MINAMATA ONLINE

SEASON 1 - 2020

Implementation Review and Support: Article 8 Emissions

MINAMATA CONVENTION ON MERCURY

This session will outline how the Minamata Convention sets out obligations with regard to the control and reduction of mercury and mercury compounds to the atmosphere (Article 8 and Annex D). The session will describe the Guidance on Best Available Techniques and Best Environmental Practices adopted at COP-1 and will provide some current information on implementation of Article 8.

SPEAKERS

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Thursday, 22 October 2020

10h00-11h00 CEST

16h00-17h00 CEST

Please register for the WebEx session using the links above.

Check the Minamata Online calendar
for other upcoming events and the presentations and video recording from the previous sessions.

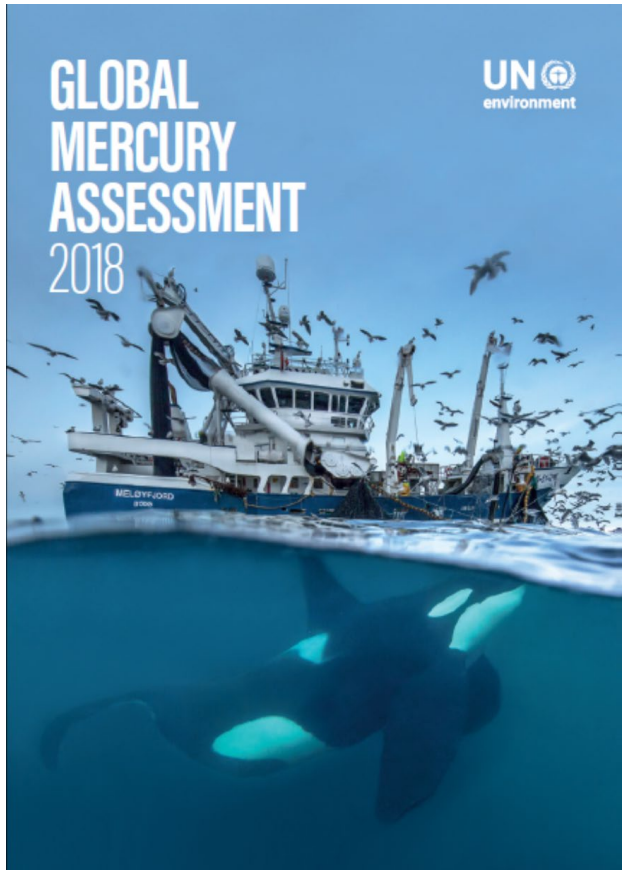
Implementation review and support

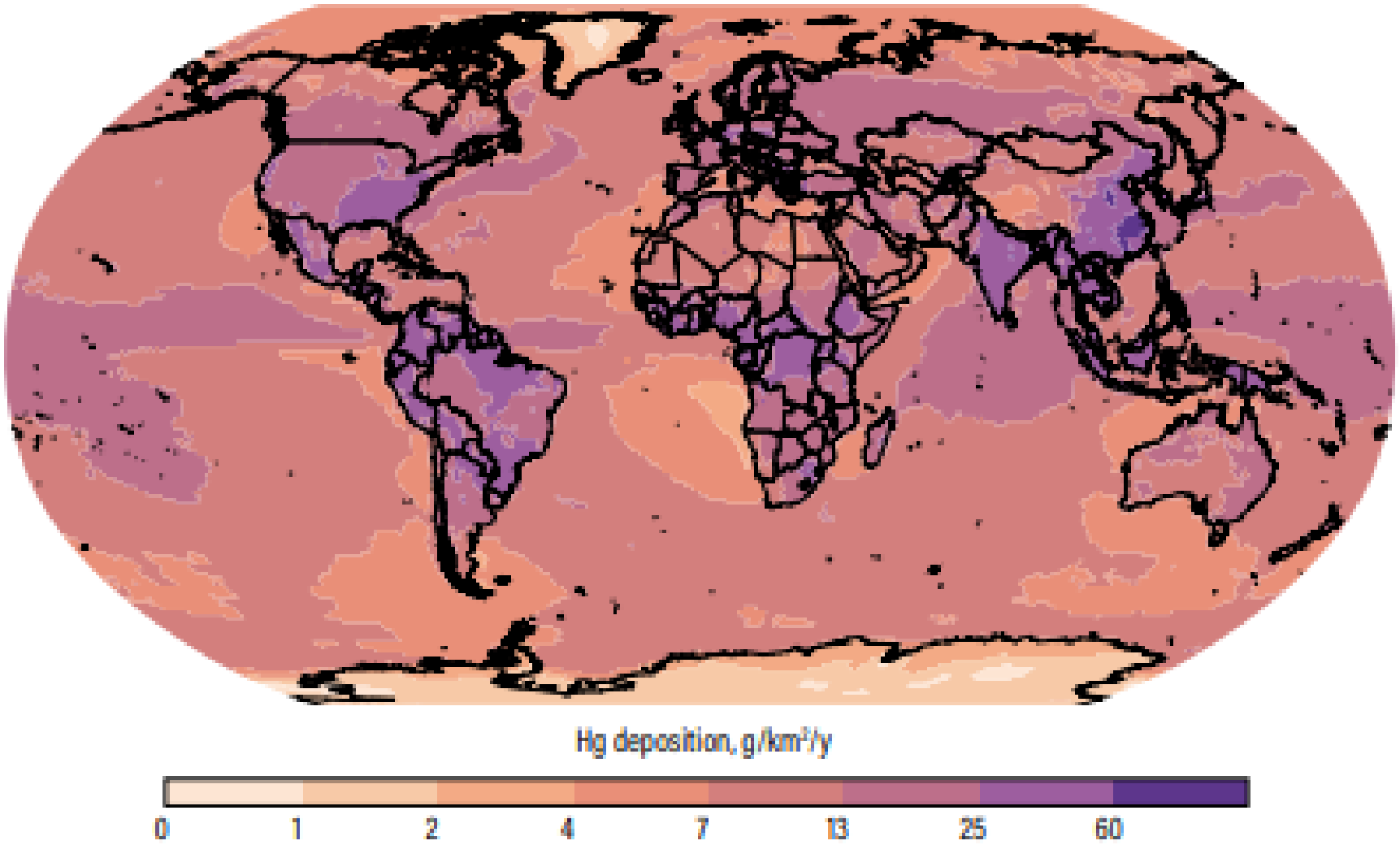
Implementation review and support

Information Session

Article 8 and Annex D: Emissions

GLOBAL MERCURY DEPOSITION (2015)

