UNITED NATIONS

UNEP

UNEP/MC/COP.5/5/Add.3

MINAMATA CONVENTION ON MERCURY

Distr.: General
2 June 2023

Original: English

Conference of the Parties to the Minamata Convention on Mercury
Fifth meeting
Geneva, 30 October–3 November 2023
Item 4 (b) of the provisional agenda*

Matters for consideration or action by the Conference of the Parties: mercury-added products and manufacturing processes in which mercury or mercury compounds are used: amendment to annexes A and B, and consideration of the feasibility of mercury-free alternatives for manufacturing processes listed in annex B

Proposals for amendments to annex A to the Minamata Convention on Mercury for consideration by the Conference of the Parties at its fifth meeting

Addendum

Proposal by the Africa region to amend part I of annex A to the Minamata Convention on Mercury, to eliminate fluorescent lighting

Note by the secretariat

1. As is indicated in the note by the secretariat on proposals for amendments to annex A to the Minamata Convention on Mercury (UNEP/MC/COP.5/5), Botswana and Burkina Faso submitted to the Secretariat, on behalf of the Africa region, a proposal to amend part I of annex A to the Convention, to eliminate fluorescent lighting.

2. The proposal is set out in annex I to the present note, while an explanatory note is set out in annex II. The annexes are presented as received, without formal editing. The proposal and the explanatory note are provided in all six official languages of the United Nations.

* UNEP/MC/COP.5/1.

Annex I*

Proposal by the Africa region to amend part I of annex A to the Minamata Convention at the fifth meeting of the Conference of the Parties to eliminate fluorescent lighting

CONTEXT

In accordance with the provisions of Article 26, the Africa region proposes to amend Annex A of the Minamata Convention on Mercury to phase-out types of mercury-containing (fluorescent) lamps not previously covered by the Convention. Taken in combination with the previous lighting amendments submitted by the Africa region (UNEP/MC/COP.4/26/Add.2) and European Union (UNEP/MC/COP.4/26/Add.1) that have been carried forward from COP-4 to COP-5 (UNEP/MC/COP.4/Dec.3), this new amendment proposes to expand the scope of coverage to all types of fluorescent lamps.

Rationale for the new amendment:

The lighting amendment proposed by the Africa region and taken up at COP-4 gained significant support from Parties to the extent that within a single COP, a decision (UNEP/MC/COP.4/Dec.3) to phase out two of the three proposed categories of fluorescent lighting was achieved. This decision was made on the basis that mercury-free alternatives are technically feasible and economically justified and takes into account the environmental and human health risks and benefits.

Building on this momentum, the Africa region considers that remaining exemptions for fluorescent lamps are no longer necessary. Since COP-4, extensive policy efforts to phase out fluorescent lighting have taken place in different parts of the world as outlined in our explanatory note to this amendment. The Africa region agrees that a global decision to phase out the remaining categories of fluorescent lamps will augment those fragmented policy efforts and strengthen global efforts to make mercury history.

This amendment contains three (3) sections:

- Annex I is the proposed amendment for COP-5.
- Annex II is an explanatory memo containing the relevant technical, economic and environmental information in accordance with Articles 4(7) to the Convention on each of the four new categories of fluorescent lamps proposed in this Amendment. Annex II also provides supplementary information on the rationale and considerations behind this proposal, including improvements to human and environmental health, elimination of mercury waste due to lighting, and lower energy bills.
- Annex III provides a graphical illustration and table to clarify the coverage of all provisions relating to fluorescent lighting in Annex A of the Convention, including this new proposal.

* The annex has not been formally edited.

Proposal by the Africa region to amend Part I of Annex A to the Minamata Convention on Mercury

The Africa region proposes to insert in Part I of Annex A: Mercury-added products, four product categories and the following phase-out dates.

Part I: Products subject to Article 4, paragraph 1

Mercury-added products	*Date after which the manufacture, import or export of the product shall not be allowed (phase-out date)*
Compact fluorescent lamps (CFLs) for general lighting purposes that are > 30 watts	2025
Compact fluorescent lamps with a non-integrated ballast (CFL.ni) for general lighting purposes that are ≤ 30 watts with a mercury content not exceeding 5 mg per lamp burner	2025
• Linear fluorescent lamps (LFLs) for general lighting purposes: (b) Triband phosphor ≥ 60 watts	2026
• Non-linear fluorescent lamps (NFLs) (e.g., U-bend and circular) for general lighting purposes: (a) Triband phosphor, all wattages (b) Halophosphate phosphor, all wattages	2026

Annex II*

Explanatory note from the Africa region regarding the proposed amendment to part I of annex A: eliminate fluorescent lighting

This explanatory note provides technical, economic and environmental information in accordance with Article 4(7) to the Convention on each of the four new categories of fluorescent lamps proposed to be added to Part I of Annex A with this Amendment. This Annex contains the following sections which set out critical information compiled to support this proposal:

II.A Compact fluorescent lamps (CFLs) for general lighting purposes greater than 30 watts

II.B Compact fluorescent lamps with a non-integrated ballast (CFL.ni) for general lighting purposes that are ≤ 30 watts with a mercury content not exceeding 5 mg per lamp burner

II.C Linear fluorescent lamps (LFLs) for general lighting purposes, Triband phosphor ≥ 60 watts

II.D Non-linear fluorescent lamps (NFLs) (e.g., U-bend and circular) for general lighting purposes, Triband and Halophosphate phosphor, all wattages

II.E Additional rationale for proposing to address these new elements at COP-5

II.A Compact fluorescent lamps (CFLs) for general lighting purposes greater than 30 watts

All compact fluorescent lamps (CFLs) contain mercury. The inclusion of this new category of CFLs is intended to bring these lamps under the scope of the Minamata Convention, and to establish a phase-out date since there are mercury-free, cost-effective light emitting diode (LED) alternatives. For over 30-40 years, these higher-wattage CFLs were commonly used in both domestic and professional applications including room illumination, streetlighting and retail lighting. As discussed in this section, there are cost-effective, mercury-free, energy-efficient LED alternatives that replace these high wattage CFLs.

