrothermal process
CEFIC CEES	11	SILMACO NV	NP	Sodium silicate	indirect heating	hydrothermal process
CEFIC CEES	12	BASF PCN GmbH	NP	Sodium silicate	dual-use	Furnace and Hydrothermal Process
CEFIC CABOT	1	Cabot GmbH, Rheinfelden	NP	Synthetic amorphous silica	indirect heating	NI
NP: Not provided. **NI: Not indicated**						

4.4 Annex 4 [Request 4]: Information on the thermal treatment of process off-gases associated with the inorganic chemical production processes to be covered by the LVIC BREF

MS/ Stakeholder	No.	Plant name	EU Registry on Industrial Sites [InspireID]	Production process	Type of thermal treatment	Information available
BE	1	Imerys Graphite and Carbon Belgium	vl01830755000185	Carbon black	Thermal Oxidation	NI
BE	2	Kronos Europe	vl00488458000284	Titanium dioxide (& related products)	Thermal Oxidation	NI
BE	3	Prayon Benelux	vl00121088000195	Phosphoric acid	Thermal Oxidation	NI
CZ	1	Partial oxidation unit - production of CHEZACARB (carbon black) (Beverly furnace)	NP	Carbon black	Thermal Oxidation	The production carbon black is included in the integrated permit for partial oxidation unit.
CZ	2	CS CABOT, spol. s r.o. – 1 Integrated permit (3 furnace black production units)	NP	Carbon black	NI	NI
CZ	3	DEZA, a.s.	NP	Carbon black	Thermal Oxidation	Yes
DE	1	SNCR at primary reformers	NP	Ammonia	Other	NI
DE	2	SCR tail gas treatment	NP	Nitric acid	Other	NI
DE	3	TO at partial oxidation	NP	Ammonia	Thermal Oxidation	NI
IT	1	Venator Scarlino Plant	NP	Titanium dioxide (& related products)	Catalytic Oxidation	NI
IT	2	YARA - Stabilimento Ferrara	NP	Ammonia	Thermal Oxidation	NI
IT	3	CABOT ITALIANA S.P.A.	NP	Carbon black	Thermal Oxidation	NI
PL	1	Grupa Azoty Tarnow	NP	Nitric acid	Other	The off-gases processing
PL	2	Grupa Azoty Puławy	NP	Nitric acid	Catalytic Oxidation	NI
SE	1	Nouryon Pulp and Performance, Albyfabriker	NP	Sodium chlorate	Thermal Oxidation	"SE - Additional information Annual environmental report, ref 1" [uploaded on BATIS]
SE	2	Nouryon Pulp and Performance, Albyfabriker	NP	Sodium chlorate	Catalytic Oxidation	"SE - Additional information Annual environmental report, ref 1" [uploaded on BATIS]

SE	3	Nouryon Pulp and Performance, Albyfabriker	NP	Sodium chlorate	Other	"SE - Additional information Annual environmental report, ref 1" [uploaded on BATIS]
SK	1	Calcium carbide	NP	Calcium carbide	Other	NI
Fertilizers Europe	1	Nitric Acid Plant	NP	Nitric acid	Other	NI
Fertilizers Europe	2	Grupa Azoty Pulawi Nitric acid	P022715	Nitric acid	Catalytic Oxidation	NI
CEFIC (ICBA)	1	CS Cabot (Valasske-Mezirici - Czech Republic)	CZ.MZP.Z723/CZ92460364.FACILITY	Carbon black	NI	NI
CEFIC (ICBA)	2	Cabot Italiana SpA (Ravenna - Italy)	IT.CAED/481232012.FACILITY	Carbon black	NI	NI
CEFIC (ICBA)	3	Cabot Carbone Sas (Lillebonne - France)	FR.CAED/3810.FACILITY	Carbon black	NI	NI
CEFIC (ICBA)	4	Cabot BV (Botlek Rotterdam - The Netherland)	NL.RIVM/000011024.FACILITY	Carbon black	NI	NI
CEFIC (ICBA)	5	Birla Carbon Italy (Trecate - Italy)	IT.CAED/280692006.FACILITY	Carbon black	NI	NI
CEFIC (ICBA)	6	Birla Carbon Hungary Kft. (Tiszaújváros - Hungary)	HU.OKIR/100430355.FACILITY	Carbon black	NI	NI
CEFIC (ICBA)	7	Birla Carbon Spain Sl (Gajano - Spain)	ES.CAED/003483000.FACILITY	Carbon black	NI	NI
CEFIC (ICBA)	8	Orion Engineered Carbons S.r.l. (Ravenna - Italy)	IT.CAED/481232015.FACILITY	Carbon black	NI	NI
CEFIC (ICBA)	9	Norcarb Engineered Carbons AB (MALMÖ - Sweden)	SE.CAED/10017658.Facility	Carbon black	NI	NI
CEFIC (ICBA)	10	Orion Engineered Carbons Sp.zo.o. (Jasło - Poland)	PL.MŚ/000000460.FACILITY	Carbon black	NI	NI
CEFIC (ICBA)	11	Orion Engineered Carbons GmbH Werk Kalscheuren (Köln - Germany)	3000214067	Carbon black	NI	NI
CEFIC (ICBA)	12	KG Deutsche Gasrußwerke GmbH & Co. (Dortmund - Germany)	E-PRTR first year of reporting: 2022	Carbon black	NI	NI
CEFIC (HF)	1	some	NP	Hydrofluoric acid	NI	Some plants do recover the heat of the kilns and some do not.

