Overview of the review process for the chemical BREFs – LVIC-S and CWW

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BAT Reference Document (BREF)	Issue date	Current Status
Horizontal chemical BREF		
Common WW&WG Treatment/Management in the Chemical Sector (CWW) **Under review**	Feb.2003	**D2 issued 15/07/11**
Organic chemical sector BREFs		
Large Volume Organic Chemicals (LVOC) **Under review**	Feb.2003	**D1 in late 2011**
Organic Fine Chemicals (OFC)	Aug.2006	-
Polymers (POL)	Aug.2007	-
Inorganic chemical sector BREFs		
Chlor-alkali Manufacturing Industry (CAK) **Under review**	Dec.2001	**D1 in late 2011**
Speciality Inorganic Chemicals (SIC)	Aug.2007	-
Large Volume Inorg.Chem.-Solid&Others (LVIC-S)	Aug.2007	-
Large Volume Inorg.Chem.-Amm., Acid&Fert. (LVIC-AAF)	Aug.2007	-

Organic Fine Chemicals (OFC) BREF (August 2006)

- Focuses on the batch manufacture of organic chemicals in multipurpose plants.
- The BREF covers following sections of Annex I of the IED:

  - **Section 4.1j**. Production of dyes and pigments
  - **Section 4.4**. Production of plant protection products and biocides
  - **Section 4.5**. Production of pharmaceutical products (chemical and biological processes)
  - **Section 4.6**. Explosives

Organic Fine Chemicals (OFC) BREF (August 2006)

- Following the same theme of 'batch manufacture in multipurpose plants' the following categories of chemicals are addressed although not explicitly named in Annex I of the IED:
  - Organic intermediates
  - Specialised surfactants
  - Flavours, fragrances, pheromones
  - Plasticisers
  - Vitamins (belonging to pharmaceuticals)
  - Optical brighteners (belonging to dyes and pigments)
  - Flame-retardants

Polymers (POL) BREF (August 2007)

- Focuses on the production of polymeric materials in plants on an industrial scale.
- The BREF covers following sections of Annex I of the IED:

  - **Section 4.1b**. Oxygen-containing hydrocarbons such as alcohols, aldehydes, ketones, carboxylic acids, esters and mixtures of esters, acetates, ethers, peroxides and epoxy resins
  - **Section 4.1h**. Plastic materials (polymers, synthetic fibres and cellulose-based fibres)
  - **Section 4.1i**. Synthetic rubbers

Chlor-alkali manufacturing industry (CAK) BREF (Dec. 2001) – under review

- The BREF covers following sections of Annex I of the IED:
  - **Section 4.2a**. Chlorine
  - **Section 4.2c**. Potassium hydroxide and sodium hydroxide

Speciality Inorganic Chemicals (SIC) BREF (Aug. 2007)

For the purpose of the SIC BREF, '**speciality inorganic chemical**' is taken to mean an inorganic substance manufactured industrially, by chemical processing, generally in relatively small quantities, according to specifications (i.e. purity) tailored to meet the particular requirements of a user or industry sector (e.g. pharmaceutical).

Speciality Inorganic Chemicals (SIC) BREF (Aug. 2007)

- To avoid duplication of information with the LVIC-S BREF, criteria was set to differentiate between the two BREFs

Criteria	LVIC	SIC
Volume of production*	Usually high	Usually low
Size of investment to build a production plant	Very high	Medium
Product description	Formula	Formula + effect, purity, formulation
Product differentiation from competition	No	Yes – often the speciality product is sold on performance
Applications	Often a large number of applications or very high volume applications	Often only a few applications or highly specialised
Driver for selling to customers	Price	Quality/price
Raw material used	Often a mineral	Often a chemical to be reprocessed and refined
R&D objective	To improve the economics of the process	To create new tailored applications
Integration of production	Vertical, often produced at the source of the mineral raw material	Often produced on an LVIC site as a complementary production
Who makes the buying decision?	The customer's purchasing department	The customer's technical/production staff
* UBA proposed an indicative threshold of 100 kt/yr		