High Wattage Compact Fluorescent Lamps
A lamp consisting of a fluorescent tube that is curved, twisted, folded or connected to render it compact, incorporating the ballast into the base of the lamp and having a rated power greater than 30 watts. Lamps of this size can contain 5 to 10 milligrams of mercury or more. High wattage CFLs exist in both integrally ballasted form (where the ballast is in the base of the CFL) and non-integrally ballasted form (where the CFL has pins that ensure it is connected to a fixture which has a compatible ballast for that lamp).


Based on the availability, economic justification, and environmental and public health benefits of eliminating mercury-added CFLs, and to be in line with the decision made at COP-4 to phase out integrally ballasted CFLs (CFL.i) that are ≤ 30 watts by 2025, this whole product category should be banned from manufacture, import and export by the end of 2025. CFLs are rapidly declining in sales

* The annex has not been formally edited.

around the world and many governments have started moving to phase them out – all wattages – with several bans already in effect.

Availability of mercury-free alternatives: In the past, high wattage CFLs were commonly used in offices, retail shops, streetlights and area security lighting - but in all these applications they are increasingly being replaced by LED. Mercury-free LED replacements for high wattage CFLs are widely available in lighting markets everywhere. These alternatives are available in a wide range of light output, colour rendering and colour temperatures. LED retrofit lamps are available to operate both in a regular light bulb socket (mains voltage) and in the fluorescent socket pins where the ballast is built into the fixture. When interviewed about product availability, manufacturers of LED lamps based in China said there are no technical impediments for manufacturing LED retrofit lamps for all base types and confirm they can be produced within a few months on placement of an order for 10,000 units or more.[1]

Economic feasibility of alternatives: Retrofitting high wattage CFLs with LED alternatives is highly cost-effective. The payback period associated with LED replacement of a CFL is short: in most cases, less than a year. In fact, in many parts of the world, LED replacements for CFLs are already the same price or even less expensive. This is the case for example in Nigeria, as shown in the comparison below. And, in addition to being less expensive to buy, the LED lamps are approximately 50% less expensive to own and operate compared to a CFL. The examples below show the cost-effectiveness of an equivalent LED replacement for a 38 watt CFL in Nigeria. This high wattage CFL with an E27 screw base (mains voltage) can be easily replaced with an 18W LED also with an E27 screw base (mains voltage) that will produce the same light output but last 2.5 times longer. Assuming the bulbs operate for 5 hours per day, the total cost of ownership over a ten-year period is less than half as expensive for the LED compared to the CFL in net present value terms (2023 Naira).

Item	Compact Fluorescent Lamp	Equivalent LED Retrofit
Life	10,000 hrs	25,000 hrs
Lamp Price*	N 1560	N 1215
Power	38 W	18 W
Use (5 hr/day)*	69 kWh/yr	33 kWh/yr
Elec cost.*	N 2490/yr	N 1180/yr
10-year total lighting cost	N 27,445	N 13,019
Payback period		Instant (LED price lower)

Figure II.1 Payback Period for a High Wattage CFL in Nigeria[2]

[1] Clarifications on Lighting Europe's comments to the RoHS Committee - https://www.clasp.ngo/wp-content/uploads/2021/01/SEA-CLASP-Clarifications-on-Industry-Comments_final.pdf

[2] Lamp prices for fluorescent and LED collected 28 March 2023. Usage: 5 hours/day, average business electricity price: N 35.91/kWh. 10% discount rate. LCC limited to 10 years.

Item	Compact Fluorescent Lamp	Equivalent LED Retrofit
Life	20,000 hrs	50,000 hrs
Lamp Price*	US$ 9.77	US$ 14.55
Power	40 W	17 W
Use (10 hr/day)*	146 kWh/yr	62 kWh/yr
Elec cost.*	US$ 21.61/yr	US$ 9.18/yr
10-year total lighting cost	US$ 249.80	US$ 114.72
Payback period		4.6 months

Figure II.2 Payback Period for a High Wattage CFL.ni in USA[3]

Environmental and health risks and benefits of alternatives: LED lamps eliminate the unnecessary risk of exposure to toxic mercury for consumers and workers when lamps break in homes, offices, schools, and businesses. They also reduce the amount of mercury contamination in landfill and waste sites due to improper disposal.

While Denmark has one of the highest collection rates in the EU, a 2016 report by the Danish Environment Protection Agency found that Denmark had achieved an overall bulb collection rate of only 36%. In the United States, recycling rates have been reported at 29% for industry recycled fluorescent lamps and CFLs, and at only 2% for consumers[4]. In Africa, collected and properly recycled e-waste (not just lighting products) was at 4% in Southern Africa, 1.3% in Eastern Africa and close to 0% in other regions[5]. The small size and weight of bulbs makes them easy for consumers to mistakenly dispose of in general waste, and consumers are often not aware that fluorescent lamps contain mercury and therefore require special disposal. In addition, due to their fragility, fluorescent bulbs break easily when discarded in general waste streams, releasing mercury into the environment and putting the health of workers and the public at risk.

In addition to the direct mercury use avoided through mercury-free alternatives, the energy savings associated with switching from fluorescent to LED lamps can also indirectly reduce mercury pollution by reducing the use of fossil-fuel generators or coal-fired power use. LEDs generally use 40% - 60% less electricity than a fluorescent lamp to generate the same level of light output.

Examples of regional and national policies to phase-out high-wattage CFLs

Numerous national policy measures that have been adopted in different regions around the world phasing out these high wattage CFLs from the market. Some examples include the following:

- The sixteen countries[6] of the Southern Africa Development Community (SADC) adopted regionally harmonised quality and performance standard SADCSTAN HT-109. This standard sets a technology-neutral efficacy requirement that phases out all fluorescent lamps.

[3] Lamp prices for 4 Pin 2G11 fluorescent and LED collected 28 March 2023. Usage: 10 hours/day, average business electricity price: $ 0.148/kWh. 3% discount rate. LCC limited to 10 years.