CEFIC (Sodium Chlorate Sector Group)	1	ARKEMA FRANCE Jarrie	NP	Sodium chlorate	Catalytic Oxidation	Not linked to any permit, treatment of hydrogen to use it as a raw material NI
CEFIC (CABOT)	1	Cabot GmbH, Rheinfelden	NP	Synthetic amorphous silica	Thermal Oxidation	NI
NP: Not provided. **NI: Not indicated.**						

4.5 Annex 5 [Request 17]: Information on installations carrying out the inorganic chemical production processes to be covered by the LVIC BREF

COUNTRY / LVIC PRODUCTIONS	AT	BE	CZ	DE	ES	FI	FR	IT	NL	PL	PT	SE	SI	SK
Ammonia	1 (2 lines)	2	1	6	3	-	4	1	2	5	-	5-10	-	1
Hydrofluoric acid	-	-	-	6	1	-	1	1	-	-	-	-	-	-
Nitric acid	1 (2 lines)	4	5	8	3	3	5	2	3	4	3	5-10		3
Phosphoric acid	-	4	1	8	2	1	-	-	-	3	-	1	-	-
Sulphuric acid	3	11	3	18	2	3	4	4	3	6	-	3	-	-
Inorganic phosphates	-	6	1	5	8	1	2	2	-	-	-	<5	-	-
Sodium carbonate (i.e. soda ash)	-	1	-	3	1	-	2	1	-	-	-	-	-	-
Sodium chlorate	-	-	-	0	1	3	1	-	3	-	1	2	-	-
Precipitated calcium carbonate	1	-	-	4	-	-	1	-	1	-	2	<5	-	-
Calcium carbide	1	-	-	1	1	-	-	-	-	-	-	1	-	1
Carbon black	-	1	2	2	1	-	1	2	2	-	-	1	-	-
Titanium dioxide (and related products)	-	1	1	5	-	1	1	1	1	-	-	-	1	-
Sodium silicate (water glass)	-	1	3	3	2	1	1	-	3	-	-	-	-	-
Synthetic amorphous silica	-	2	-	8	1	-	-	-	3	-	-	2	-	-
Ammonium nitrate and calcium ammonium nitrate	1	4	2	2	3	-	3	1	3	5	2	3	-	2
Nitrogen-, phosphorus- or potassium-based fertilisers (simple or compound fertilisers)	2	13	2	17	26	4	9	3	5	7	1	5-10	-	-
Calcium nitrate	-	1	1	-	-	-	-	-	2	-	1	-	-	1
Superphosphates	-	1	-	4	5	-	4	-	1	-	1	-	-	-
Urea and urea ammonium nitrate	1	-	1	2	4	-	-	1	2	6	1	-	-	1
Sodium carbonate including calcium chloride and refined sodium bicarbonate	-	1	-	4	1	-	-	1	-	-	-	-	-	-
Titanium dioxide including ferrous chloride	-	see above	-	1	-	-	-	-	-	-	-	-	-	-
Titanium dioxide including ferrous sulphate (e.g. copperas and related products).	-	see above	1	2	1	-	1	1	-	1	-	-	-	-