Speciality Inorganic Chemicals (SIC) BREF (Aug. 2007)

- The BREF covers following six families of substances:
  - Speciality inorganic pigments
  - Silicones
  - Phosphorus compounds (PCl3, POCl3, PCl5)
  - Inorganic explosives
  - Cyanides (NaCN, KCN)
  - Soluble inorganic salts of nickel (NiSO4, NiCl2, NiCO3, Ni(NO3)2)

Large Volume Inorganic Chemicals-Ammonia, Acid and Fertilisers (LVIC-AAF) BREF (Aug. 2007)

- The BREF covers following sections of Annex I of the IED:

  - **Section 4.2a**. Ammonia, hydrogen fluoride
  - **Section 4.2b**. Hydrofluoric acid, phosphoric acid, nitric acid, sulphuric acid, oleum
  - **Section 4.3**. Phosphorus-, nitrogen- or potassium-based fertilisers (simple or compound fertilisers)

- Forum decision on the 'Strategy to review the chemical BREFs' dated March 2007 (http://eippcb.jrc.es/ief/)

  - Addresses possible gaps in terms of scope and technical issues
  - List of chemical substances/processes to be considered for the review of the chemical BREFs (to guide the TWGs)
  - 'Priority 1' substances – Forum members considered that these have to be included in the first review of a chemical BREF
  - 'Priority 2' substances – should be considered by the relevant TWG for inclusion in the first review of a chemical BREF

BAT Reference Document for Large Volume Inorganic Chemicals – Solids and Others (LVIC-S)

August 2007

Scope of the LVIC-S BREF (August 2007)

- Activities covered in **Section 4.2** (i.e. production of inorganic chemicals) of Annex I of the IED, in particular:

  - **Section 4.2d**. Salts, such as ammonium chloride, potassium chlorate, potassium carbonate, sodium carbonate, perborate, silver nitrate
  - **Section 4.2e**. Non-metals, metal oxides or other inorganic compounds such as calcium carbide, silicon, silicon carbide

Scope of the LVIC-S BREF (August 2007)

'*A homogeneous and strictly defined LVIC-S industry does not really exist, and there no clear borderlines between the four inorganic chemical industry groups*'

Criteria used for the selection of the processes covered

- Scale and economic importance of the production
- Number of plants and their distribution in different Member State
- Impact of a given industry on the environment
- Accordance of the industrial activities with the structure of Annex I
- Representativeness for a wide range of technologies applied in the LVIC-S industry
- Validated data and information on LVIC-S products sufficient to formulate 'Techniques to consider for the determination of BAT' and to draw BAT conclusions

LVIC-S products covered by the LVIC-S BREF (Aug. 2007)

- 5 products at '**cornerstone**' level (Chapter 2 to Chapter 6)
- 17 products at '**selected illustrative**' level (addressed at a lesser level of detail in Chapter 7)

LVIC-S BREF (Aug. 2007) – 'cornerstone' products

1. **Soda ash** (sodium carbonate, including sodium bicarbonate)
2. **Titanium dioxide** (chloride and sulphate process route)
3. **Carbon black** (rubber and speciality grades)
4. **Synthetic amorphous silica** (pyrogenic silica, precipitated silica, and silica gel)
5. **Inorganic phosphates** (detergent, food and feed phosphates)

LVIC-S BREF (Aug. 2007) – 'selected illustrative' products

1. Aluminium fluoride
2. Calcium carbide
3. Carbon disulphide
4. Ferrous chloride
5. Copperas and related products
6. Lead oxide
7. Magnesium compounds
8. Sodium silicate
9. Silicon carbide
10. Zeolites
11. Calcium chloride
12. Precipitated calcium carbonate
13. Sodium chlorate
14. Sodium perborate
15. Sodium percarbonate
16. Sodium sulphite and related products
17. Zinc oxide

LVIC-S BREF (Aug. 2007) – Example BAT conclusions for soda ash plants with Solvay process

1. Total consumption of salt in the raw brine 1.5-1.7 tonne NaCl per tonne of soda ash.
2. Total energy consumption in the production of soda ash 9.7-13.6 GJ per tonne of dense soda ash produced.
3. For dry gas streams, apply bag filters to achieve a total dust emission level to air of <5-20 mg/Nm3.
4. For wet gas streams, apply wet scrubbers to achieve a total dust emission level to air of <25-50 mg/Nm3.