[4] https://pubmed.ncbi.nlm.nih.gov/23635464/

[5] https://www.statista.com/statistics/1154659/ewaste-documented-recycling-africa/

[6] The 16 countries of SADC: Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, United Republic Tanzania, Zambia and Zimbabwe.

- The seven countries[7] of the East African Community (EAC) adopted a regionally harmonised quality and performance standard, EAS 1064-1:2022 that is aligned with SADC, phasing out fluorescent lamps.
- The European Commission made a decision under the Restriction of Hazardous Substances (RoHS) Directive to ban the sales of CFLs (including all high wattage CFLs) in February 2023.
- The European Economic Area (Iceland, Liechtenstein, and Norway) in addition to Switzerland have harmonised with the EU-27 RoHS Directive (example: Norway RoHS regulation).
- Pakistan adopted a decree that bans all compact fluorescent lamps from 1 July 2023, including high wattage CFLs.
- In the United States, California adopted AB 2208, a law that bans the sale of all integrally ballasted CFLs on 1 January 2024 and all non-integrally ballasted CFLs starting 1 January 2025.

II.B Compact fluorescent lamps with a non-integrated ballast (CFL.ni) for general lighting purposes that are ≤ 30 watts with a mercury content not exceeding 5 mg per lamp burner

CFLs come in two types – those which are integrally ballasted (CFL.i) and those which are not integrally ballasted (CFL.ni) – also called "pin-base CFLs". The inclusion of this new category of pin-based CFLs is intended to bring standard wattage (less than or equal to 30 Watts) within the scope of the Minamata Convention. These lamps are commonly used in professional applications such as downlights and wall-washers. All CFLs contain mercury, and they can take up to five minutes to warm up to full brightness, they are fragile, and they have short lifetimes compared to LED. As discussed in this section, there are cost-effective, mercury-free, energy-efficient Light Emitting Diode (LED) alternatives that replace CFL.ni.

Compact Fluorescent Lamp, non-integrally ballasted (CFL.ni) ≤ 30 watts
A compact fluorescent lamp where the ballast operating the lamp is contained inside the fixture into which the pin-base CFL.ni lamp is inserted. The "ni" stands for non-integrated, meaning the ballast is not integrated within the lamp. In alignment with Annex A of the Minamata Convention, this category of CFL.ni is rated for less than or equal to 30 watts.


Based on the availability, economic justification, and environmental and public health benefits of eliminating mercury-added CFL.ni, these products should be banned from manufacture, import and export by the end of 2025 – along with all the other CFLs. This product category is declining in sales around the world and many governments have already adopted policy measures that phase them out.

Availability of mercury-free alternatives: Mercury-free LED replacements for CFL.ni lamps are widely available in lighting markets everywhere. These alternatives are available in numerous different shapes and sizes, levels of light output, color renderings and color temperatures. LED retrofit lamps are available that operate on both two pin and four-pin sockets, designed for specific types of CFL.ni. Research on the availability of CFLni pin bases has shown that of the 19 types of CFL.ni base types (e.g., 2G7, 2GX-7, 2G11, etc.), LED retrofits are available today for 16 of them. For the three which LED replacements were not immediately available, the reason given was the low volume of sales for these base types. However, as noted earlier, suppliers in China said there are no technical impediments

[7] The 7 countries of East African Community: Burundi, Democratic Republic of Congo, Kenya, South Sudan, Tanzania, Rwanda and Uganda.

for manufacturing LED retrofit lamps for these base types. Manufacturers confirm they can be produced within a few months on request.[8]

Economic feasibility of alternatives:

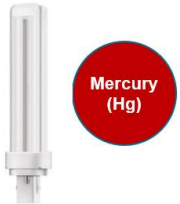
Retrofitting CFL.ni lamps with LED alternatives is highly cost-effective. The payback period associated with LED replacement of a CFL.ni is short: in most cases, less than a year. While the first cost of the LED retrofit may be slightly more expensive than the pin-base CFL, the running cost is significantly less. Market analysis has shown that LEDs are approximately 50% less expensive to own and operate than a CFL.ni.

The example below shows the cost-effectiveness of a retrofit LED lamp compared with a pin-based CFL.ni lamp in South Africa. Assuming the bulbs operate for 10 hours per day (typical for an office building), the payback period of the retrofit LED lamp is 8 months, plus the LED lamp lasts more than 3 times longer which would save significantly on lamp replacement costs. Over a 10-year period, the total cost of lighting for these equivalent lamps is over 50% lower for the LED lamp.

Item	CFL with non-integrated ballast	Equivalent LED Retrofit
Life	8,000 hrs	30,000 hrs
Lamp Price*	R 47.61	R 99.00
Power	26 W	11 W
Use (10 hr/day)*	95 kWh/yr	40 kWh/yr
Elec cost.*	R 127.17/yr	R 53.80/yr
10-year total lighting cost	R 1,312.45	R 633.56
Payback period		8 months

Figure II.3 Payback Period for a CFL.ni in South Africa[9]

A second example is offered below from the Asia-Pacific region. An 18W CFL.ni lamp in Singapore could be replaced today with a mercury-free LED retrofit pin-based lamp that would pay back in 11 months and will last for 8 years. The net present value of the total cost of lighting over those 8 years for the LED lamp is roughly half the cost of the fluorescent lamp, thus LED is not only mercury-free but also the least cost option.



Item	CFL with non-integrated ballast	Equivalent LED Retrofit
Life	8,000 hrs	30,000 hrs

[8] Clarifications on Lighting Europe's comments to the RoHS Committee - https://www.clasp.ngo/wp-content/uploads/2021/01/SEA-CLASP-Clarifications-on-Industry-Comments_final.pdf

[9] Lamp prices for fluorescent and LED lamp collected 4 April 2023. Usage assumptions are: 10 hours/day, 365 days/year. Electricity is R 1.34/kWh. 7% discount rate.