4.6 Annex 6 [Request 18]: Preliminary list of well-performing plants carrying out the inorganic chemical production processes to be covered by the LVIC BREF

Number	Company name	MS	Town where the installation is located	EU Registry on Industrial Sites [InspireID]	Main inorganic chemical production process(es) carried out on site					
					Process 1	Process 2	Process 3	Process 4	Process 5	If "other", please specify
1	Borealis Agrolinz Melamine	AT	Linz		Ammonia	AN and CAN	NPK and CN	Urea and UAN	Nitric acid	
2	Timac Agro	AT	Pischelsdorf		NPK and CN					
3	Donau Chemie	AT	Pischelsdorf		Sulphuric acid					
4	Voest	AT	Linz		Sulphuric acid					
5	Lenzing AG	AT	Lenzing		Sulphuric acid					
6	Donau Chemie	AT	Landeck		Calcium carbide					
7	Omya	AT	Golling		Other					Precipitated calcium carbonate
8	Linde Gas	AT	Linz		Hydrogen					
9	TIAG	AT	Treibach		Hydrogen					
1	BASF Antwerpen_Cyclohexanonen soda	BE	Antwerpen		Soda ash (sodium carbonate)					
2	BASF Antwerpen_Caprolactam	BE	Antwerpen		NPK (ammoniumsulfaat)					
3	BASF Antwerpen_Ammoniak	BE	Antwerpen		Ammonia					
4	BASF Antwerpen_Zwavelzuren Oleum	BE	Antwerpen		Sulphuric acid					
5	BASF Antwerpen_salpeterzuurinstallatie SZ5	BE	Antwerpen		Nitric acid					
6	Eurochem_SZ_2_3_4	BE	Antwerpen		Nitric acid					
7	Eurochem_NPK	BE	Antwerpen		NPK					

8	Eurochem_ESM2	BE	Antwerpen		AN					
9	Eurochem_ESM1	BE	Antwerpen		AN					
10	Eurochem_nitrofosforzuur	BE	Antwerpen		phosphoric acid					
11	Evonik Antwerpen - B	BE	Antwerpen		NPK (ammoniumsulfaat)					
12	Evonik Antwerpen – FK	BE	Antwerpen		synthetic amorphous silica					
13	Evonik Silica Belgium	BE	Oostende		synthetic amorphous silica					
14	Lanxess Antwerpen - MTEXIII deel A (zwavelzuurbedrijf)	BE	Antwerpen		Sulphuric acid					
15	Lanxess Antwerpen - MTEXIII deel E/F (ammoniumsulfaat)	BE	Antwerpen		NPK (Sulphates)					
16	Tessenderlo Chemie Ham sulfaat zwavelzuur	BE	Ham		Sulphuric acid					
17	Tessenderlo Chemie Ham Calciumchloride	BE	Ham		calcium chloride					
18	Tessenderlo Chemie Tessenderlo 2	BE	Tessenderlo		Ferric chloride					
19	Silmaco	BE	Lanaken		sodium silicate					
20	Kronos Europe	BE	Gent		TiO_2					
21	PVS Chemicals Belgium	BE	Gent		Sulphuric acid					
22	Rain Carbon 939	BE	Zelzate		Sulphuric acid					
23	Imerys Graphite and Carbon Belgium	BE	Willebroek		Carbon black					
24	Molymet Belgium 940	BE	Gent		Sulphuric acid					
1	Lovochemie	CZ	Lovosice		Nitric acid	AN and CAN	NPK and CN	Urea and UAN		
2	PRECHEZA a.s.	CZ	Přerov		Titanium dioxide (& related products)	Ferrous sulphate	Sulphuric acid	Other		iron oxide pigments
3	ORLEN Unipetrol RPA s.r.o.	CZ	Litvínov - Záluží		Ammonia					
4	ORLEN Unipetrol RPA s.r.o.	CZ	Litvínov - Záluží		Carbon black					