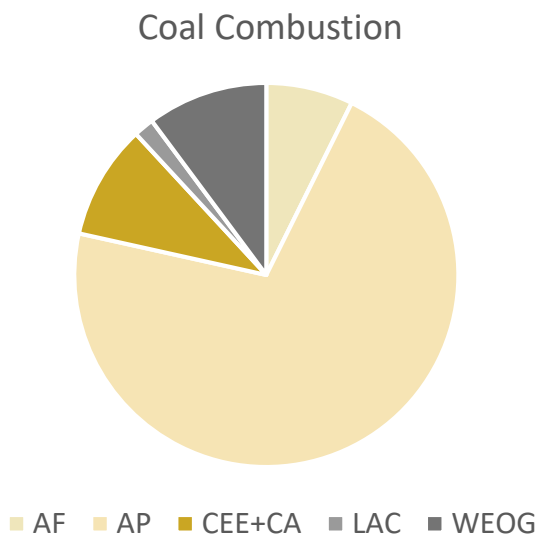


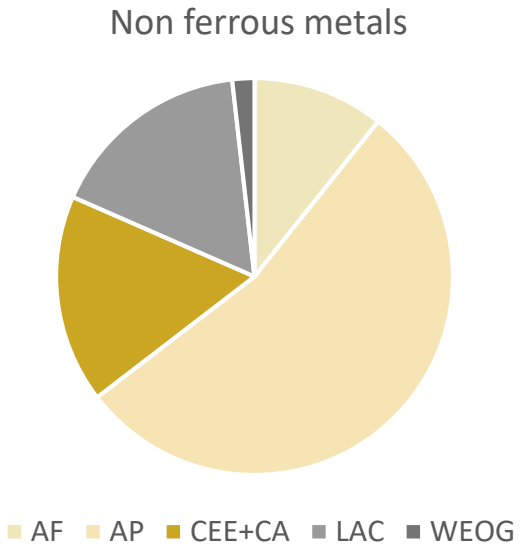


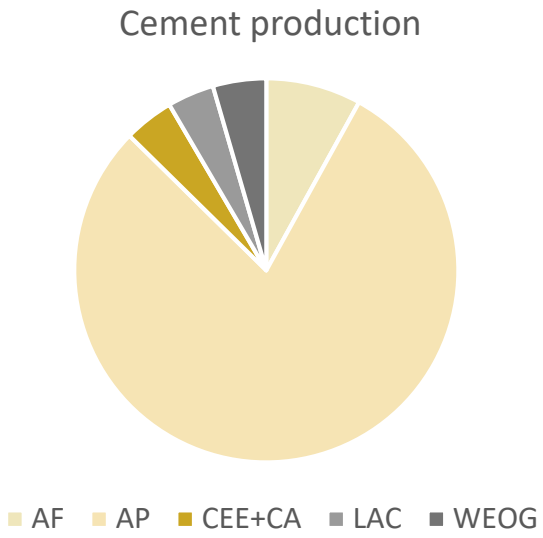
Global Mercury Assessment 2018 (2015 estimate, tonnes)

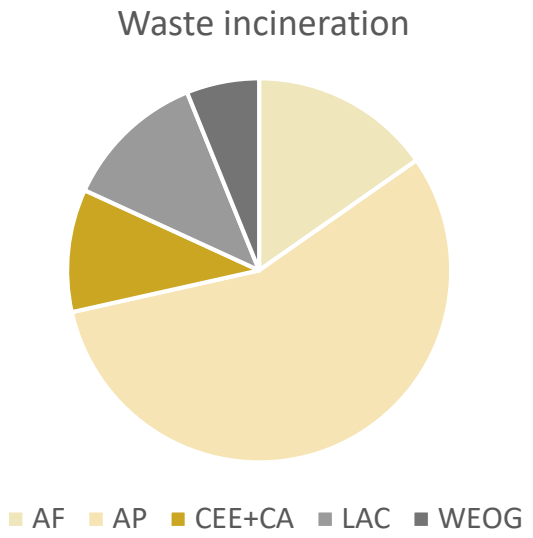
Total mercury emission 2,224

Coal combustion	474
Non-ferrous metals	327
Cement production	233
Waste incineration	15







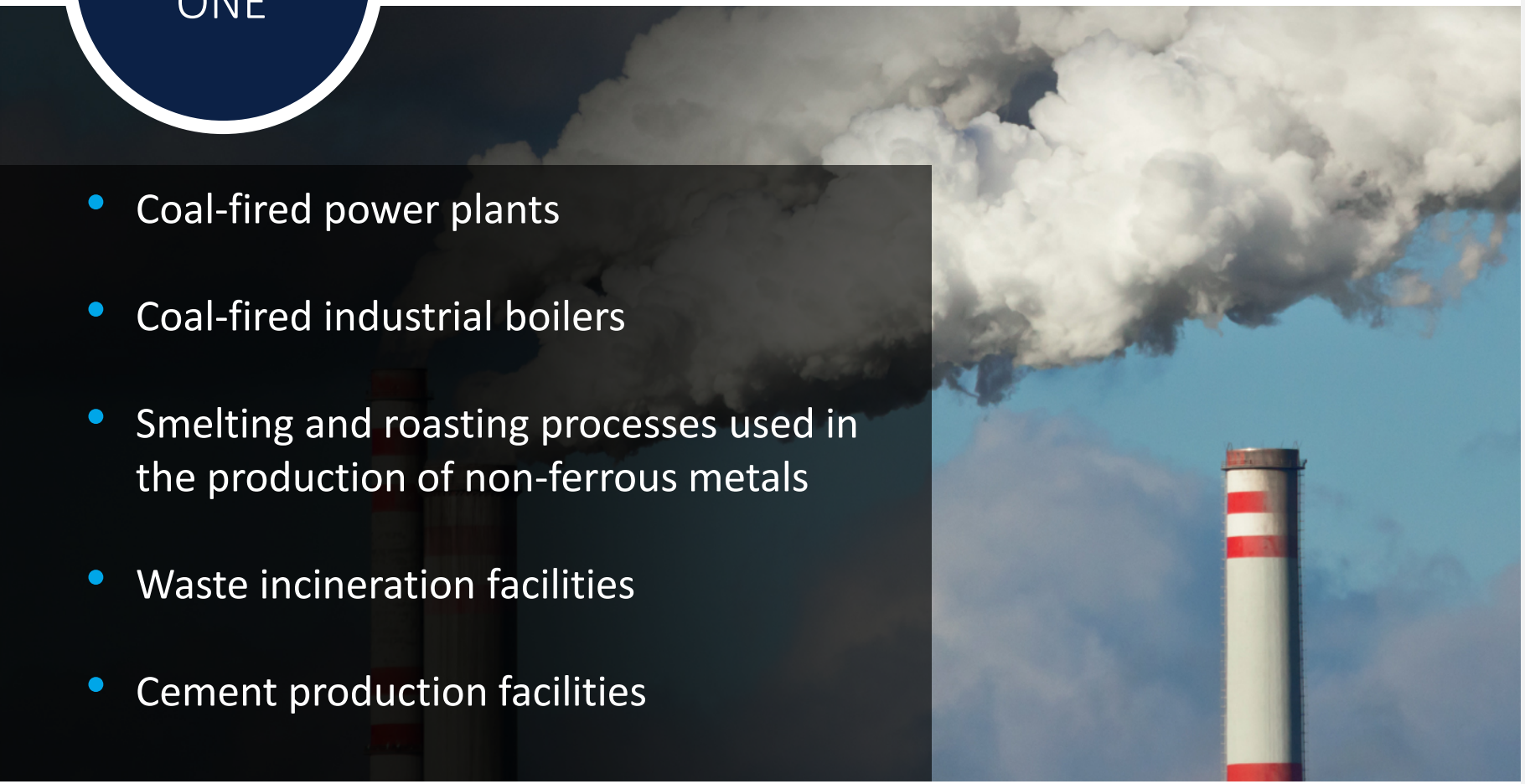


THIS INFORMATION SESSION WILL COVER

- **OVERVIEW: WHY CONTROLLING EMISSIONS TO THE AIR IS IMPORTANT**
- **ARTICLE 8 (AIR EMISSIONS) AND ANNEX D**
  - Overview and Source Categories
  - Subcategories
  - “Relevant Sources” within Categories
  - New Source Controls
  - Existing Source Controls
  - Inventories
  - Reporting to COP
  - Summary
- **GUIDANCE ON BEST AVAILABLE TECHNIQUES/BEST ENVIRONMENTAL PRACTICES (BAT/BEP)**
  - Other guidance
  - Additional Resources
- **CURRENT INFORMATION ON IMPLEMENTATION AND CHALLENGES**

SECTION ONE

ARTICLE 8 EMISSIONS AND ANNEX D



- Coal-fired power plants
- Coal-fired industrial boilers
- Smelting and roasting processes used in the production of non-ferrous metals
- Waste incineration facilities
- Cement production facilities

"Article 8 concerns controlling and, where feasible, reducing emissions of mercury and mercury compounds … to the atmosphere through measures to control emissions from the point sources falling within the source categories listed in Annex D."

OVERVIEW OF ARTICLE 8

Para 3: A Party with relevant sources shall take measures to control emissions……..