Review of the LVIC-S BREF (Aug.2007)

Substances proposed to be included in the LVIC-S BREF by the 'Strategy to review the chemical BREFs' (March 2007)

- Four 'Priority 1' substances – Forum members considered that these have to be included in the first review of a chemical BREF
- Six 'Priority 2' substances – should be considered by the relevant TWG for inclusion in the first review of a chemical BREF

- Proposed 'Priority 1' substances for their inclusion in the LVIC-S BREF
  - Aluminium chloride (AlCl3)
  - Aluminium sulphate (Al2(SO4)3)
  - Chromium compounds
  - Ferric chloride (FeCl3)

- Proposed 'Priority 2' substances for their inclusion in the LVIC-S BREF

  - Potassium carbonate (K_2CO_3)
  - Potassium chlorate ($KClO_3$)
  - Potassium sulphate (K_2SO_4)
  - Sodium sulphate (Na_2SO_4)
  - Hydroxylamine (NH_2OH)
  - Ammonium chloride (NH_4Cl)

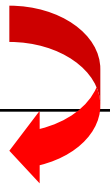
BAT Reference Document for Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector (CWW)

February 2003

Under revision –
Second draft of the reviewed CWW BREF issued on 15 July 2011

Workflow for the revision of the CWW BREF

Main steps	Date
Original CWW BREF	February 2003
TWG reactivation and call for wishes	April 2008
Kick-off meeting	June 2008
Draft 1	October 2009
Draft 2	July 2011
Final TWG meeting	Foreseen in 2012