Lamp Price*	SGD 4.50	SGD 14.00
Power	18 W	9 W
Use (10 hr/day)*	66 kWh/yr	31 kWh/yr
Elec cost.*	SGD 20.54/yr	SGD 9.70/yr
8-year total lighting cost	SGD 167.57	SGD 85.50
Payback period		11 months

Figure II.4 Payback Period for a CFL.ni application in Singapore[10]

Environmental and health risks and benefits of alternatives: LED lamps eliminate the unnecessary risk of exposure to toxic mercury for consumers and workers when lamps break in homes, offices, schools, and businesses. They also reduce the amount of mercury contamination in landfill and waste sites due to improper disposal. The small size and weight of CFL.ni bulbs make them easy for consumers to mistakenly dispose of them in general waste. Often, consumers or maintenance workers are not aware that fluorescent lamps contain mercury and therefore require special disposal. In addition, due to their fragility, fluorescent bulbs break easily when discarded in general waste streams, releasing mercury into the environment and putting the health of workers and the public at risk. In addition to the direct mercury use avoided through mercury-free alternatives, the energy savings associated with switching from fluorescent to LED lamps can also indirectly reduce mercury pollution by reducing the use of fossil-fuel generators or coal-fired power use. LEDs generally use 40% - 60% less electricity than a fluorescent lamp to generate the same level of light output.

Examples of regional and national policies to phase-out CFL.ni lamps

CFL.ni lamps are included in the same regional and national policy measures described above that have been adopted in different regions around the world to phase out CFLs from the market. Some examples include the following:

- The sixteen countries[11] of the Southern Africa Development Community (SADC) adopted regionally harmonised quality and performance standard SADCSTAN HT-109. This standard sets a technology-neutral efficacy requirement that phases out all fluorescent lamps.
- The seven countries[12] of the East African Community (EAC) adopted a regionally harmonised quality and performance standard, EAS 1064-1:2022 that is aligned with SADC, phasing out fluorescent lamps.
- The European Commission made a decision under the Restriction of Hazardous Substances (RoHS) Directive to ban the sales of CFL.ni in February 2023.
- The European Economic Area (Iceland, Liechtenstein, and Norway) in addition to Switzerland have harmonised with the EU-27 RoHS Directive (example: Norway RoHS regulation).
- Pakistan adopted a decree that bans all compact fluorescent lamps from 1 July 2023.
- In the United States, California adopted AB 2208, a law that bans the sale of all non-integrally ballasted CFLs starting 1 January 2025.

[10] Lamp prices for fluorescent and LED lamp collected 4 April 2023. Usage assumptions are: 10 hours/day, 365 days/year. Electricity is SGD 0.31/kWh. 7% discount rate.

[11] The 16 countries of SADC: Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, United Republic Tanzania, Zambia and Zimbabwe.

[12] The 7 countries of East African Community: Burundi, Democratic Republic of Congo, Kenya, South Sudan, Tanzania, Rwanda and Uganda.

II.C Linear fluorescent lamps (LFLs) for general lighting purposes, Triband phosphor ≥ 60 watts

In the Minamata Convention, linear fluorescent lamps are divided into two major categories based on the phosphor used in the lamp: halophosphate and triband. The European Union's proposed amendment to COP-4 (UNEP/MC/COP.4/26/Add.1) extended the original scope of coverage in Annex A of the Minamata Convention for halophosphate LFLs to include all wattages. Similarly, with this new amendment, the triband phosphor LFL scope of coverage is being extended to bring all wattages under coverage. This proposed amendment adds triband phosophor LFLs greater than 60 watts to Annex A and proposes to phase them out in line with other linear fluorescent lamps in 2026.

Linear Fluorescent Lamps, High Wattage, Triband Phosphor
This amendment extends coverage of the Minamata Convention Annex A to high wattage (greater than 60 watts) triband-phosphor LFLs for general lighting purposes. Coverage includes all diameters (e.g., T5, T8, T12) and lengths, although generally the high wattage lamps are greater than four feet (1.2m). A few examples of fluorescent lamps include F80T5, F70T8 and F65T12.


LED retrofit lamps are available for high wattage LFLs. Based on the economic feasibility and environmental and public health benefits of eliminating mercury-added LFLs, these products should be banned for manufacture, import and export by 2026. LFLs are declining in sales around the world thanks to widespread market adoption of energy-efficient, safe LED retrofit tubes.

Availability of mercury-free alternatives: High wattage triband phosphor linear fluorescent tubes are commonly used in offices, hospitals, schools and other areas which have lights on for long periods of time. Today there are various mercury-free LED replacement lamps available to replace these high wattage fluorescent tube lamps, manufactured by over 50 different companies. These retrofit LED lamps are available in the same length, size, and light colour and offer the same illuminated space. Many of these LED products are designed as direct retrofits into fixtures originally designed to accept fluorescent tubes. In this way, the mercury-free LED tubes are simple drop-in replacements that avoid the need for rewiring that was present in some of the first-generation LED tubes.[13] In addition to this convenient approach, there are also options of by-passing the fluorescent ballast and running mains voltage directly to the sockets of the existing fixture or replacing the fluorescent fixture entirely with a mercury-free LED luminaire. Any of these three options would achieve the objective of removing mercury from lighting.

For LFL configurations that are not readily available for purchase, research shows that there are no technical impediments to upgrading from fluorescent to LED lamps in an existing fluorescent fixture. Custom manufacturing is widely advertised for LED lamps of any length, base type, wattage, color rendering index, and color temperature with delivery lead times as short as one month.

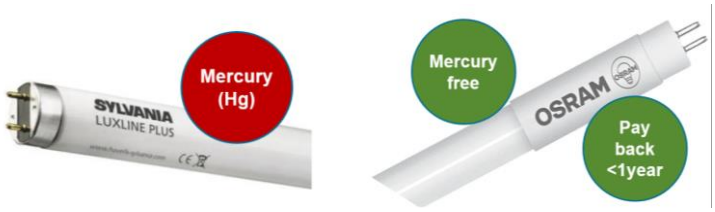
Economic feasibility of alternatives:

Retrofitting high-wattage triband phosphor LFLs with LED alternatives is highly cost-effective. Due to the high operating hours, lower prices for LED and increasing cost of electricity, the payback period associated with LED replacement of a high-wattage LFL is short and in most cases, much less than a

[13] Assessing Annex III Fluorescent Lamp Exemptions in the Light of Scientific and Technical Progress: Report to the Committee on the Restriction of Hazardous Substances, Swedish Energy Agency, Feb 2020.

year. From a total cost of ownership perspective, the LED retrofits cost about half as much (in net present value) to own and operate than fluorescent.