- ☑ BAT/BEP or associated ELVs for new facilities
- ☑ Measure(s) selected to control/reduce mercury emissions from existing sources
- ☑ Establish/maintain a mercury emissions inventory

WASTE INCINERATION

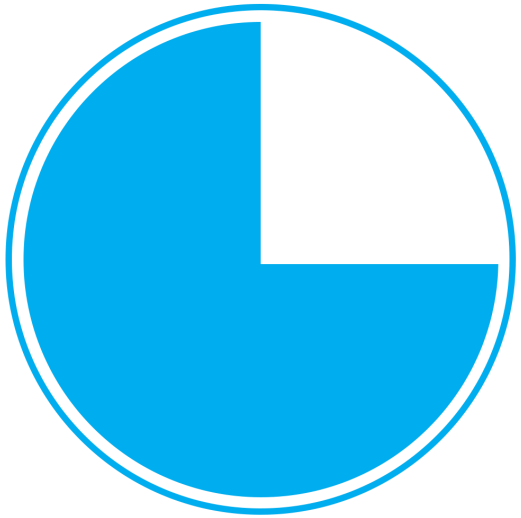
- Medical waste
- Municipal waste
- Hazardous waste
- Sewage sludge

NON-FERROUS METALS

- Pb — Lead
- Zn — Zinc
- Cu — Copper
- Au — Industrial Gold

“RELEVANT SOURCES” WITHIN CATEGORIES

There is an option not to cover all sources within a category, but…



75% COVERAGE OF EMISSIONS

…the sources regulated must account for at least 75% of the emissions within the category.

NEW SOURCE CONTROLS

A source is considered “new” when construction begins one year after the Convention enters into force for the Party.

Deadline for applying controls is five years after entry into force.

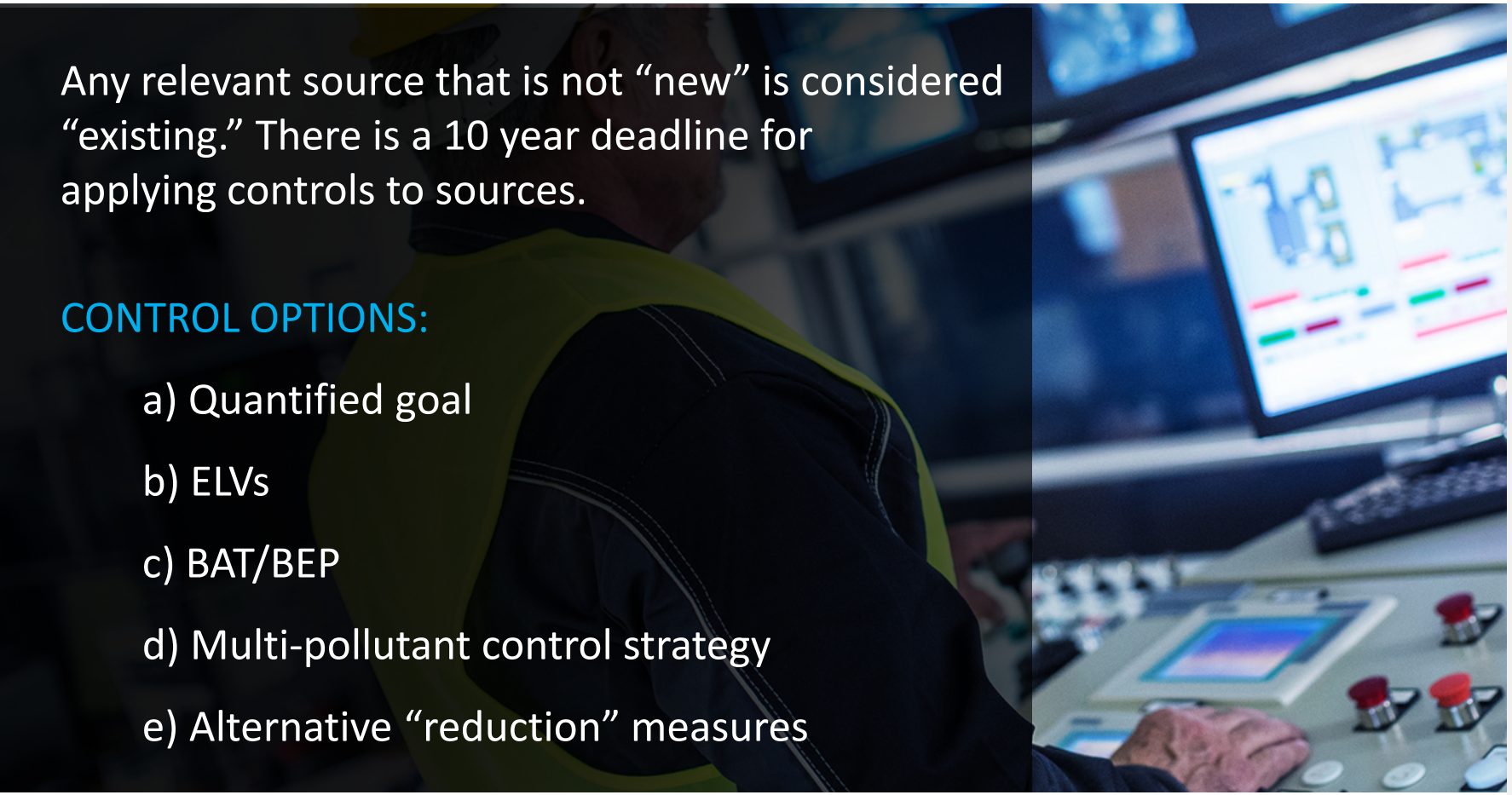
CONTROL OPTIONS:

- BAT/BEP
- “Consistent” emission limit values (ELVs)

Article 8 para 4

For its new sources, each Party shall require the use of best available techniques and best environmental practices (BAT/BEP) to control and reduce emissions, as soon as practicable but no later than five years after the date of entry into force. A Party may use emission limit values that are consistent with the application of best available techniques.

EXISTING SOURCE CONTROLS



Any relevant source that is not “new” is considered “existing.” There is a 10 year deadline for applying controls to sources.

CONTROL OPTIONS:

a) Quantified goal

b) ELVs

c) BAT/BEP

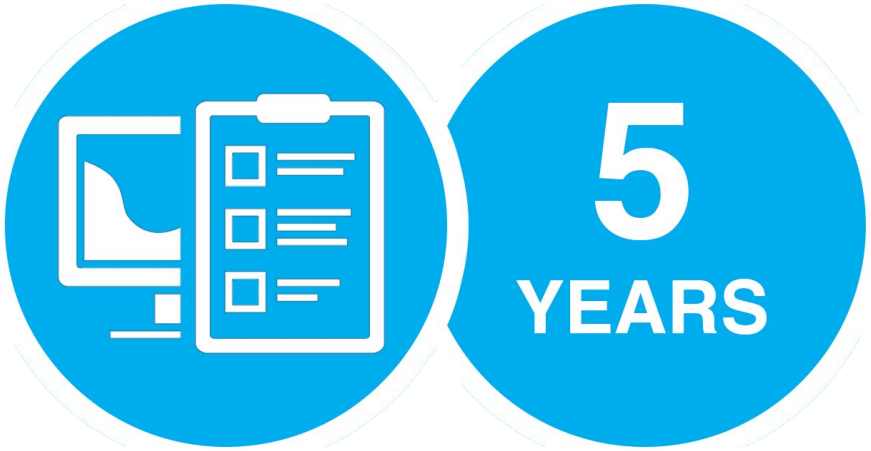
d) Multi-pollutant control strategy

e) Alternative “reduction” measures

Article 8 para 5

For its existing sources, each Party shall include in any national plan, and shall implement, one or more of the following measures, as soon as practicable but no more than ten years after the date of entry into force:

INVENTORIES



Develop emissions inventory within five (5) years

Maintain thereafter

Article 8 para 7

Each Party shall establish, as soon as practicable and no later than five years after the date of entry into force of the Convention for it, and maintain thereafter, an inventory of emissions from relevant sources.

REPORTING TO COP

- Source categories within country
- Control measures chosen
- Progress/effectiveness
- Other details decided at COP 1

SUMMARY

- ☑ BAT/BEP or associated ELVs for new facilities
- ☑ Measure(s) selected to control/reduce mercury emissions from existing sources
- ☑ Establish/maintain a mercury emissions inventory

SECTION TWO

Guidance on emissions within the convention

Article 8 refers to four guidance documents to be adopted by the Conference of the Parties:

- Best Available Techniques and Best Environmental Practices
- Support for Parties in implementing measures for existing sources, in particular guidance on determining goals and setting emission limit values
- Guidance on criteria relating to relevant sources
- Guidance on the methodology on preparing inventories of emissions

Article 8
Emissions

8. The Conference of the Parties shall, at its first meeting, adopt guidance on:

(a) Best available techniques and on best environmental practices, taking into account any difference between new and existing sources and the need to minimize cross-media effects; and

(b) Support for Parties in implementing the measures set out in paragraph 5, in particular in determining goals and in setting emission limit values.