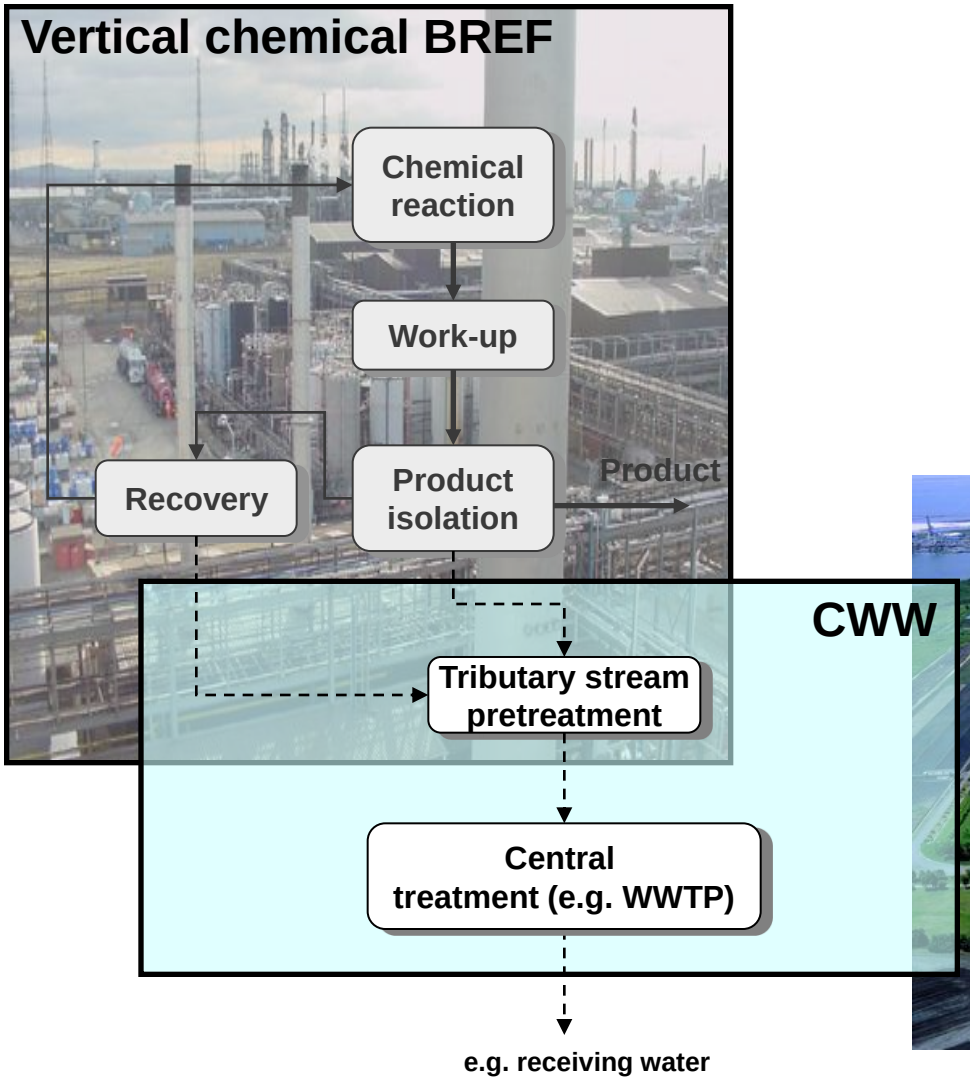
IPPC to IED

Scope of the revised CWW BREF (July 2011) - Draft

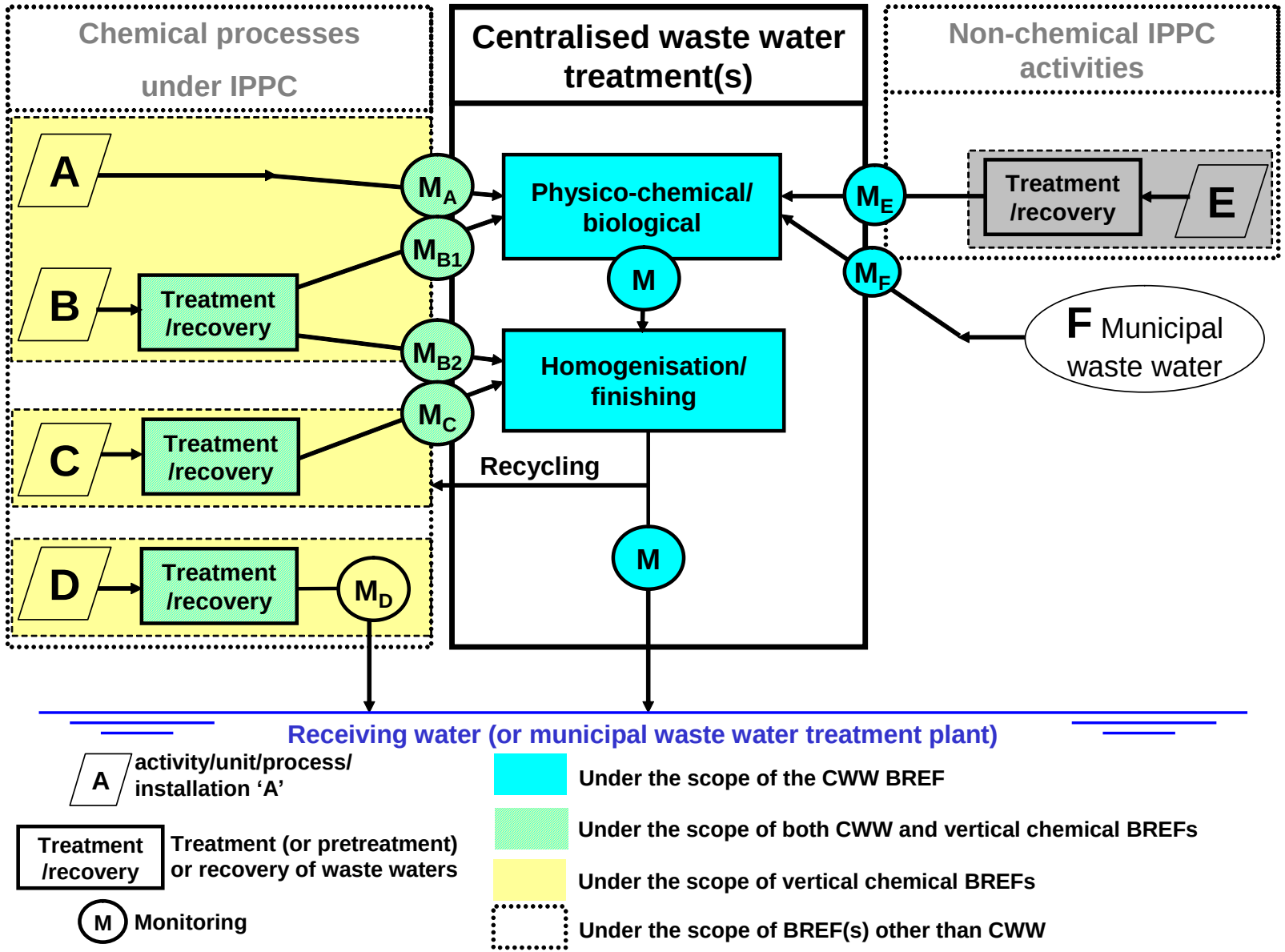
The BREF covers chemical sites where activities specified in **Section 4** (i.e. chemical industry) of Annex I of the IED are operated.