5	ORLEN Unipetrol RPA s.r.o.	CZ	Litvínov - Záluží		Hydrogen					
6	Synthesia, a.s.	CZ	Pardubice		Nitric acid					
7	DEZA, a.s.	CZ	Valašské Meziříčí		Carbon black					only thermal oxidation (combustion)
8	Vodní sklo a.s.	CZ	Ústí nad Labem - Neštěmice		Sodium silicate					
9	Vodní sklo a.s.	CZ	Ústí nad Labem - Střekov		Sodium silicate					
10	Vodní sklo a.s.	CZ	Brno		Sodium silicate					
11	BorsodChem MCHZ	CZ	Ostrava		Nitric acid	Nitric acid				
12	CS CABOT, spol. s r.o.	CZ	Valašské Meziříčí		Carbon black					
13	Spolana s.r.o.	CZ	Neratovice		Sulphuric acid	NPK and CN				
14	Fosfa a.s.	CZ	Břeclav-Poštorná		Phosphoric acid	Inorganic phosphates				
1	SOLVAY QUIMICA, SL	ES	Torrelavega-Cantabria	003182000	Sodium carbonate (soda ash)					
2	Industrias Químicas del Ebro S.A	ES	Zaragoza	002768000	Sodium silicate	Synthetic amorphous silica				
3	Silicatos de Malpica (SIMAL)	ES	Zamudio	004661000	Sodium silicate					
4	Fertiberia	ES	Sagunto	001588000	Nitric acid	AN and CAN				
5	Atlantic Copper	ES	Huelva	003421000	Sulphuric acid					
6	CARBURO DEL CINCA, SA	ES	Monzón, Huesca	000396000	Calcium carbide					
7	Fertiberia	ES	Palos	001587000	Ammonia	Urea and UAN				
8	Fertiberia	ES	Huelva	001586000	NPK and CN					
9	VENATOR	ES	Huelva	003199000	Titanium dioxide (& related products)					

1	Yara Phosphates Oy/Yara Suomi Oy	FI	Kokkola		Inorganic phosphates	Other				Potassium sulphate
2	Yara Suomi Oy, Siilinjärvi	FI	Siilinjärvi		Nitric acid	Phosphoric acid	Sulphuric acid	NPK and CN		
3	Yara Suomi Oy, Uusikaupunki	FI	Uusikaupunki		Nitric acid	NPK and CN				
4	Kemira	FI	Joutseno		Sodium chlorate					
5	Kemira	FI	Äetsä		Sodium chlorate					
6	Kemira	FI	Kuusankoski		Other					ClO2
7	Kemira	FI	Pori		Titanium dioxide (& related products)					
1	Solvay Chimica Italia S.P.A.	IT	Rosignano Marittimo	IT794	Sodium carbonate (soda ash)	Calcium chloride				
2	VENATOR	IT	Scarlino		Titanium dioxide (& related products)	Ferrous sulphate	Other			Gypsum
3	Yara Italy, Ferrara	IT	Ferrara		Ammonia	Urea and UAN				
4	Yara Italy, Ravenna	IT	Ravenna		Nitric acid	AN and CAN	NPK and CN			
1	Grupa Azoty Kedzierzyn S.A.	PL	Kędzierzyn Koźle		Ammonia					
2	Grupa Azoty Kedzierzyn S.A.	PL	Kędzierzyn Koźle		Nitric acid					
3	Grupa Azoty Kedzierzyn S.A.	PL	Kędzierzyn Koźle		Nitric acid					
4	Grupa Azoty Kedzierzyn S.A.	PL	Kędzierzyn Koźle		Urea and UAN					
5	Grupa Azoty Kedzierzyn S.A.	PL	Kędzierzyn Koźle		NPK and CN					
6	Grupa Azoty Zakłady Chemiczne "POLICE" S.A.	PL	Police		Ammonia					
7	Grupa Azoty Zakłady Chemiczne "POLICE" S.A.	PL	Police		Phosphoric acid					
8	Grupa Azoty Zakłady Chemiczne "POLICE" S.A.	PL	Police		Sulphuric acid					