9. The Conference of the Parties shall, as soon as practicable, adopt guidance on:

(a) Criteria that Parties may develop pursuant to paragraph 2 (b);

(b) The methodology for preparing inventories of emissions.

Inventory requirements in Minamata Convention

Article 8(7): Each Party shall establish, as soon as practicable and no later than five years after the date of entry into force, and maintain thereafter, an **inventory of emissions** from relevant sources.

Article 8(11): Each Party shall include information on its implementation of this Article in its reports submitted pursuant to Article 21.

Article 21(2): Each Party shall include in its reporting the information as called for in Articles 3, 5, 7, 8 and 9 of this Convention.

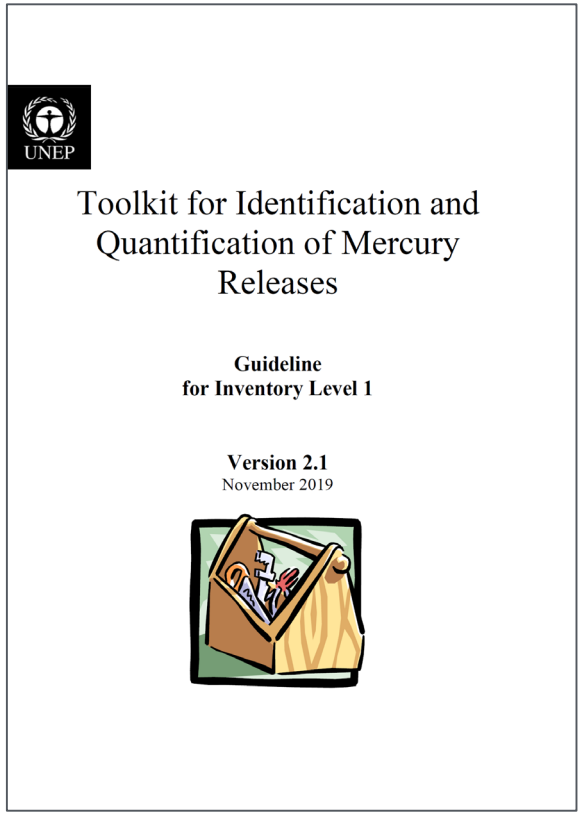
Article 21 reporting obligation (full report) – every four years starting at 31 December 2021.

Guidance on the methodology for preparing inventories of emissions pursuant to Article 8

Methodology to establish an emissions inventory typically involves many or all of the following steps:

- Plan the approach for development of inventory, within available resources, and consider how to collect, handle and review data, including any quality control and quality assurance processes
- Collect existing emissions data as a useful starting point
- Identify relevant sources within each source category
- Establish facility-based emissions reporting requirements
- Collect the emissions reports from facilities on a periodic basis (e.g. annually)
- Develop a database to store the reported emissions data
- Facilitate analysis of the results
- Make the data publicly accessible and searchable.

UNEP inventory toolkit could be a good starting point for parties developing their own emissions inventories.



Guidance on BAT/BEP

Chapter I: Introduction

Chapter II: Common Techniques

Chapter III: Monitoring

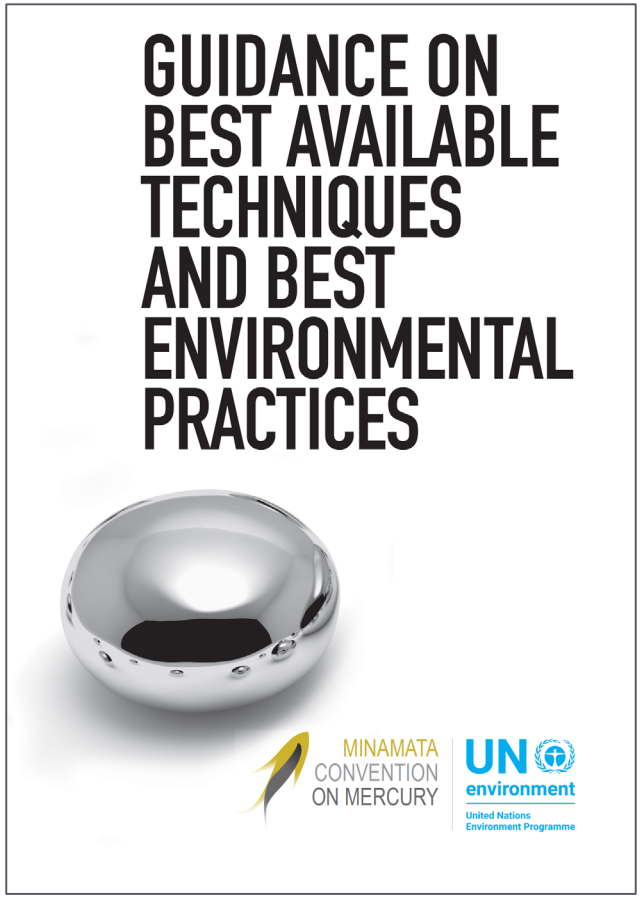
Chapter IV: Coal-fired power plants and coal-fired industrial boilers

Chapter V: Smelting and roasting processes used in the production of non-ferrous metals (lead, zinc, copper and industrial gold)

Chapter VI: Waste incineration facilities

Chapter VII: Cement clinker production facilities

Appendix: New and emerging techniques



Nature of guidance

- It's guidance, to help Parties: it's not mandatory, and it doesn't limit national discretion.
- It doesn't define what is BAT: it provides information about a range of techniques to help Parties make decisions
- Parties' decisions will need to take account of national circumstances
- The guidance reflects the knowledge and information available to the group at the time it was written: the guidance should be a living document, which improves and develops over time.

MC-1/4: Guidance in relation to mercury emissions

The Conference of the Parties,

I

Recognizing the importance of the control of mercury emissions in achieving the objective of the Minamata Convention on Mercury,

Decides to adopt the guidance with regard to article 8, particularly its paragraphs 8 (a) and (b), on best available techniques and on best environmental practices, taking into account any differences between new and existing sources and the need to minimize cross-media effects, and on support for parties in implementing the measures set out in paragraph 5, in particular in determining goals and in setting emission limit values, as put forward by the intergovernmental negotiating committee to prepare a global legally binding instrument on mercury;[3]

II

Recognizing further that some of the control measures described in the guidance may not be available to all parties for technical or economic reasons,

Noting that paragraph 10 of Article 8 of the convention requires the Conference of the Parties to keep the guidance under review, and update it as appropriate, in order to reflect any circumstances not currently fully covered,

Requests parties with experience in using such guidance to provide the secretariat with information on that experience, and the secretariat to compile such information and, in consultation with parties and others, to update the guidance as necessary.

1 INTRODUCTION

1.1 PURPOSE OF DOCUMENT

This document presents guidance related to best available techniques (BAT) and best environmental practices (BEP) to assist parties in fulfilling their obligations under Article 8 of the Minamata Convention on Mercury (hereinafter referred to as "the Convention"), which concerns controlling and, where feasible, reducing emissions of mercury and mercury compounds to the atmosphere from the point sources falling within the source categories listed in Annex D to the Convention. The guidance has been prepared and adopted as required by Article 8: it does not establish mandatory requirements, nor does it attempt to add to, nor subtract from, a party's obligations under Article 8. Paragraph 10 of Article 8 requires parties to take the guidance into account, and requires the Conference of the Parties to keep it under review, and update it as appropriate, in order to reflect circumstances not currently fully covered in the guidance.

In determining BAT, each party will take account of its national circumstances in accordance with the definition of BAT set out in paragraph 2 (b) of Article 2, which explicitly takes into account economic and technical considerations for a given party or a given facility within its territory. It is recognized that some of the control measures described in the present guidance may not be available to all parties for technical or economic reasons. Financial support, capacitybuilding, technology transfer and technical assistance are made available as set out in articles 13 and 14 of the Convention.