Scope of the revised CWW BREF (July 2011) - Draft

- The BREF covers the following activities operated at chemical sites:
  - Collection and treatment of waste water streams in central waste water pre-treatment and/or treatment plants. Such plants may also treat waste water streams generated on-site and/or off-site from
    - Activities specified in Section 1.2 (i.e. refining of mineral oil and gas) of Annex I of the IED
    - Other activities that fall under Annex I of the IED
    - Other activities that do not fall under Annex I of the IED
  - Treatment of waste water sludge (with the exception of incineration)
  - Collection and treatment in central waste gas treatment plants of waste gas streams


Vertical chemical BREF
Chemical reaction
Work-up
Recovery
Product isolation
Product
CWW
Tributary stream pretreatment
Central treatment (e.g. WWTP)
e.g. receiving water

Scope of CWW


Chemical processes under IPPC
Centralised waste water treatment(s)
Non-chemical IPPC activities
A
B
C
D
Treatment /recovery
Treatment /recovery
Treatment /recovery
Treatment /recovery
M_A
M_{B1}
M_{B2}
M_C
M_D
Physico-chemical/ biological
M
Homogenisation/ finishing
Recycling
M
M_E
M_F
Treatment /recovery
E
F Municipal waste water
Receiving water (or municipal waste water treatment plant)
A activity/unit/process/ installation 'A'
Treatment /recovery Treatment (or pretreatment) or recovery of waste waters
M Monitoring
Under the scope of the CWW BREF
Under the scope of both CWW and vertical chemical BREFs
Under the scope of vertical chemical BREFs
Under the scope of BREF(s) other than CWW