The example below compares an 80 watt T5 fluorescent lamp with a 37 watt LED retrofit T5 lamp in South Africa that will produce the same illumination. Assuming the bulb operates for 10 hours per day, the payback periods for LED lamps is only 2 months yet the LED lamp is rated to last nearly 2.5 times as long as the fluorescent lamp. In net present value terms, over a ten-year period the LED lamp will cost less than half as much as running a fluorescent tube in the same socket.



Item	Linear Fluorescent Lamp	Equivalent LED Retrofit
Life	24,000 hrs	60,000 hrs
Lamp Price*	R 116.53	R 158.41
Power	80 W	37 W
Use (10 hr/day)*	292 kWh/yr	135 kWh/yr
Elec cost.*	R 460/yr	R 212/yr
10-year total lighting cost	R 4,796	R 2,295
Payback period		2 months

Figure II.5 Payback Period for a high wattage triband phosphor LFL in South Africa[14]

Environmental and health risks and benefits of alternatives:

LED retrofit lamps remove the risk of mercury exposure and pollution associated with the use and breakage of LFLs. Industrial, commercial, and multi-family residential building staff, who may handle large quantities of LFLs, are particularly at risk from this exposure route, as are waste management workers. Often, these workers are not aware that fluorescent lamps contain mercury and therefore require special disposal. In addition, due to their fragility, fluorescent bulbs break easily when discarded in general waste streams, releasing mercury into the environment and putting the health of workers and the public at risk. In addition to the direct mercury use avoided through mercury-free alternatives, the energy savings associated with switching from fluorescent to LED lamps can also indirectly mitigate mercury pollution by reducing the use of fossil-fuel generators or coal-fired power use. LEDs generally use 40% - 60% less electricity than a fluorescent lamp to generate the same level of light output.

Examples of regional and national policies to phase out

Different countries and regions around the world have adopted policy measures to phase out high-wattage tri-band LFLs from the market, such as:

- The sixteen countries[15] of the Southern Africa Development Community (SADC) adopted regionally harmonised quality and performance standard SADCSTAN HT-109. This standard sets a technology-neutral efficacy requirement that phases out all fluorescent lamps.

[14] Lamp prices for fluorescent and LED collected 28 March 2023. Usage: 10 hours/day, average business electricity price: R 1.58/kWh. 10% discount rate. LCC limited to 10 years.

[15] The 16 countries of SADC: Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, United Republic Tanzania, Zambia and Zimbabwe.

- The seven countries[16] of the East African Community (EAC) adopted a regionally harmonised quality and performance standard, EAS 1064-1:2022 that is aligned with SADC, phasing out fluorescent lamps.
- The European Commission made a decision under the Restriction of Hazardous Substances (RoHS) Directive to ban sales of LFL by August 2023.
- The European Economic Area (Iceland, Liechtenstein, and Norway) in addition to Switzerland have harmonised with the EU-27 RoHS Directive (example: Norway RoHS regulation).
- In the United States, California adopted AB 2208, a law that bans the sale of all fluorescent lamps, including high-wattage tri-band LFLs starting 1 January 2025.

II.D Non-linear fluorescent lamps (NFLs) (e.g., U-bend and circular) for general lighting purposes, Triband and Halophosphate phosphor, all wattages

The most common fluorescent lamp sold today is a straight fluorescent tube. There are, however, fluorescent tubes that are not straight – specifically, the ones where the glass tube has been bent into the shape of the letter "U" or into a circle. In Annex A of the Minamata Convention, coverage exists for linear fluorescent lamps (LFLs) which some Parties interpret as only applying to straight tube fluorescent lamps, while other Parties interpret the scope more broadly, including both straight and non-straight fluorescent lamps. With this proposed amendment, the proposing Parties wish to remove this ambiguity as to the coverage and phasing-out of mercury-containing lighting by establishing a category of non-linear fluorescent lamps (NFLs) and establishing a phase-out date. If adopted, this measure would explicitly include all U-bend, circleline and other non-linear fluorescent lamps within the scope of Annex A.

Non-Linear Fluorescent Lamps (U-bend, Circular)
NFLs for general lighting purposes, including both halophosphate and triband phosphor fluorescent lamps. Coverage includes non-linear fluorescent lamps of all diameters (e.g., T5, T8, T12), wattages, and non-linear shapes (U-bend, circleline, etc.)
  

Based on the economic feasibility and environmental and public health benefits of eliminating mercury-added non-linear fluorescent (NFLs) lamps, and considering the wide-spread availability of mercury-free LED retrofits for these same fluorescent lamps, NFLs should be banned for manufacture, import and export by 2026, in line with the phase-out of linear fluorescent lamps. NFLs are declining in sales around the world thanks to the market adoption of LED retrofit U-bend and circleline LED lamps.

Availability of mercury-free alternatives: Non-linear fluorescent lamps are commonly used in commercial spaces, offices, hospitals, schools and other areas which have the lights on for long periods of time. Today there are plenty mercury-free LED retrofit lamps available to replace NFLs, and they are available in virtually any size, length, color temperature, and light output level. These LED products are designed as direct retrofits into fixtures originally designed to accept non-linear fluorescent tubes, thus they are intended as simple drop-in replacements that avoid the need for rewiring. In addition to this convenient approach, there are also options of by-passing the fluorescent ballast and running mains voltage directly to the sockets of the existing fixture or replacing the fluorescent fixture entirely with a

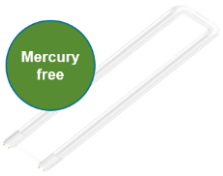
[16] The 7 countries of East African Community: Burundi, Democratic Republic of Congo, Kenya, South Sudan, Tanzania, Rwanda and Uganda.

mercury-free LED luminaire. Any of these three options would achieve the objective of removing mercury from lighting.