BAT/BEP – Definitions (Article 2)

"Best available techniques" means those **techniques that are the most effective to prevent and reduce emissions and releases of mercury** to air, water and land and the impact of such emissions and releases on the environment as a whole, **taking into account economic and technical considerations for a given Party or a given facility** within the territory of that Party. In this context:

(i) "**Best**" means most effective in achieving a high general level of protection of the environment as a whole;

(ii) "**Available**" techniques means, in respect of a given Party and a given facility within the territory of that Party, those techniques developed on a scale that allows implementation in a relevant industrial sector under economically and technically viable conditions, taking into consideration the costs and benefits, whether or not those techniques are used or developed within the territory of that Party, provided that they are accessible to the operator of the facility as determined by that Party; and

(iii) "**Techniques**" means technologies used, operational practices and the ways in which installations are designed, built, maintained, operated and decommissioned;

"Best environmental practices" means the application of the most appropriate combination of environmental control measures and strategies;

BAT/BEP Guidance –Introduction

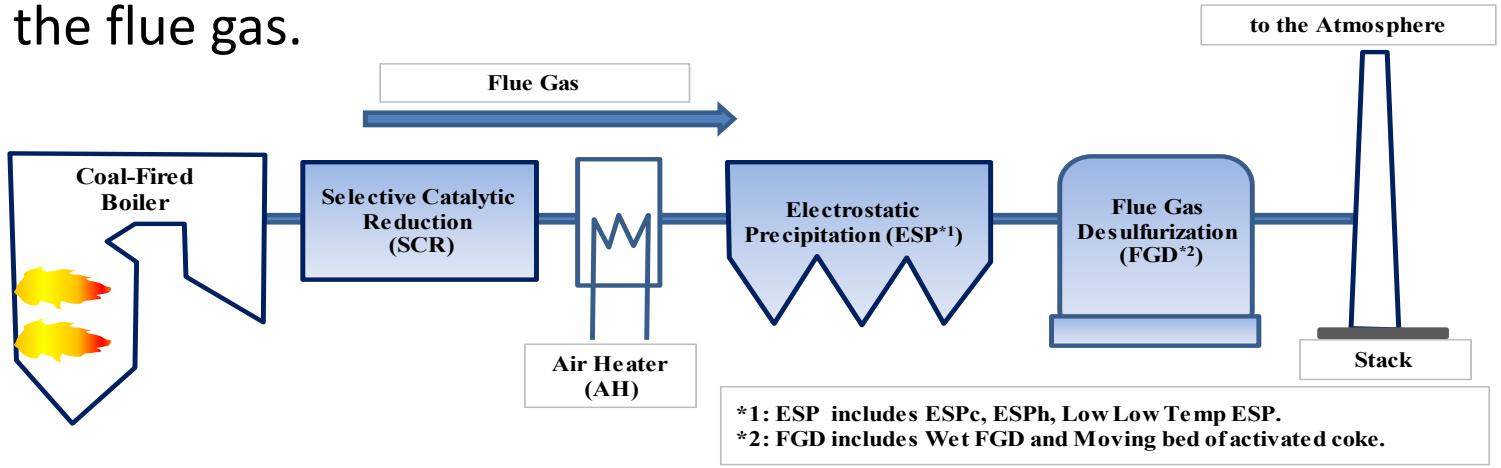
The process for selecting and implementing BAT could be expected to include the following general steps.

- Step 1: establish information about the source, or source category.
- Step 2: identify the full range of options of emission control techniques.
- Step 3: identify technically viable control options.
- Step 4: select the control technique options which are the most effective for the control and reduction of emissions.
- Step 5: determine which of these options can be implemented under economically and technically viable conditions.

Coal-fired power plants and coal-fired industrial boilers

- Removal of mercury prior to combustion
  - Coal washing, selection or blending (does not alone constitute BAT)
- Measures to reduce mercury emissions during combustion
  - Use of a fluidized bed boiler (does not alone constitute BAT)
- Mercury removal by co-benefit of conventional APCSs
  - Combination of SCR, ESP and FGD can remove mercury up to 95% and result a concentration of less than 1 µg/Nm^3 of mercury in the flue gas.
  - Combination of SCR, FF and FGD can remove mercury up to 99% and result a concentration of <0.5 µg/Nm^3 of mercury in the flue gas.

ACPS: Air Pollution Control Systems
SCR: Selective Catalytic Reduction
ESP: Electrostatic Precipitation
FF: Fabric Filter
FGD: Flue Gas Desulfurization



Coal-fired power plants and coal-fired industrial boilers

- Dedicated mercury control technologies
  - Activated carbon injection technology has been adopted for coal-fired power plants in the United States.
  - The operations of activated carbon injection technology in the United States show that the mercury concentration in flue gas after activated carbon injection and fabric filters may be lower than 1 μg/Nm^3.
- BEPs
  - Improving the energy efficiency for whole plant
  - improving the efficiency of APCSs
  - environmentally sound management of the plant
  - environmentally sound management of coal combustion residues

Asia-Pacific workshop on regional workshop on the reduction of mercury emission from coal combustion

- Held in Hanoi, Viet Nam, from 31 Oct to 1 Nov 2019
- Funded by European Commission and China Trust Fund
- Back to back with Multi-pollutant Emission from Coal Workshop and UNEP Global Mercury Partnership
- Participating countries: China, India, Indonesia, Mongolia, Sri Lanka, Thailand and Viet Nam
- Objectives:
  - To understand the applicability and usefulness of the BAT/BEP guidance document and identify needs for further guidance
  - To exchange information on the emission inventories from coal.
  - To share experience in introducing control measures on the mercury emission from coal combustion, and identify opportunities for international cooperation
- Report available on the web

Existing regulations on mercury emission from coal combustion

- China – 0.03mg/m3 (coal PP). Pollution permits. Technical specifications.
- India – 0.03mg/m3 (coal PP)
- Indonesia – 0.03mg/m3. Action plan developed.
- Mongolia – no limit
- Sri Lanka – 0.01mg/m3 (any process), 0.001-0.01mg/m3 for incinerators
- Thailand – no limit for coal. General limit 3mg/m3
- Viet Nam – No limit for coal. 0.5/0.2 mg/m3 for waste incineration.

Smelting and roasting processes used in the production of non-ferrous metals (Pb, Zn, Cu and Au)

BAT

- Boliden-Norzink Process - Based on a wet scrubber using the reaction between mercury(II) chloride and mercury to form mercury(I) chloride (calomel).
- Selenium filters - Selenious acid dried to precipitate red amorphous selenium, which reacts with the mercury in the gas to form HgSe.
- Activated carbon filter beds - Activated carbon adsorpts mercury.
- DOWA Filter Process - Based on the adsorption of mercury onto pumice stones coated with lead sulfide
- Jerritt Process - Based on conversion of elemental mercury to mercury (II) chloride by reaction with dissolve chlorine
- Co-benefit of common air pollution abatement technologies and acif plants in mercury control – bag filters, ESP, scrubbers, combined gas cleaning and acid plants

BEP

- Environmental management systems
- Blending feedstocks to control mercury emissions
- Atmospheric mercury emissions
- Particulate matter control
- Environmentally sound management and disposal of air pollution control wastes

Waste Incineration

- BAT:
  - Pretreatment, waste input and control
  - Incineration process
  - Flue-gas treatment
    - ✓ Dust removal techniques
    - ✓ Wet scrubbing techniques
    - ✓ Activated carbon injection
    - ✓ Boiler bromide addition
    - ✓ Static bed filters
- BEP:
  - Waste management practices
    - ✓ Source separation and recycling
    - ✓ Inspection and waste characterization
    - ✓ Proper handling and storage
    - ✓ Good incineration operating and management practices
    - ✓ Site selection for new installations (to minimize potential risk to public health and environment)
    - ✓ Regular inspection and maintenance
    - ✓ Operator training
  - Prevention of fire risks

Control measures	Reduction efficiency
High efficiency scrubbers with ingredients in scrubber liquor	> 85%
Injection of bromine-containing chemicals into the incineration chamber + Scrubber	> 90%
Activated carbon injection + fabric filters	> 95%