9	Grupa Azoty Zakłady Chemiczne "POLICE" S.A.	PL	Police		Titanium dioxide (& related products)					
10	Grupa Azoty Zakłady Chemiczne "POLICE" S.A.	PL	Police		NPK and CN					
11	Grupa Azoty Zakłady Chemiczne "POLICE" S.A.	PL	Police		Urea and UAN					
12	Grupa Azoty Zakłady Chemiczne "POLICE" S.A.	PL	Police		Ferrous sulphate					
13	Grupa Azoty Tarnow S.A.	PL	Tarnow		Ammonia					
14	Grupa Azoty Tarnow S.A.	PL	Tarnow		AN and CAN					
15	Grupa Azoty Tarnow S.A.	PL	Tarnow		AN and CAN					
16	Grupa Azoty Tarnow S.A.	PL	Tarnow		AN and CAN					
17	Grupa Azoty Tarnow S.A.	PL	Tarnow		AN and CAN					
18	Grupa Azoty Tarnow S.A.	PL	Tarnow		Nitric acid					
19	Grupa Azoty Tarnow S.A.	PL	Tarnow		Sulphuric acid					
20	Grupa Azoty Zakłady Azotowe "Puławy" S.A.	PL	Puławy		Nitric acid					
1	ADP Fertilizantes - Alverca	PT	Alverca		Nitric acid	AN and CAN	Other			Nitroammonium fertilizers
2	ADP Fertilizantes - Lavradio	PT	Lavradio		Nitric acid	Other				AN, UAN
3	Bondalti Chemicals	PT	Estarreja		Nitric acid					
4	HyChem - Química Sustentável	PT	Póvoa de Santa Iria		Sodium chlorate					
5	Sopac - Sociedade Produtora de Adubos Compostos	PT	Setúbal		Superphosphates	Other				NPK
6	Specialty Minerals Portugal, Especialidades Minerais, S.A.	PT	Figueira da Foz		Other					Precipitated calcium carbonate
7	ASCENZA AGRO, S.A.	PT	Setúbal		Other					NPK
1	Cinkarna	SI	Celje		Titanium dioxide (& related products)					
1	Duslo a.s.	SK	Šaľa		Ammonia					
2	Duslo a.s.	SK	Šaľa		Nitric acid					
3	Duslo a.s.	SK	Šaľa		Nitric acid					
4	Duslo a.s.	SK	Strážske		Nitric acid					

5	Duslo a.s.	SK	Šaľa		Urea and UAN					
6	Duslo a.s.	SK	Strážske		NPK and CN					
7	Duslo a.s.	SK	Šaľa		AN and CAN					
8	Duslo a.s.	SK	Šaľa		AN and CAN					
9	FORTISCHEM a. s.	SK	Nováky		Calcium carbide					

4.7 Annex 7 [Request 22]: Summary of initial positions on emerging techniques in the current LVIC-AAF and LVIC-S BREFs

BREF	Production process	Technique*	TWG Member/Observer												
			AT	BE	CZ	DE	ES	FR	IT	PL	PT	SE	SI	EEB	ICBA
LVIC-S	Soda ash	9.2.1					NR	NR	NR					BC	
		9.2.2					NR	NR	NR					NR	
	Titanium dioxide	9.3.2.2			NR			NR	ET	NR			NR	NR	
		9.3.2.3			NR			BC	ET	NR			ET	NR	
		9.3.2.4			NR			NR	ET	NR			ET	NR	
		9.3.2.5			NR			NR	NR	NR			ET	BC	
		9.3.2.6			NR			NR	NR	NR			NR	NR	
		9.3.3		BC	NR			BC	BC	NR			BC	BC	
		9.3.4			ET			BC	BC	NR			BC	BC	
	Carbon black	9.4.2			BC			NR				NR		BC	BC
	Silicon carbide	9.7.1.1						NR						ET	
LVIC-AAF	Ammonia	2.2.3.5				BC	BC	NR	NR					BC	
	Nitric acid	3.6.1	BC			BC	BC	NR	NR		BC	NR		BC	

NB: BC = BAT candidate; ET = emerging technique; NR = not relevant.