Economic feasibility of alternatives:

The replacement of NFLs with mercury-free alternatives is highly cost-effective. In general, the initial investment in LED retrofit lamps is recovered around one year. Replacement LED lamps also offer labor cost savings due to their longer life spans, typically twice that of fluorescent lamps. The short payback periods for LED replacement lamps are typically a key feature advertised by manufacturers for these lamps.

The example below compares a 36 watt U-bend fluorescent lamp with an equivalent (direct, drop-in replacement) 20 watt LED lamp in the Germany. The LED retrofit lamp has 2.5 times the service life and produces the same light output from the fixture even though the wattage is lower. The price of the LED retrofit lamp is about 20 Euros more, however this difference is paid for in electricity savings in just under 6 months. The LED lamp then goes on to last for more than 10 years. From a total cost of ownership perspective over ten years, the LED is less than half the cost of the mercury-containing fluorescent U-bend lamp.



Item	Non-Linear Fluorescent Lamp	Equivalent LED Retrofit
Life	20,000 hrs	50,000 hrs
Lamp Price*	EUR €25.90	EUR €46.41
Power	36 W	20 W
Use (10 hr/day)*	131 kWh/yr	73 kWh/yr
Elec cost.*	EUR €93.29/yr	EUR €51.83/yr
10-year total lighting cost	EUR €996.70	EUR €573.04
Payback period		5.9 months

Figure II.6 Payback Period for a non-linear fluorescent lamp (U-bend) in Germany[17]

An example of a cost-payback calculation with LED retrofit bulbs is shown for Switzerland below. We compared a CHF 12.60 circleline fluorescent lamp rated at 32 watts with a CHF 22.00 circleline LED retrofit lamp rated at 20 watts. The LED retrofit lamp is rated for more than triple the lifetime and consumes only 20 watts yet produces the same light as the 32 watt fluorescent. Assuming operation for 10 hours per day and CHF 0.162/kWh, the LED option offers a payback of 1.3 years compared to the fluorescent (and will last for 8 years). These calculations reflect energy costs and bulb costs, but do not incorporate labor costs saved over time from reduced frequency of bulb changes.

[17] Lamp prices for fluorescent and LED collected 28 March 2023. Usage: 10 hours/day, average business electricity price: EUR€ 0.71/kWh. 3% discount rate. LCC limited to 10 years.

Item	Fluorescent Lamp	Equivalent LED Retrofit
Life	9,000 hrs	30,000 hrs
Lamp Price*	**CHF 12.60**	**CHF 22.00**
Power	32 W	20 W
Use (10 hr/day)*	117 kWh/yr	73 kWh/yr
Elec cost.*	CHF 18.92/yr	CHF 11.83/yr
8-year total lighting cost	CHF 204.82	CHF 119.11
Payback period		1.3 years

Figure II.7 Payback Period for a non-linear fluorescent lamp (Circleline) in Switzerland[18]

Environmental and health risks and benefits of alternatives:

LED retrofit lamps remove the risk of mercury exposure and pollution associated with the use and breakage of NFLs. Industrial, commercial, and multi-family residential building staff, who may handle large quantities of NFLs are particularly at risk from this exposure route, as are waste management workers. Often, these staff are not aware that fluorescent lamps contain mercury and therefore require special disposal. In addition, due to their fragility, fluorescent bulbs break easily when discarded in general waste streams, releasing mercury into the environment and putting the health of workers and the public at risk. Infants and toddlers are likely to be most exposed to mercury vapor when a lamp breaks, especially in an unventilated space. Uptake of mercury vapor in early life not only results in a higher relative dose than in adults, but also increases the risk of developmental disabilities.

In addition to the direct mercury use avoided through mercury-free alternatives, the energy savings associated with switching from fluorescent to LED lamps can also indirectly reduce mercury pollution by reducing the use of fossil-fuel generators or coal-fired power use. LEDs generally use 40% - 60% less electricity than a fluorescent lamp to generate the same level of light output.

Examples of regional and national policies to phase out

Some of the regional and national policy measures that have been adopted in different regions around the world phasing out NFLs from the market include the following:

- The sixteen countries[19] of the Southern Africa Development Community (SADC) adopted regionally harmonised quality and performance standard SADCSTAN HT-109. This standard sets a technology-neutral efficacy requirement that phases out all fluorescent lamps, including NFLs.
- The seven countries[20] of the East African Community (EAC) adopted a regionally harmonised quality and performance standard, EAS 1064-1:2022 that is aligned with SADC, phasing out fluorescent lamps.
- In the United States, California adopted AB 2208, a law that bans the sale of all fluorescent lamps, including non-linear fluorescent, starting 1 January 2025.

II.E Additional rationale for proposing to address these new elements at COP-5

1) Reinforcing COP-4 decisions to phase out some categories of fluorescent lamps

According to the Minamata Convention 2022 progress report, the upcoming fifth meeting of the Conference of the Parties will consider the further strengthening of Annex A and B. Building on the

[18] G10q Non-Linear Lamp prices for fluorescent and LED collected 28 March 2023. Usage: 10 hours/day, average business electricity price: CHF 0.162/kWh. 4% discount rate.

[19] The 16 countries of SADC: Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, United Republic Tanzania, Zambia and Zimbabwe.

[20] The 7 countries of East African Community: Burundi, Democratic Republic of Congo, Kenya, South Sudan, Tanzania, Rwanda and Uganda.

enormous support that the proposal from the Africa region garnered during COP-4, the Africa region hopes to build on this momentum by creating the opportunity to phase out all remaining categories of mercury-containing fluorescent lamps at COP-5. Such a decision will fulfil the renewed goal of expanding and strengthening efforts against toxic mercury pollution globally.