Cement clinker production facilities

- Input Control
  - Use of limit requirements on mercury content in *raw materials and fuels*;
  - Use of a quality assurance system for input materials, especially for waste-derived raw materials and fuels, for the control of mercury content in input materials;
  - Use of input materials with low mercury content when possible, and avoiding the use of waste with high mercury content;
  - Selective mining if mercury concentrations vary in the quarry, when possible;
  - Choice of location for new facilities that takes mercury content in the limestone quarry into account.
- Secondary measures
  - Dust shuttling and collecting the dust instead of returning it to the raw feed
  - Dust shuttling combined with sorbent injection
  - Sorbent injection with a polishing bag filter
- Multi-pollutant control measures
  - Wet scrubbers – sulfur dioxide emissions control
  - Selective catalytic reduction – nitrogen oxides emissions control
  - Activated carbon filter – multiple pollutant emissions control

Other guidance on Article 8

Guidance on criteria relating to relevant sources

- Paragraph 2b of Article 8 says that a Party may, if it chooses, establish criteria to identify relevant sources covered within a source category so long as those criteria for any category include at least 75 per cent of the emissions from that category.
- Guidance is provided on criteria related to this decision – size of the facility, mercury emission amount, expected life of the facility, location, etc.

Support for Parties in implementing measures for existing sources, in particular guidance on determining goals and setting emission limit values

- Guidance provides information on the technical aspects to address existing sources
  - ✓ Quantified goal for controlling/reducing emissions from relevant sources
  - ✓ Emission limit values for controlling/reducing emissions from relevant sources
  - ✓ The use of BAT/BEP to control emissions from relevant sources
  - ✓ A multi-pollutant control strategy that would deliver co-benefits for control of mercury emissions
  - ✓ Alternative measures to reduce emissions from relevant sources

SECTION THREE

ARTICLE 8 EMISSIONS AND ANNEX D
Reducing mercury emissions from the coal combustion sector

DR LESLEY SLOSS

UNEP MINAMATA ONLINE SERIES, OCTOBER 2020

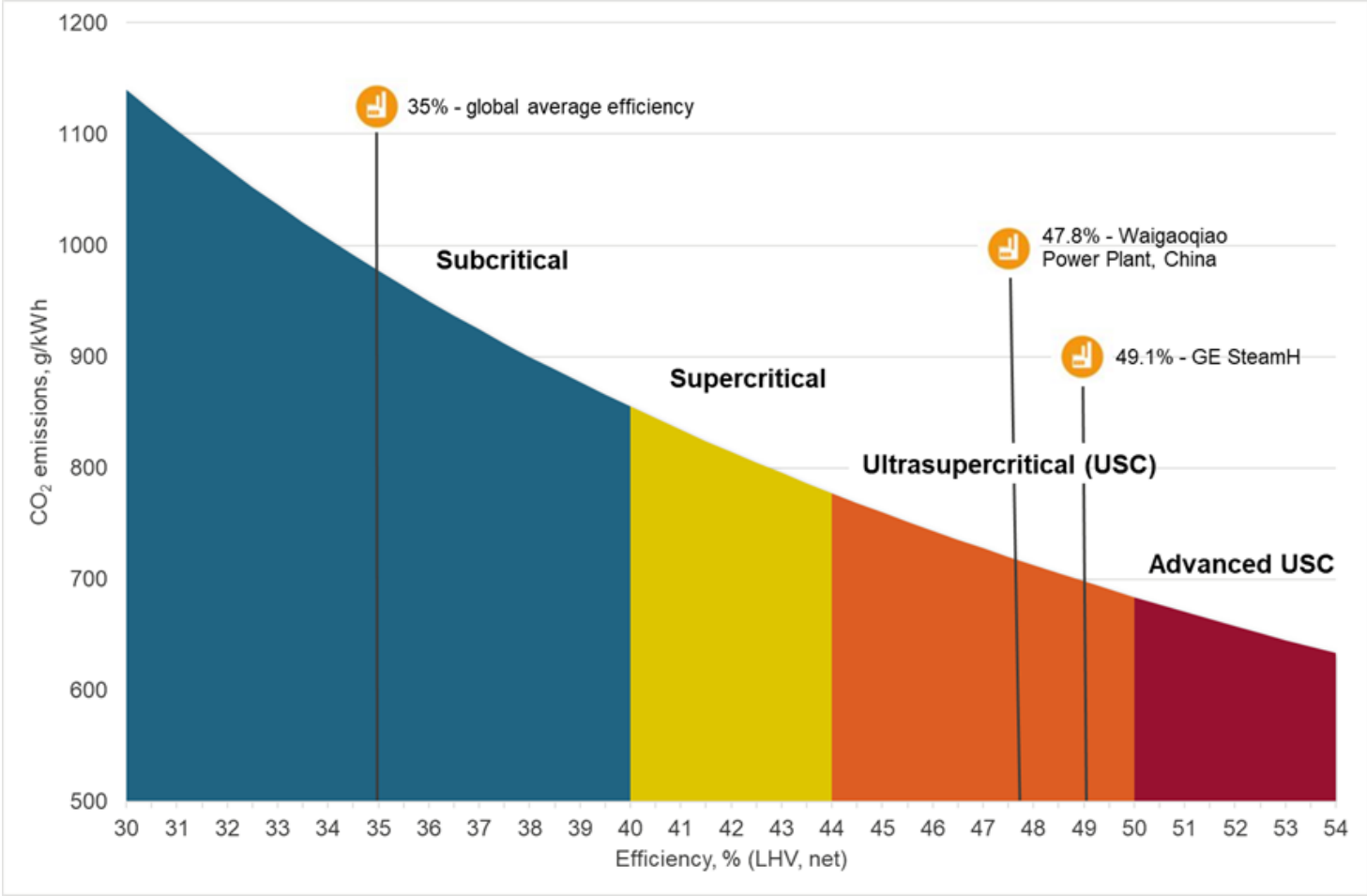
IEA
CLEAN COAL CENTRE

Article 8 defines plants by age

New plants:
BAT/BEP

Existing plants:
- Quantified goal
- Emission limit value
- BAT/BEP
- Multipollutant strategy
- “Alternative measures”

New coal plants are cleaner plants



For existing plants, compliance with Minamata is more of a challenge

BAT/BEP

- Uncontrolled coal-fired power plants can release over 90% of the mercury in the coal
- Plants fitted with control technologies can achieve >90% mercury control
- The best mercury control strategy varies from plant to plant
- Expert advice is required and is available through the Coal Partnership Area

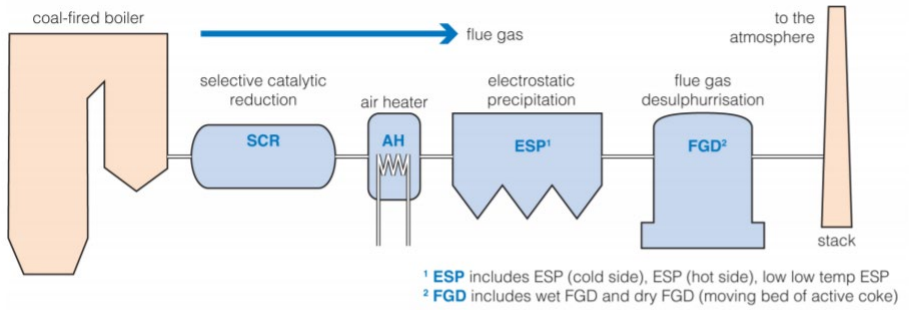


Figure 1 Process diagram of a typical configuration of coal-fired power plant (Moritomi, 2014)

Table 4 Relative cost of Hg removal for various techniques

Approach	Capital cost	Incremental O&M cost	Comments
Increasing plant efficiency	moderate	low	Not a significant effect on mercury emissions but good for multi-pollutant emission plant output
Coal washing/treatment	High	moderate	Washing is less expensive than chemical treatment. Coal specific results
Coal blending	Very low	Very low	Will depend on coal availability. May require refurbishment of pulverisers
Coal additives	Very low	low	Can be sprayed on to coal or into boiler. Proprietary, so cost varies with supplier. May be issues with corrosive impacts on plant
Upgrading flue gas controls (ESP, FF, FGD)	variable	low	The cost of upgrading on modifying existing pollution control devices will vary on a case by case basis but could improve performance of the plant in more than just mercury control and is a one-off cost
Activated carbon injection	Low	low	Maintenance of new sorbent injection facility now required. High costs for waste management for some sorbents. However, newer sorbents are low cost and do not cost disposal issues
Multi-pollutant systems	New, therefore variable	variable	New systems are emerging into the market and need to be considered on a case by case basis

OVERVIEW OF ARTICLE 8

Para 3: A Party with relevant sources shall take measures to control emissions

- ☑ BAT/BEP or associated ELVs for new facilities
- ☑ Measure(s) selected to control/reduce mercury emissions from existing sources
- ☑ Establish/maintain a mercury emissions inventory

Defining BAT/BEP: evaluate the fleet

In order to reduce emissions from the coal sector in a logical and cost-effective manner, parties will have to establish a sector-specific inventory.