List of techniques:
9.2.1 Integration of a soda ash plant with an ammonia plant
9.2.2 Innovations in the carbonation section of the soda ash plant
9.3.2.2 Fluid bed calcination
9.3.2.3 Osmosis of strong and weak acid filtrates from pre-leach and post-leach
9.3.2.4 Solvent extraction of sulphate metals from strong and weak acid filtrates
9.3.2.5 Solvent extraction of $TiOSO_4$ and $TiCl_4$ from aqueous solution
9.3.2.6 Hydrometallurgical process - hydrolysis of $TiOSO_4$ and $TiCl_4$ solutions
9.3.3 Finishing plants for the chloride and sulphate process
9.3.4 New products and co-products
9.4.2 Low NO_X in dryers
9.7.1.1 Emerging techniques - Plasma reactor
2.2.3.5 Pressure Swing Adsorption (PSA) to combine in one step CO_2 removal and methanation
3.6.1 Combined NO_X and N_2O abatement with addition of hydrocarbons

4.8 Annex 8 [Request 22]: List of obsolete techniques in the current LVIC-AAF and LVIC-S BREFs

Obsolete techniques			
BREF	**Chemical Product/ Section in BREF**	**BAT Candidates in the current LVIC-AAF and LVIC-S BREFs**	**TWG Member**
LVIC-AAF	**Common abatements**	1.4.5 Optimisation/maintenance of vacuum pumps	Euromines
		1.4.7. Recovery of NO_X from exhaust gases´	CZ
	Ammonia	2.4.25 Handling of start-up, shutdown and abnormal operating conditions	ES
	Nitric acid	3.4.5 N_2O decomposition by extension of the reactor chamber	ES
		3.4.10 Addition of H_2O_2 to the last absorption stage	ES
	Sulphuric acid	4.4.1. Single contact/single absorption process	CZ, FI, SE
		4.4.3. Addition of a 5th bed to a double contact process	CZ
		4.4.6. Replacement of brick-arch converters	CZ, SE
		4.4.21 Tail gas treatment: Sulphazide process	SE
	Urea and UAN	8.4.1 Conventional total recycling process	IT, FERTILIZERS EUROPE
		8.4.10. Minimisation of NH_3 emissions from granulation	IT, FERTILIZERS EUROPE
	NPK and CN	7.4.4 Particle formation (3): prill tower	ES
LVIC-S	**Soda ash**	2.4.5. Centrifugation of crude sodium bicarbonate – energy saving	IT, ES
	Synthetic Amorphous silica	5.2 Applied processes and techniques	SE

4.9 Annex 9 [Request 23]: Summary of initial positions on additional techniques to consider for the LVIC BREF

	Project Title/ Technique	TWG Member/Observer								
		CZ	ES	FR	IT	PL	EEB	EUROFER	Fert.EU	CEFIC
1	Novel routes and catalysts for synthesis of ammonia as alternative renewable fuel		UD		NR	UD	ET		NR	
2	Toward efficient electrochemical green ammonia cycle		ET		ET	UD	ET		ET	
3	Solar driven electrochemical nitrogen fixation for ammonia refinery		UD		NR	UD	ET		NR	
4	Advanced materials and Reactors for ENergy storage tHrough Ammonia		UD		NR	NR	ET		NR	
5	Innovative industrial transformation of the steel and chemical industries of Europe		UD			ET	ET	UD		
6	Waste utilisation in phosphoric acid industry through the development of ecologically sustainable and environmentally friendly processes for a wide class of phosphorus-containing products	NR		BC			ET		NR	
7	An international network on new strategies for processing calcium phosphates						ET		NR	
8	Re-designing the value and supply chain of water and minerals: a circular economy approach for the recovery of resources from saline impaired effluent (brine) generated by process industries		ET	BC			ET			
9	Flexible Pilot Scale Manufacturing of Cost-Effective Nanocomposites through Tailored Precision Nanoparticles in Dispersion				NR		ET			
10	Innovative solution for phosphate recovery from exhausted extinguishing powders						UD		NR	
11	World class innovative novel nanoscale optimized electrodes and electrolytes for electrochemical reactions					UD	UD	UD	NR	UD
12	Technology demonstration of large-scale photo-electrochemical system for solar hydrogen production		UD			ET	UD	UD	NR	UD
13	Low temperature catalytic methane decomposition for COx-free hydrogen production		UD			UD	UD	UD	UD	UD
14	Towards local circular economy: biomass-based pyrogasification process for the production of green hydrogen		UD			NR	UD	UD	ET	UD
15	OSOD - 1 step process hydrogen generator for highly efficient, safe and cost competitive production and storage of hydrogen		UD			NR	UD	ET	NR	UD
16	100 MW Green hydrogen production in a replicable and scalable industrial hosting environment		ET			UD	UD	UD	ET	UD
17	Game changer in high temperature steam electrolysers with novel tubular cells and stacks geometry for pressurized hydrogen production		UD			UD	UD	ET	ET	UD
18	BIOgas membrane reformer for deceNtralIzed hydrogen produCtiOn		UD			NR	UD	UD	NR	UD
19	Multimegawatt high-temperature electrolyser to generate green hydrogen for production of high-quality biofuels		UD			UD	UD	UD	ET	UD
20	Industrial electrolyser for large-scale on-site renewable hydrogen production for manufacturing industry		ET			NR	UD	ET	ET	UD
21	First small-scale deployment (fsd) of a pre-commercial plant based on photoelectrocatalytic technology for hydrogen production		ET			UD	UD	UD	NR	UD
NB: BC = BAT candidate; UD= Under development, ET = emerging technique; NR = not relevant.										

