Last September 30th, 2014 India did join the International Convention of Minamata over mercury emission. One year before, the Japanese Government has urged that the Convention had the name of the town from which it took its name the neurological syndrome that locals contracted from contaminated wastewater, enter the food chain through fish. The Convention, signed already by 128 countries is the result of four years of negotiations and provides checks and restrictions on a wide range of products, processes and industries where mercury is used, released or emitted. In Italy, as an international body for the implementation of the Convention of Minamata, has been created the National Reference Center on Mercury (CNRM), thanks to an agreement between the National Research Council and the Ministry of the Environment.

The elements of interest in the Minamata Convention are as follows.

- Products containing mercury, for which there are already alternatives comparable, will be banned from 2020. This rule applies, for example batteries, switches, relays, lamps and certain types of measuring instruments such as barometers, manometers, thermometers and sphygmomanometers.
- International trade on mercury is limited to the purposes allowed under the Convention or for disposal. There is also an obligation to request written permission.
- Provisions for temporary safe storage have been issued, for the proper management and disposal of waste.
- Signed a more efficient and effective mechanism for the verification of compliance with the obligations of the Contracting Parties and the adoption of appropriate measures.
- Finally, there is a consistent and efficient multilateral funding by the Global Environment Facility (GEF), in combination with other funding sources.

These limits will take effect from 2020. In particular, the document talks about the ban on the production, export and import of certain products containing mercury, including, explicitly, the cold cathode fluorescent lamps (CCFL) and external electrode fluorescent linear ones (External Electrodes fluorescent Lamps, which EEFL) and some types of compact fluorescent lamps (CFL).
While in the case of CFLs is made clear that there are types excluded in the cold cathode fluorescent lamps do not provide exemptions for particular categories, as it so far has been done with the RoHS (“special” lamps and so on). An important detail: in listing does not say that is the lamp to be banned (as is the case for other products), but the use of mercury in these lamps. So you can produce lamps filled with pure neon, for example.

In any case, 2020 is the year that will see the development of the announcement:
- Compact Fluorescent Lamps (CFL) for general lighting power ≤30 watts & a mercury content of >5mg per lamp.
- Linear fluorescent lamps (LFL) for general lighting power ≤30 watts and a mercury content of > 5 mg.
- Tri-band phosphor lamps with power <60 watts and a mercury content of > 5mg.
- Lamps Halophosphate power ≤ 40 watts and a mercury content > 10mg.
- Vapor lamps of high pressure mercury (HPMV) for general lighting.
- Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays:
  - Short (≤ 500mm) with a mercury content of >3.5 mg
  - Medium (> 500mm & ≤ 1500mm) with a mercury content of > 5mg
  - Long (> 1500mm) with a mercury content of > 13 mg.

Over the years, several researchers have dedicated to an alternative to the mercury discharge lamps, based on the fumes of this heavy metal; the main reason is due to the incompatibility of environmental mercury, inhalation or direct contact, can cause damage to brain cells, liver and nervous system. Since 1800 had many well-known properties of

![Coal mines map: India is the 3rd largest coal consumer after US and P.R.C.](image)
mercury and its salts; some of these salts were used for the black dye of protein fibers, such as wool felts in the preparation of hats and the same human hair. Soon it became clear, however, that the use of mercury, were associated with harmful and toxic properties. The phrase "mad as a hatter" (he is one of the characters from "Alice in Wonderland" by Lewis Carroll, not coincidentally a doctor!) derives from the devastating effects of mercury on the mind of the workers who handled it.

In the lighting industry, gas discharge sources are still based on this substance, simply because the substitutes have not proved equally efficient in terms of lumens per watt. In other words serves more energy to obtain the same light; This brings us to the next step.

A realistic approach to environmental impact cannot be separated from the emission of mercury due to the production of electricity, which depends on the 'energy mix' of each country. Taking as a basis the European average, the amount of mercury emitted into the atmosphere from power plants is about 30 μg per kWh of energy produced. The countries most affected in terms of health, from the emissions of coal are: Poland, Germany, Romania and Bulgaria. All those countries have huge coal mines in their own territory and the use of domestic resources is the simpler way to reduce the country dependency from importing primary energy. Italy and France, for antithetical energy policies, are, fortunately, in the slums of this sad list: France is mostly a nuclear power plants, while Italy prefers natural gas (from Russia and Algeria). It is estimated that mercury emissions, only by coal power plants, would amount, in Italy, about 700 kg, with a higher air pollution in the vicinity of the plants themselves. In that mercury emissions due to coal, must be added the mercury released into the air from incineration of solid waste and industrial uses, but that's another story.

India scenario can be resumed by these figures: 855 km2 of coal mining area, 572 coal mines for a total production of 373 Million tons (in 2004). India is the third hard coal producer in the world after China and the USA. There are 170 opencast mines; 359 underground and 33 mixed mines.

About 70% of the heat and electricity production in India depends on indigenous coals, while about 41 Million tons of coking coals were imported in 2005.

In 2010, 37% of mercury emissions in the world was due to the extraction of gold from the mines, and 24% for the combustion of coal by industries. According to the European RoHS Directive, fluorescent lamps shall not exceed the amount of mercury shown in the Table herein.

As a well-known Dutch producer informs that the content of mercury is only 1.4 mg instead of 5 mg allowed in normal tri-phosphor lamps & 2 mg instead of 8 mg in the long life fluorescent tube.

The European coal contains, depending on the types, from 60 to 80 milligrams of mercury per ton; because it takes about 0.35 kg of coal to produce one kWh of electricity, the "mercury content" of the electricity produced in coal power plants amounts to about 30 μg per kWh, depending on the quality of coal and conversion efficiency.

A comparison of the values given in the last column of Table 2 and 3 show that the amount of "emitted mercury" during the life span of a fluorescent tube is about 10 times that contained in the lamp itself; while a proper management of the waste enables the recycling of the substance, the combustion leads directly into the atmosphere this heavy metal. This shows that, regardless of other environmental aspects such as the increase in production of CO2, LED, OLED or coming mercury-free lamps (still to be developed) would not stop the emission of mercury into the atmosphere.

<table>
<thead>
<tr>
<th>Lamp</th>
<th>Fluorescent tube</th>
<th>Life (hours)</th>
<th>Emissions (Hg) mg</th>
<th>Limit</th>
<th>Art of the art</th>
</tr>
</thead>
<tbody>
<tr>
<td>58W T8</td>
<td>8.000</td>
<td>17,0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35W T5</td>
<td>12.000</td>
<td>12,6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35W T5</td>
<td>24.000</td>
<td>25,0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Mercury emitted from power plants over the life of some lamps