This will require:

- An official dataset of all coal-fired units in the country
- The most up to date, plant-specific data to calculate current/baseline emissions
- Maintenance of this inventory to determine trends in emissions and to evaluate the efficacy of policies

Creating an inventory – UNEP toolkit

emission (t/y) = EF x AV x RF

EF emission factor, amount of Hg released per tonne of coal burned

AV activity value, amount of coal burned by each plant

RF reduction/retention factor, amount of mercury retained as ash or gypsum

Plant	Coal type	EF, g Hg/kg	AF, t/y coal	RF, Installed control techs	Emission, t/y
A	bituminous	0.03	100 kt/y	ESP, SCR, FGD – 80%	0.6
B	bituminous	0.03	50 kt/y	Fabric filter – 40%	0.9

Creating a sectoral action plan

- Evaluate emissions on a plant-by-plant basis, as accurately as possible (the iPOG* can help with plant-specific RF factors)

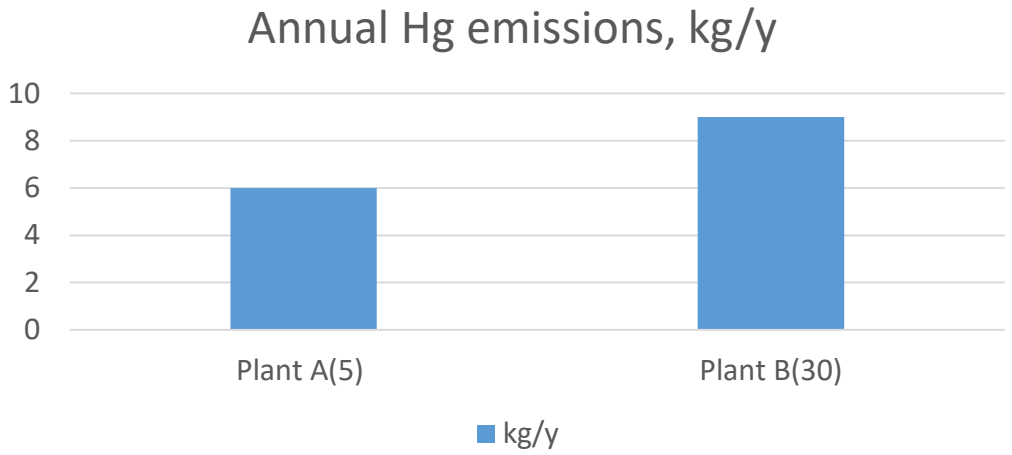
- Rank plants according to their mercury emissions – target higher emitters as a priority

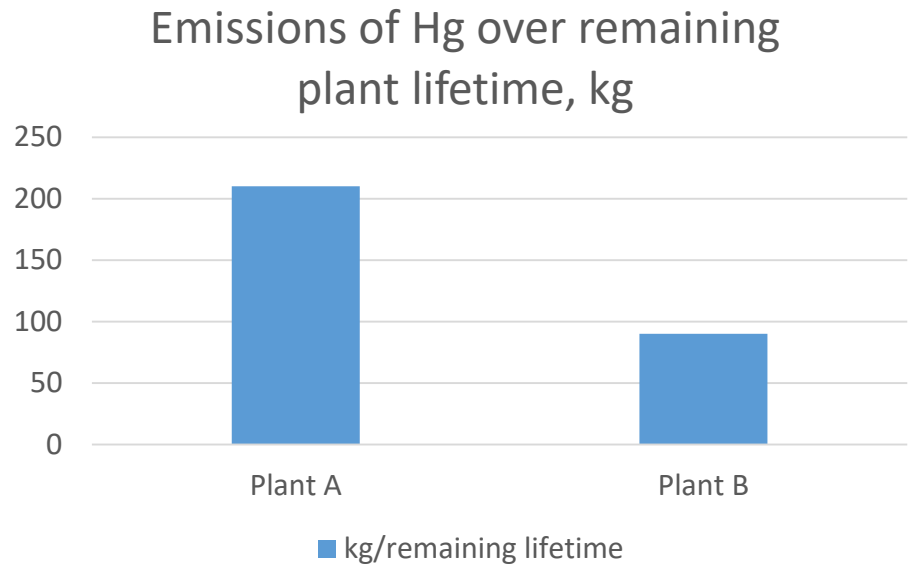
iPOG – the UNEP tool to help estimate mercury behaviour in coal-fired power plants, available from:

https://web.unep.org/globalmercurypartnership/interactive-process-optimization-guidance-ipog%E2%84%A2

Possible approaches to ranking

- Current highest emitters based on total annual emissions – this identifies the major sources right now (2019/2020)
- Highest emitters over remaining plant lifetime – this focuses more on plants which may have longer left to run (plants can run for 40 years or more)

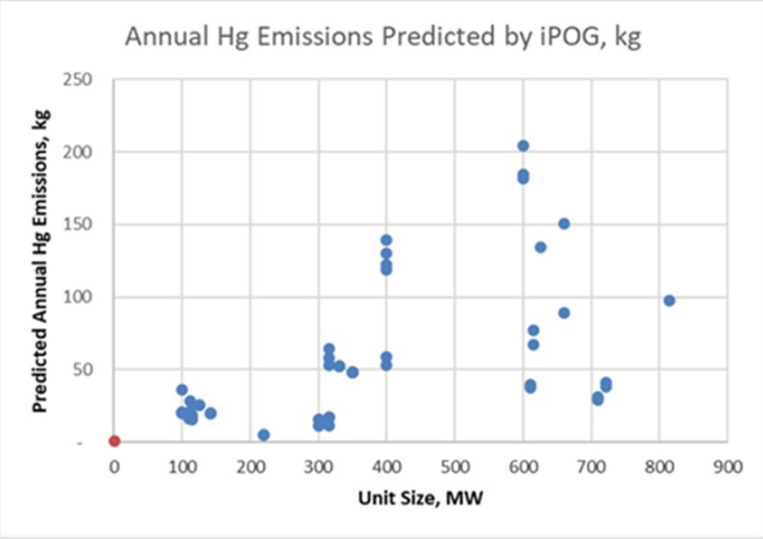




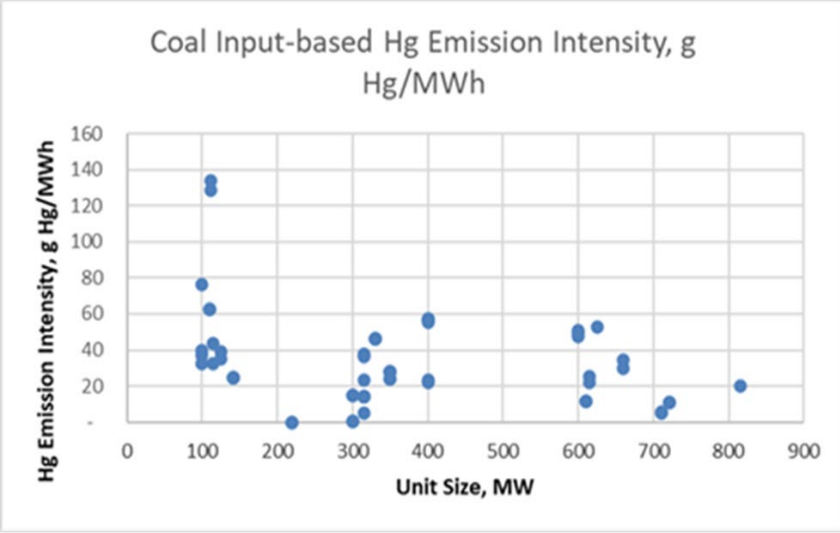
(Plant A is 5 years old, Plant B is 30 years old)