Scope of the revised CWW BREF (July 2011) - Draft

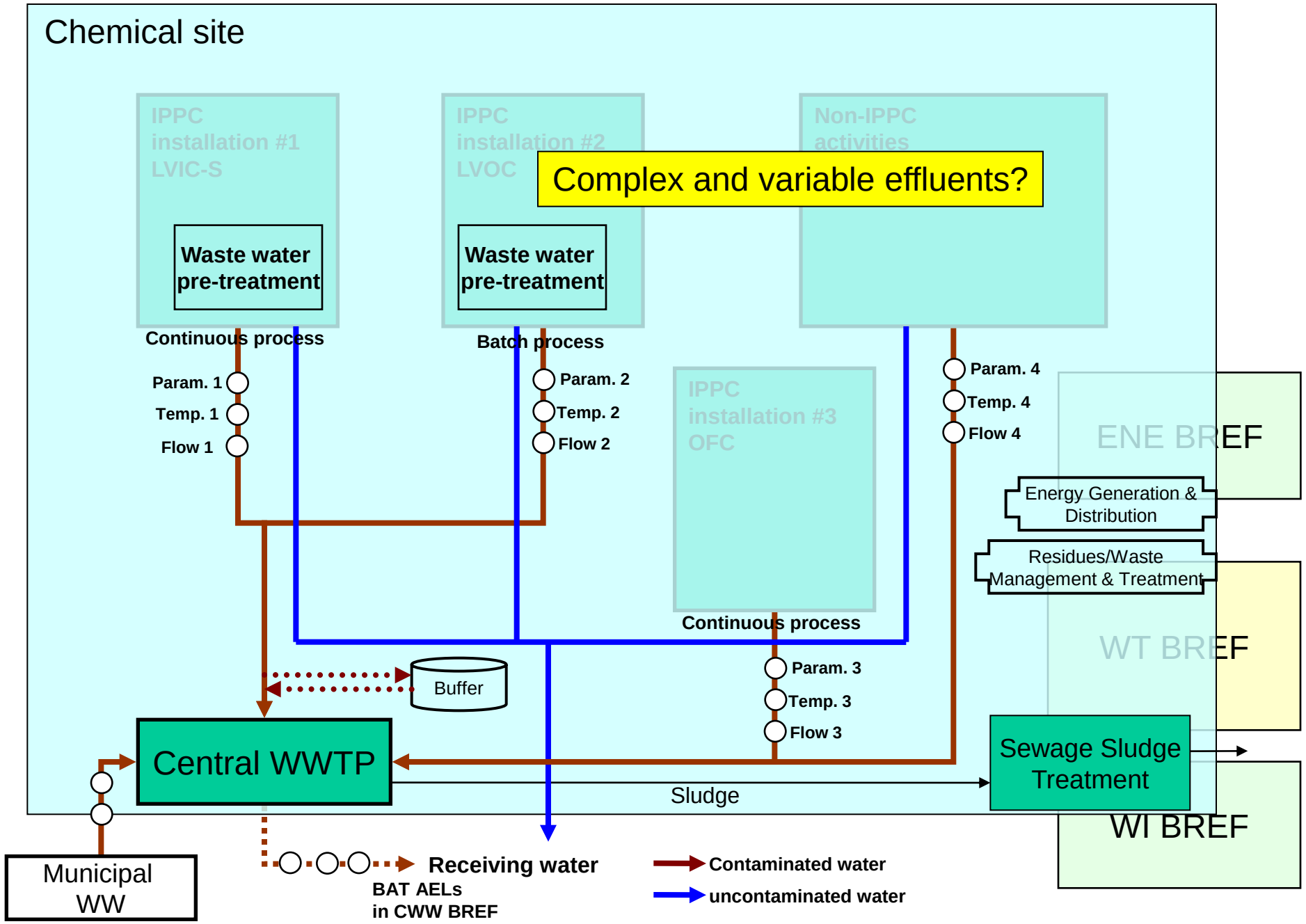
- The BREF covers the following techniques:
  - Waste water and waste gas treatment techniques that are **'commonly'** used and applied in the chemical industry (including emission and consumption levels associated with these techniques, their technical applicability and information on costs).
  - '**Commonly**' indicates that the techniques are frequently used or are considered applicable within the chemical industry. Techniques applied at only one chemical site and/or designed for only one chemical production process are generally not covered.

Scope of the revised CWW BREF (July 2011) - Draft

- The BREF additionally covers:
  - Environmental issues generic to the whole chemical industry (i.e. Section 4 of the Annex I of the IED) including, but not limited to:
    - Environmental management systems
    - Collection, use and treatment of contaminated rainwater and fire-fighting water
    - Energy efficiency measures related to waste water treatment and waste gas operations

Scope of the revised CWW BREF (July 2011) - Draft

- The scope of the BREF **does not** cover:
  - Process-integrated measures which are specific to particular production activities covered by Section 4 of Annex I of the IED (this falls under the scope of the seven vertical chemical BREFs)
  - Treatment of waste water sludge (with the exception of incineration) outside of chemical sites (this falls under the scope of the Waste Treatment (WT) BREF)
  - Incineration of waste water sludge (this falls under the scope of the Waste Incineration (WI) BREF)
  - Urban waste water treatment plants covered by Council Directive 91/271/EEC concerning urban waste water treatment