2) There are cost-effective mercury-free alternatives for all fluorescent lighting applications

Readily available LED retrofit lamps will enable countries to avoid the unnecessary risk of exposure to toxic mercury. A transition to this mercury-free technology will protect consumers and workers when lamps break in homes, offices, schools, and businesses, and reduce the amount of mercury contamination at waste sites due to improper disposal. Based on a 2017 UNEP report, fluorescent lamps represent approximately 10% of all mercury of the products listed in Annex A of the Minamata Convention.[21]

3) Equity and anti-dumping consideration

Developing countries are at risk of becoming dumping grounds for mercury-containing lamps that no longer have a viable domestic market in their places of origin. The Africa region's concern is that this practice will escalate as the domestic fluorescent market in wealthy countries disappears due to regulations and consumer preferences. Manufacturers no longer able to sell mercury-containing, inefficient fluorescent bulbs in those markets will seek to export them instead to un- and under-regulated markets, largely in developing economies. In other words, as lighting markets in the OECD countries and elsewhere shift to clean LED lighting, less-regulated markets are likely to experience "environmental dumping" of old fluorescent technologies.

4) Used fluorescent lamp collection schemes are costly and ineffective

Collecting and processing hazardous mercury waste from fluorescent lamps is a burden that all governments struggle with. It potentially exposes waste haulage workers and recyclers as well as neighboring communities to high levels of mercury pollution. Regional and national programmes are very expensive, not only to run but to sensitize end-users on safe disposal mechanisms, so the bulbs are not mixed into general waste streams. The easiest way to eliminate this source of toxic mercury contamination to stop installing fluorescent lighting in our offices and homes. Halting the manufacture, import and export of fluorescents eliminates mercury pollution at the source, protecting public and environmental health.

5) Delaying the phase-out results in lost economic, public health and environmental benefits

Each year fluorescent phase-out dates are delayed results in lost mercury, financial, and energy savings. According to expert groups working on lighting,[22] if the Minamata Convention adopts a 2026 phase-out year for LFLs and 2025 for pin-based CFLni, the total savings from 2026 through 2050 would amount to:

- 178 metric tonnes of mercury avoided (lamps and power plant emissions)
- $1.23 trillion in electricity bill savings
- 2.97 gigatonnes of carbon dioxide avoided – the equivalent of approximately three times the annual CO_2 emissions of Japan.

If the Convention adopts a 2027 phase-out date (one-year delay), compared to 2026, the mercury savings would be reduced by 18 metric tonnes. In turn, the world would be burdened with $109 billion more in electricity bills and 300 million metric tonnes of carbon dioxide will be released to the atmosphere.

[21] lighting represents 9.3 to 10.3% of anthropogenic consumption in products (Annex A). UN Mercury Supply Trade and Demand Study, 2017 (Table 12, page 46) https://wedocs.unep.org/bitstream/handle/20.500.11822/21725/global_mercury.pdf

[22] For information on the Clean Lighting Coalition savings estimates: https://cleanlightingcoalition.org/

COP-4 adopted a decision on international cooperation and coordination, recognising the Minamata Convention's contribution to addressing the triple planetary crises of pollution, biodiversity loss, and climate change. A complete phase-out of fluorescent lamps helps to address this triple planetary crisis as outlined below:

1) Responding to the Climate Emergency

According to the Intergovernmental Panel on Climate Change[23], now is the time for urgent climate action to secure a liveable future for all. The latest IPCC report issued last March underscored the fact that the world is entering a climate emergency, and the losses and damages we are already experiencing will continue and worsen in the future, hitting the most vulnerable people and ecosystems especially hard. As a co-benefit to mercury pollution reduction, the opportunity for climate mitigation resulting from a global fluorescent phase-out is unmatched by any other opportunity provided within the scope of the Minamata Convention. Parties can support this technologically feasible and economically justified transition to LED lighting that will not only reduce mercury pollution, but also contribute substantial CO_2 emission reductions. The urgent and rapid phase-out of toxic compact fluorescent lamps in 2025 and linear fluorescent lamps in 2026 would represent a robust response to the climate emergency.

2) Households and businesses are experiencing a Cost-of-Living Crisis

Households and businesses across Africa and the world are experiencing significant increases in the cost of living. Compounding global crises including COVID-19, the war in Ukraine, increased extreme weather events, and climate-related impacts on agricultural yields are all contributing to economic pressures that will likely mount to a global recession, according to experts. Energy prices – including petrol prices and electricity tariffs – are also increasing in response to supply uncertainty and capacity shortfall. The United Nations Development Programme has estimated over 70 million people in developing economies have fallen into poverty since March 2022 as a direct effect of increased energy and food costs.[24] Making the transition to energy-efficient LED lighting is an easy, accessible upgrade that would alleviate pressure on consumers by cutting household and business lighting electricity bills in half. Additionally, as energy prices increase, payback periods get shorter, since the energy savings are worth even more. Finally, from a national perspective, promoting efficient lighting helps to reduce strain on the grid, freeing up electrical power to be leveraged for other productive uses.

3) The International Energy Agency recommends all LED sales in 2025

The IEA recently published two reports that offer guidance on how the world lighting market should shift to LEDs in 2025:

a. **Net Zero Emissions by 2050.**[25] *An IEA report that sets out a series of measures the world must undertake to achieve net zero climate emissions by 2050.* On page 146 of this report, the IEA calls for a total global sales shift to LED lighting: "The share of light-emitting diode (LED) lamps in total lightbulb sales reaches 100% by 2025 in all regions."

b. **Technology and innovation pathways for zero-carbon-ready buildings by 2030.**[26] *An IEA report that focuses on the opportunities in the building sector which can help to achieve zero-carbon ready buildings by 2030.* This report has a chapter on lighting which is aptly titled: "Targeting 100% LED lighting sales by 2025".