Data helps decision making

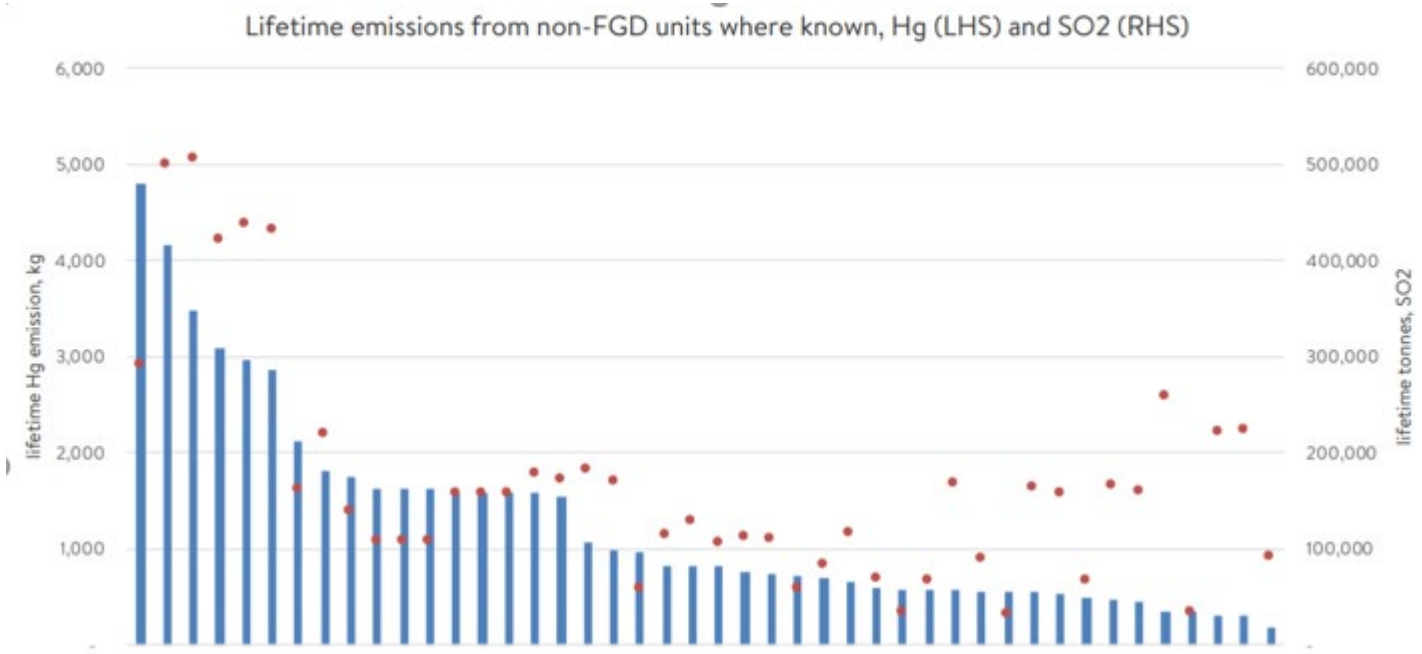
- The size of the plant is less important than the Hg behaviour in the plant



- It is not correct to assume that larger plants cause larger emissions



Ranking of plants allows prioritisation of action



Some plants are clearly responsible for more emission than others

Top 10-15 plants in this set will emit more than the remaining plants combined, over their remaining lifetime.

Targeting top emitters will give the quickest and most cost-effective means for Minamata compliance

Plant and coal specific data will produce far more accurate emission estimates

These will facilitate more effective reduction strategies

IEA
CLEAN COAL CENTRE

Thank you for listening

ANY QUESTIONS?

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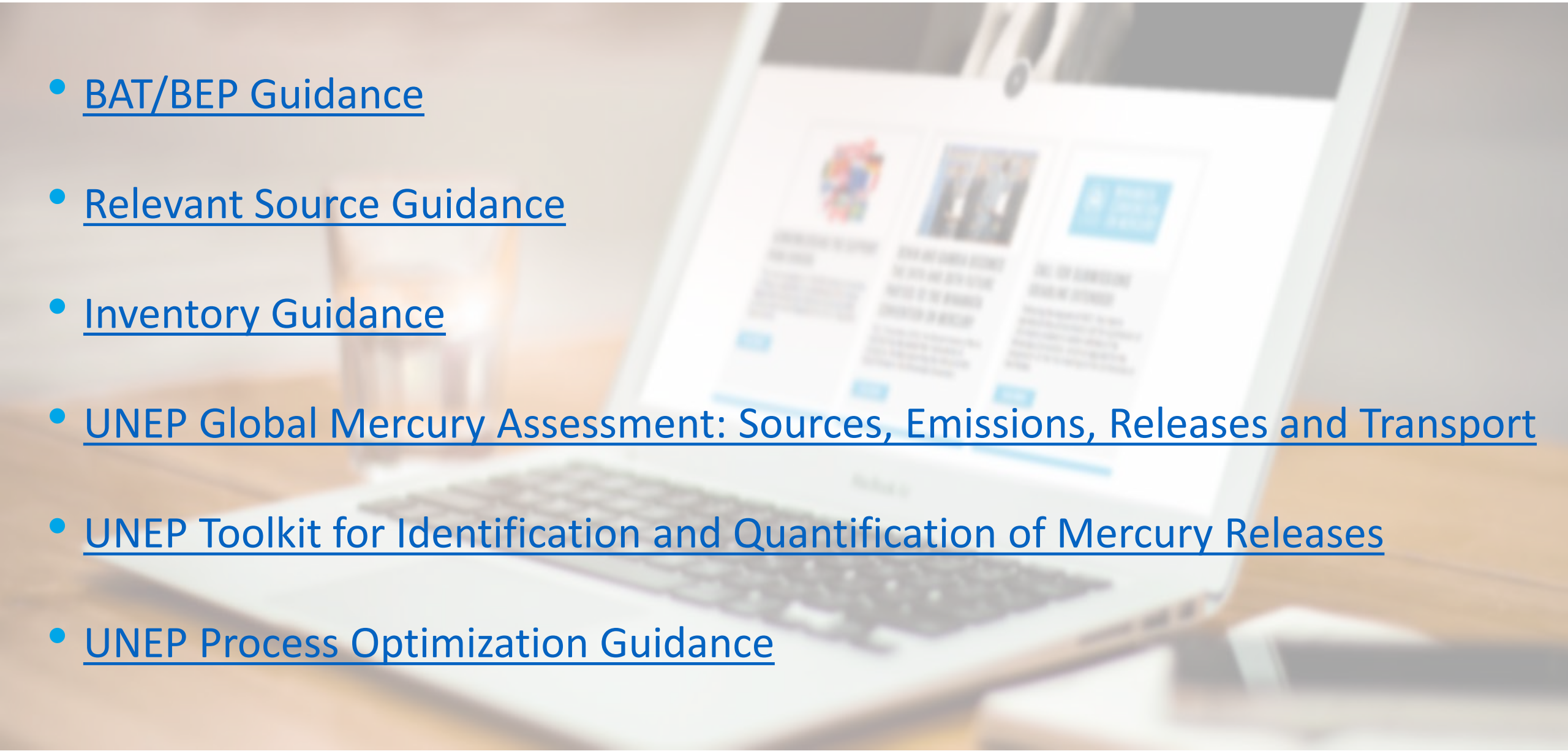
RESOURCES



- BAT/BEP Guidance
- Relevant Source Guidance
- Inventory Guidance
- UNEP Global Mercury Assessment: Sources, Emissions, Releases and Transport
- UNEP Toolkit for Identification and Quantification of Mercury Releases
- UNEP Process Optimization Guidance

WEB www.mercuryconvention.org

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