Chemical site
IPPC installation #1 LVIC-S
Waste water pre-treatment
Continuous process
Param. 1
Temp. 1
Flow 1
IPPC installation #2 LVOC
Waste water pre-treatment
Batch process
Param. 2
Temp. 2
Flow 2
Complex and variable effluents?
Non-IPPC activities
Param. 4
Temp. 4
Flow 4
IPPC installation #3 OFC
Continuous process
Param. 3
Temp. 3
Flow 3
Buffer
Central WWTP
Sewage Sludge Treatment
Sludge
Municipal WW
Receiving water
BAT AELs in CWW BREF
Contaminated water
uncontaminated water
ENE BREF
Energy Generation & Distribution
Residues/Waste Management & Treatment
WT BREF
WI BREF

Structure of the revised CWW BREF (July 2011)

Chapter 1 – General information

Chapter 2 – Consumption and emission levels of central waste water treatment plants

Chapter 3 – Common techniques to consider in the determination of BAT

Chapter 4 – Best available techniques (BAT) conclusions

Chapter 5 – Emerging techniques

Chapter 6 – Concluding remarks and recommendations for future work

Structure of the revised CWW BREF (July 2011)

Chapter 3 – Common techniques to consider in the determination of BAT

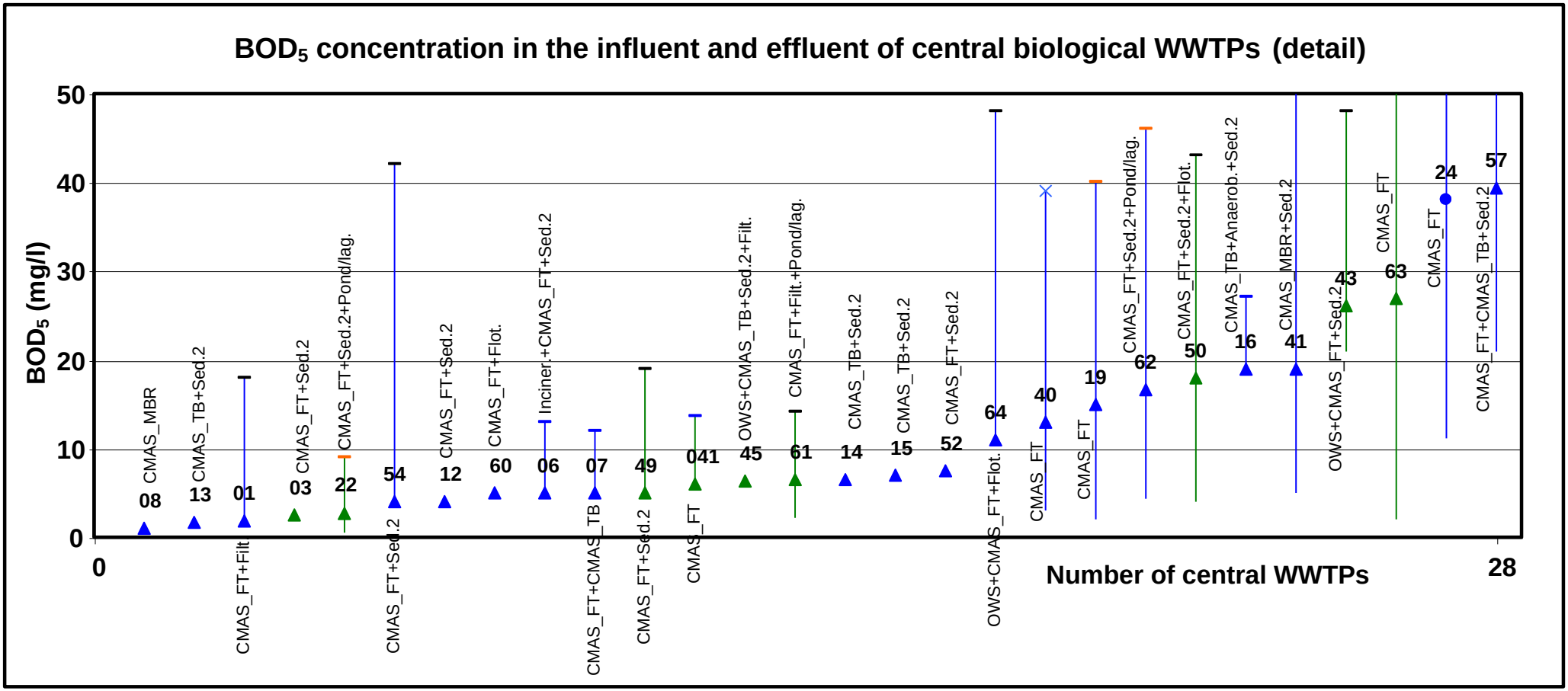
- **Section 3.1.** Waste water/waste gas management
- **Section 3.2.** Individual treatment techniques
- **Section 3.3.** Combined treatment techniques
- **Section 3.4.** Techniques to prevent/reduce diffuse VOC emissions
- **Section 3.5.** Odour management
- **Section 3.6.** Waste management
- **Section 3.7.** Energy management
- **Section 3.8.** Other common techniques