4) UNEP United for Efficiency recommends fluorescent phase-out in 2023-2025

In February 2021, the United Nations Environment Programme's United for Efficiency (U4E) programme published draft mandatory energy performance standards (MEPS) documents which

[23] IPCC Press Release, 20 March 2023. https://www.ipcc.ch/site/assets/uploads/2023/03/IPCC_AR6_SYR_PressRelease_en.pdf

[24] UNDP "Addressing the cost-of-living crisis in developing countries: Poverty and vulnerability projections and policy responses" report: https://www.undp.org/publications/addressing-cost-living-crisis-developing-countries-poverty-and-vulnerability-projections-and-policy-responses

[25] IEA Net Zero Emissions by 2050 report: https://www.iea.org/reports/net-zero-by-2050

[26] IEA Technology and Innovation Pathways report: https://www.iea.org/reports/targeting-100-led-lighting-sales-by-2025

recommend a 2023 phase-out of all CFLs[27] and a latest phase-out date of 2025 for all LFLs.[28] This recommendation includes explicit functional performance requirements specifying that “The luminaire and light source shall not contain any mercury (0.0 mg)”. These “model regulations” are available to policymakers around the world and are being used as starting points for MEPS.

[27] UNEP U4E Model Regulation on General Service Lamps (including CFLs): https://united4efficiency.org/resources/model-regulation-guidelines-for-energy-efficiency-and-functional-performance-requirements-for-general-service-lamps/

[28] UNEP U4E Model Regulation on Linear Fluorescent Lamps (including LFLs): https://united4efficiency.org/resources/model-regulation-guidelines-for-energy-efficiency-and-functional-performance-requirements-for-linear-lighting/

Annex III*

Illustration of the coverage of fluorescent lighting in Part I of Annex A, including this proposal

This Annex note provides an illustration of coverage in Figure III.1 and a table of all the provisions relating to fluorescent lighting in Annex A, Part I including this amendment. This Annex is offered to Parties for clarity on the need and appropriateness of these amendments.

<table>
<tr><td rowspan="2">Compact Fluorescent Lamps</td><td colspan="2">Compact Fluorescent Lamps (CFLS) ≤30 Watts and >5 mg Hg</td><td rowspan="2">CFLs >30 Watts
(high wattage CFLs, includes both CFL.i and CFL.ni)</td></tr>
<tr><td>Integrally Ballasted (CFL.i)
≤30 Watts and ≤5 mg Hg</td><td>Non-integrally Ballasted (CFL.ni)
≤30 Watts and ≤5 mg Hg</td></tr>
</table>

<table>
<tr><td rowspan="5">Fluorescent Lamps</td><td>Linear fluorescent, triband phosphor <60 Watts and >5 mg Hg</td><td rowspan="2">Linear fluorescent, triband phosphor,
≥60 Watts</td></tr>
<tr><td>Linear fluorescent, triband phosphor <60 Watts and ≤5 mg Hg</td></tr>
<tr><td>Linear fluorescent, halophosphate ≤40 Watts and >10 mg Hg</td><td rowspan="2">Linear fluorescent, halophosphate,
>40 Watts</td></tr>
<tr><td>Linear fluorescent, halophosphate ≤40 Watts and ≤10 mg Hg</td></tr>
<tr><td colspan="2">Non-linear fluorescent (U-bend, circular), triband and halophosphate, all wattages</td></tr>
</table>

CCFL / EEFL	Lamps of short, medium and long length for displays with various mercury content	CCFL and EEFL not included in the original scope of coverage

Key:

- From original Annex A table (Minamata Convention Text, 2013)
- Africa/EU Amendments submitted to COP-4, carried forward to COP-5
- African Amendment adopted by Parties in Bali at COP-4 in 2022
- New amendment proposed for consideration at COP-5

Figure III.1 Categories and Subgroups of Fluorescent Lamps in the Minamata Convention Annex A

* The annex has not been formally edited.

Table III.1 Fluorescent lamp provisions situated in the context of Annex A, Part I

Mercury-added products	Date after which the manufacture, import or export of the product shall not be allowed (phase-out date)
Compact fluorescent lamps (CFLs) for general lighting purposes that are ≤ 30 watts with a mercury content exceeding 5 mg per lamp burner	2020
Compact fluorescent lamps (CFLs) for general lighting purposes that are > 30 watts	2025
Compact fluorescent lamps with an integrated ballast (CFL.i) for general lighting purposes that are ≤ 30 watts with a mercury content not exceeding 5 mg per lamp burner	2025
Compact fluorescent lamps with a non-integrated ballast (CFL.ni) for general lighting purposes that are ≤ 30 watts with a mercury content not exceeding 5 mg per lamp burner	2025
Linear fluorescent lamps (LFLs) for general lighting purposes: (a) Triband phosphor < 60 watts with a mercury content exceeding 5 mg per lamp; (b) Halophosphate phosphor ≤ 40 watts with a mercury content exceeding 10 mg per lamp	2020
Linear fluorescent lamps (LFLs) for general lighting purposes: (a) Halophosphate phosphor ≤ 40 watts with a mercury content not exceeding 10 mg per lamp; (b) Halophosphate phosphor > 40 watts	[2025] [2027] [2030]
Linear fluorescent lamps (LFLs) for general lighting purposes: (a) Triband phosphor < 60 watts with a mercury content not exceeding 5 mg/lamp	[2027] [2030]
Linear fluorescent lamps (LFLs) for general lighting purposes: (a) Triband phosphor ≥ 60 watts	2026
Non-linear fluorescent lamps (NFLs) (e.g., U-bend and circular) for general lighting purposes: (a) Triband phosphor, all wattages; (b) Halophosphate phosphor, all wattages	2026
Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays: (a) short length (≤ 500 mm) with mercury content exceeding 3.5 mg per lamp (b) medium length (> 500 mm and ≤ 1 500 mm) with mercury content exceeding 5 mg per lamp (c) long length (> 1 500 mm) with mercury content exceeding 13 mg per lamp	2020
Cold cathode fluorescent lamps (CCFL) and external electrode fluorescent lamps (EEFL) of all lengths for electronic displays, not included in the listing directly above	2025

Colour Key:

	From original Annex A table (Minamata Convention Text, 2013)
	African Amendment adopted by Parties in Bali at COP-4 in 2022
	African/EU Amendments submitted to COP-4, carried forward to COP-5
	New Amendment proposed for consideration at COP-5