4.10 ANNEX 10: Compiled list of proposed KEIs and additional information for emissions to air

Matrix –Proposed KEI and additional information for emissions to air vs LVIC production processes

Substance/ Parameter / Production/ process		Cl_2	CO_2	Dust	H_2S	HCl	HF	N_2O	NH_3	NO_x	P_2O_5 equivalent	SO_2	SO_3/ H_2SO_4	Metals	TOC/VOC	CO	CH_4
Ammonia				X	X				X	X						X	X
Hydrofluoric acid				X			X					X					
Nitric acid								X	X	X							
Phosphoric acid				X			X										
Sulphuric acid					X					X		X	X				
Inorganic phosphates				X		X	X				X						
Sodium carbonate (i.e. soda ash)			X	X					X	X		X				X	
Calcium chloride				X		X				X							
Sodium chlorate		X		X													
Calcium carbide				X						X						X	
Carbon black				X						X		X		X	X	X	
TiO_2	Chloride route	X		X		X				X						X	
	Sulphate route			X	X					X		X					
Ferrous sulphate		X		X						X		X					
Sodium silicate				X		X	X			X		X					
Synthetic amorphous silica		X		X		X				X					X	X	
AN and CAN				X			X		X								
NPK and CN				X		X	X		X	X							
Superphosphates				X		X	X		X								
Urea and UAN				X					X								

X: KEI initial EIPPCB proposal

X: KEI new EIPPCB proposal

X: investigate with data if KEI

X: collect data as contextual information

4.11 ANNEX 11: Compiled list of proposed KEIs for emissions to water

Matrix –Proposed KEIs for emissions to water vs LVIC production processes

Production/process \ Substance/Parameter	Total Phosphorus	Total inorganic nitrogen	TSS	Chlorides (as total)	Sulphates	Fluorides	Cyanide	Sulphite	Ammonium	Calcium	Sodium	Hg, Cd	Cr, Ni, Cu, Zn	As, Mn, Pb, Ti, V
Ammonia		X												
Hydrofluoric acid			X		X	X								
Nitric acid		X												
Phosphoric acid	X					X						X	X	
Sulphuric acid												X	X	X
Inorganic phosphates(1)	X													
Sodium carbonate (i.e. soda ash)		X	X	X					X	X	X	X	X	X
PCC			X											
Calcium chloride			X											
Sodium chlorate	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium carbide							X	X						
Carbon black	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TiO_2 Chloride route			X	X								X	X	X
TiO_2 Sulphate route			X		X							X	X	X
Ferrous sulphate			X		X							X	X	X
Sodium silicate	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Synthetic amorphous silica				X										
AN and CAN		X												
NPK and CN	X	X		X		X						X	X	
Superphosphates	X	X				X						X		X
Urea and UAN		X												

X: KEI initial EIPPCB proposal
X: KEI new EIPPCB proposal
X: investigate with data if KEI

(1) Only feed phosphates – feed-grade DCP product.