Structure of the revised CWW BREF (July 2011)

Chapter 2 – Consumption and emission levels of central waste water treatment plants (WWTPs)

- 63 questionnaires on central WWTPs arising from 11 Member States
- Key parameters analysed
  - Chemical oxygen demand (COD), total organic carbon (TOC), biochemical oxygen demand (BOD)
  - Total suspended solids (TSS)
  - Adsorbable organically bound halogens (AOX)
  - Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn)
  - Nitrogen and phosphorus compounds
  - Phenols
  - Chlorides, sulphates
  - Toxicity

BOD5 concentration in the effluent of central WWTPs (reported yearly average values)



From data collection to BAT associated emission levels (BAT-AELs)

- Data collection done under the IPPC regime

- Challenge is to meet the IED requirements:
  - Averaging periods
  - Monitoring regime
  - 'Normal operating conditions' vs. 'other than normal operating conditions'

Structure of the revised CWW BREF (July 2011) - Draft

Chapter 4 – Best available techniques (BAT) conclusions

Section 4.1. Environmental management systems
Section 4.2. Environmental management at chemical sites
Section 4.3. Energy management at chemical sites
Section 4.4. Waste management at chemical sites
Section 4.5. Prevention/reduction of diffuse VOC emissions from chemical plants at chemical sites
Section 4.6. Prevention/reduction of odour emissions at chemical sites
Section 4.7. Prevention/reduction of noise emissions at chemical sites
Section 4.8. Waste water and waste gas collection systems at chemical sites
Section 4.9. Waste water management and treatment chemical sites
Section 4.10. Waste gas management and treatment at chemical sites
Section 4.11. Monitoring of final effluent discharge from central WWTPs

Example Draft BAT conclusions of the revised D2 of the CWW BREF (July 2011)

Section 4.9. Waste water management and treatment at chemical sites (BAT 25 to BAT 43)

- BAT conclusion for process-integrated measures
- BAT conclusions for central pre-treatment of tributary waste water streams at chemical sites
- BAT conclusions for central waste water treatment at chemical sites

→ the BAT associated emission levels (BAT-AELs) for final waste water discharge from central waste water treatment plants

Parameter	Draft BAT-AEL (yearly average) (mg/L)
Biochemical oxygen demand (BOD5)	2 – 20
Chemical oxygen demand (COD) (1)	10 – 125
Total organic carbon (TOC) (1)	5 – 50
Total suspended solids (TSS)	2 – 20
Total nitrogen (as total bound nitrogen, TNb) (2)	3 – 25
Total nitrogen (as total inorganic nitrogen) (2)	2 – 15
Ammoniacal nitrogen (as N)	0.1 – 5

(1) Either TOC or COD is to be monitored.

(2) Either TNb or total inorganic nitrogen is to be monitored.

Thank you for your attention

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